



# Course Outline

**BEES3041**

## **Big Data in the Biological, Earth and Environmental Sciences**

School of BEES

Faculty of Science

T2, 2020

# 1. Staff

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Position	Name	Email & contact details	Consultation times and locations
Course Convenor	Shinichi Nakagawa	<a href="mailto:s.nakagawa@unsw.edu.au">s.nakagawa@unsw.edu.au</a> Room 5102, Level 5 West Biological Sciences South (E26)	Email*
Lecturers	Will Cornwell	<a href="mailto:w.cornwell@unsw.edu.au">w.cornwell@unsw.edu.au</a> Room 5104, Level 5 West Biological Sciences South (E26)	Email*
	Martin De Kauwe	<a href="mailto:m.dekauwe@unsw.edu.au">m.dekauwe@unsw.edu.au</a> Climate Change Research Centre Level 4, Mathews Building (F23)	Email*
	Daniel Falster	<a href="mailto:daniel.falster@unsw.edu.au">daniel.falster@unsw.edu.au</a> Room 5109, Level 5 West Biological Sciences South (E26)	Email*
	Shawn Laffan	<a href="mailto:shawn.laffan@unsw.edu.au">shawn.laffan@unsw.edu.au</a> Room G14G Samuels Building (F25)	Email*
	Sarah Perkins-Kirkpatrick	<a href="mailto:sarah.kirkpatrick@unsw.edu.au">sarah.kirkpatrick@unsw.edu.au</a> Room 466.01 Mathews Building (F23)	Email*

**\* Current isolation and school closures mean we are often working from home, with children doing the same. We will reply to your emails during work hours, and perhaps not immediately**

## 2. Course information

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Units of credit: 6

Pre-requisite(s): 48 UOC, including BEES2041

Teaching times and locations: the first 4 weeks (also the first lecture of the 4<sup>th</sup> week), but for further details see course schedule

Component	HPW	Time	Day	Location
<b>Lectures</b>	<b>4</b>			
Lecture 1*	2	2:00 pm – 4:00 pm	Monday	Online
Lecture 2	2	10:00 am - 12:00 pm	Tuesday	Online
<b>Labs</b>	<b>4</b>			
Lab 1*	2	4:00 pm – 6:00 pm	Monday	Online
Lab 2	2	2:00 am – 4:00 pm	Tuesday	Online

\*Timetable says these lecture and lab times are in the reverse order, but we want to provide a background lecture before a corresponding lab. Also, note that we are likely to use a set of a 2-hour lecture and 2-hour lab to mix the components of lecture and lab.

<http://www.timetable.unsw.edu.au/2019/BEES3041>

### 2.1 Course summary

This is an advanced quantitative methods course which uses a project-based approach to consider the analysis, visualisation and communication of (often) large and complex data sets. Students will choose a topic for in-depth instruction in one of the advanced quantitative research endeavours of the School of BEES. The modules cover techniques including, for example, bibliometric data, geographic data analyses, population and systems dynamics, phylogenetics and time series analyses.

### 2.2 Course aims

To prepare students for using large complex data sets.

To prepare students for honours and further independent research.

To utilise the talents of several strategic hires in the School of BEES.

To increase the graduate attributes of our most capable students.

### 2.3 Course learning outcomes (CLO)

At the successful completion of this course you (the student) should be able to:

1. Describe, apply and evaluate different research methods used across the biological, Earth and environmental sciences
2. Design and develop methods for data visualisation and analysis
3. Conduct analyses of big and complex data
4. Effective written and visual communication of complex data sets

## **3. Strategies and approaches to learning**

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### **3.1 Learning and teaching activities**

In this course, students work as a real data scientist i.e. someone who can effectively analyse, interpret and present real and often challenging data. This is an advanced course and will use a problem-based approach with modules so that students can select a topic based on their sub-discipline/specialisation in BEES.

In the first 4 weeks, students will attend a mix of lectures and practicals on 6 different topics. During the period of this course, students conduct a research project, supervised by one of the course lecturers. This project is designed to teach you how to carry out research, analyse, interpret, and present data. This involves attending a weekly tutorial, to update supervisors about their project, and producing a research proposal, presentation, project paper and popular article. The course assessment will be based on these 4 assignments.

### **3.2 Expectations of students**

Attendance to all scheduled classes is compulsory. When conducting your independent research projects, you are expected to attend all weekly sessions with your project supervisor (online). Your supervisor is there to help you, but they will not chase you up regarding your progress and it is your responsibility to follow up if you have any issues arising with your project.

## 4. Course schedule and structure

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Week	Lecture & Lab	Date	Lecturer
1	<b>Introduction:</b> Deciding on your project and meeting your supervisors	1 Jun	All of us
	<b>Special Lab:</b> Introduction to GitHub (WC) & Introduction to R Markdown (SN)	1 Jun	WC + SN
	<b>Lecture 1:</b> Meta-research, systematic reviews and bibliometrics (SN)	2 Jun	SN
	<b>Lab 1:</b> Bibliometrics and systematic reviews using R	2 Jun	SN
2	<b>Public holiday</b>	8 Jun	
	<b>Lecture 2:</b> Big biodiversity data: genetic, functional, and geographic data from across the world	9 Jun	WC
3	<b>Lab 2:</b> Big biodiversity data: genetic, functional, and geographic data from across the world	9 Jun	WC
	<b>Lecture 3:</b> Modelling forests, starting with a leaf	15 Jun	MDK
	<b>Lab 3:</b> Modelling the photosynthetic response to environmental conditions	15 Jun	MDK
	<b>Lecture 4:</b> Growth and mortality rates of trees across the world	16 Jun	DF
4	<b>Lab 4:</b> Estimating growth and mortality rates for rainforest trees	16 Jun	DF
	<b>Lecture 5:</b> The spatial analysis of diversity patterns	22 Jun	SL
	<b>Lab 5:</b> The spatial analysis of diversity patterns	22 Jun	SL
	<b>Lecture 6:</b> Climate models and constructing climate projections	23 Jun	SPK
	<b>Lab 6:</b> Climate models and constructing climate projections	23 Jun	SPK

1-9	<p><b>Project</b></p> <p>During these weeks, you will be working independently on your research projects. Each week you will meet with your research advisor for a tutorial session to help with your project – these are not formally scheduled so you will need to arrange this time with your advisor</p> <p>Weeks 1-5: Discussing research topics with a supervisor and deciding on a topic</p> <p>Week 5: Research proposal due</p> <p>Weeks 6-9: Meet with your supervisor every week with a group of other students. Independent project work</p>	
10	Research presentations – 2:00 pm – 5:00 pm (online) (3 <sup>rd</sup> Aug)	

## 5. Assessment

### 5.1 Assessment tasks

Assessment task	Weight	Due date	Submission details*	Feedback
<b>Assessment 1:</b> Research Proposal This proposal will briefly outline a topic and data of your choice, and describe methods one will use to analyse the dataset.	10%	Week 5 3 <sup>th</sup> July	Via Moodle	Marks and comments, 1 week after submission. Via Moodle
<b>Assessment 2:</b> Final Report Your independent project report based on the Proposal in Assignment 1 and this report will take a format of an academic paper.	60%	Week 10 7 <sup>th</sup> Aug	Via Moodle	Marks and comments, 2 weeks after submission. Via Moodle
<b>Assessment 3:</b> Final Presentation You will present your topic, data, and findings to the class.	15%	Week 10 In class 3 <sup>rd</sup> Aug	In class (online)	Marks and comments, 1 week after submission. Via Moodle
<b>Assessment 4:</b> Science Communication (Twitter Conference) You will prepare 4 tweets that summarises your independent project in a way accessible to a wider audience	15%	Week 10 4 <sup>th</sup> Aug	Via Twitter	Marks and comments, 2 weeks after submission. Via Moodle

\*Assignments submitted after the due date will be penalised at the rate of 10% per day unless accompanied by a medical certificate and special consideration application ([lodged via myUNSW](#)). All outstanding assignments must be handed in by the end of Week 10. Work will only be accepted after this date if accompanied by a special consideration application (this is School policy).

#### Further information

UNSW grading system: [student.unsw.edu.au/grades](http://student.unsw.edu.au/grades)

UNSW assessment policy: [student.unsw.edu.au/assessment](http://student.unsw.edu.au/assessment)

### 5.2 Assessment criteria and standards

Detailed instructions for each assessment will be provided in class and on Moodle

All assessments are based on individual work, and are not group assignments.

## 6. Academic integrity, referencing and plagiarism

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**Referencing** is a way of acknowledging the sources of information that you use to research your assignments. You need to provide a reference whenever you draw on someone else's words, ideas or research. Not referencing other people's work can constitute plagiarism.

Further information about referencing styles can be located at [student.unsw.edu.au/referencing](http://student.unsw.edu.au/referencing)

**Academic integrity** is fundamental to success at university. Academic integrity can be defined as a commitment to six fundamental values in academic pursuits: honesty, trust, fairness, respect, responsibility and courage.<sup>1</sup> At UNSW, this means that your work must be your own, and others' ideas should be appropriately acknowledged. If you don't follow these rules, plagiarism may be detected in your work.

Further information about academic integrity and **plagiarism** can be located at:

- The *Current Students* site [student.unsw.edu.au/plagiarism](http://student.unsw.edu.au/plagiarism), and
- The *ELISE* training site [subjectguides.library.unsw.edu.au/elise](http://subjectguides.library.unsw.edu.au/elise)

The *Conduct and Integrity Unit* provides further resources to assist you to understand your conduct obligations as a student: [student.unsw.edu.au/conduct](http://student.unsw.edu.au/conduct).

## 7. Readings and resources

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Useful resources such as readings, recommended internet sites, and other useful materials will be provided via the Moodle page

## 8. Administrative matters

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<b>School information</b>	School website: <a href="http://www.bees.unsw.edu.au/">http://www.bees.unsw.edu.au/</a> School office – The Biosciences Student Office is where to go for administrative matters relating to BEES courses. It is located on the ground floor of the biological sciences building, room G27. <a href="mailto:BEESinfo@unsw.edu.au">BEESinfo@unsw.edu.au</a>
<b>Occupational Health and Safety</b>	Information on relevant Occupational Health and Safety policies and can be found on the following website: <a href="http://www.bees.unsw.edu.au/health-and-safety">http://www.bees.unsw.edu.au/health-and-safety</a> UNSW OHS Home page: <a href="http://safety.unsw.edu.au/">http://safety.unsw.edu.au/</a>
<b>Equity and Diversity</b>	Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course Convenor prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equity and Diversity Unit (9385 4734 or <a href="http://www.studentequity.unsw.edu.au/">http://www.studentequity.unsw.edu.au/</a> ).

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<sup>1</sup> International Center for Academic Integrity, 'The Fundamental Values of Academic Integrity', T. Fishman (ed), Clemson University, 2013.



	Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.		
<b>Student complaint procedure</b>	<p>In all cases you should first try to resolve any issues with the course convenor.</p> <p>If this is unsatisfactory, you should contact the School Student Ethics Officer (A/Prof Stephen Bonser, <a href="mailto:s.bonser@unsw.edu.au">s.bonser@unsw.edu.au</a>) or the Deputy Head of School (A/Prof Scott Mooney <a href="mailto:s.mooney@unsw.edu.au">s.mooney@unsw.edu.au</a>) who is the School's Grievance Officer and Designated Officer under the UNSW Plagiarism Procedure.</p> <p>UNSW has formal policies about the resolution of complaints that are available online for review (see <a href="https://student.unsw.edu.au/complaints">https://student.unsw.edu.au/complaints</a>).</p>		
	<b>School contact</b>	<b>Faculty Contact</b>	<b>University contact</b>
	Dr S Mooney Deputy Head of School (Undergraduate Programs) <a href="mailto:s.mooney@unsw.edu.au">s.mooney@unsw.edu.au</a> Tel: 9385 8063	Dr Chris Tisdell Associate Dean (Education) <a href="mailto:cct@unsw.edu.au">cct@unsw.edu.au</a> Tel: 9385 6792 or Dr S Mooney Associate Dean (Undergraduate Programs) <a href="mailto:s.mooney@unsw.edu.au">s.mooney@unsw.edu.au</a> Tel: 9385 8063	Student Administration in the Office of the Pro-Vice Chancellor (Students). <a href="mailto:clare.jones@unsw.edu.au">clare.jones@unsw.edu.au</a> Tel: 9385 3087 University Counselling and Psychological Services3 Tel: 9385 5418 <a href="mailto:counselling@unsw.edu.au">counselling@unsw.edu.au</a>

## 9. Additional support for students

- The *Current Students Gateway*: [student.unsw.edu.au](http://student.unsw.edu.au)
- Academic Skills and Support: [student.unsw.edu.au/skills](http://student.unsw.edu.au/skills)
- Student Wellbeing, Health and Safety: [student.unsw.edu.au/wellbeing](http://student.unsw.edu.au/wellbeing)
- Disability Support Services: [student.unsw.edu.au/disability](http://student.unsw.edu.au/disability)
- UNSW IT Service Centre: [www.it.unsw.edu.au/students](http://www.it.unsw.edu.au/students)