UNSW Course Outline

ZPEM3532 Advanced Topics in Physics and Oceanography - 2024

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General Course Information

Course Code : ZPEM3532
Year : 2024
Term : Semester 2
Teaching Period : Z2
Is a multi-term course? : No
Faculty : UNSW Canberra
Academic Unit : UC Science
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : UNSW Canberra at ADFA
Campus : UNSW Canberra
Study Level : Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

ZPEM3532 Advanced Topics in Physics and Oceanography is a compulsory component of Physics or Oceanography majors at UNSW Canberra and is designed to be equally applicable to students of either sub-discipline. It may also be offered as an elective to other Science

students. The course provides a unique opportunity for students to build research skills relevant to their discipline, and affords the opportunity to apply some of the knowledge they have developed during the first two and a half years of their respective programs towards a directed research project in either Physics or Oceanography.

Course Aims

ZPEM3532 is a compulsory component of Physics or Oceanography majors at UNSW Canberra and is designed to be equally applicable to students of either sub-discipline. The course provides a unique opportunity for Physics and Oceanography students to build research skills relevant to their discipline, and affords the opportunity to apply some of the knowledge they have developed during the first two and a half years of their respective programs, but in a much more self-directed and strategic manner than in previous courses.

ZPEM3532 will be run in two distinct parts. The first half of the course will consist of weekly lectures and interactive tutorials designed to help students develop research and data analysis skills, as well as gain proficiency in modern programming languages (e.g. Python). In the second half of the course, students will apply these skills by working in small groups to complete directed research projects chosen by discipline staff. Students will communicate the results of their projects through an oral presentation, written reports and logbooks kept during the project.

Relationship to Other Courses

ZPEM3532 allows students to apply domain knowledge they have developed during the first two and a half years of their programs to a directed research project suggested by discipline staff. With a choice of projects across atmopsheric physics, astrophysics, oceanography, nuclear physics and condensed matter/materials physics, students can apply and extend the concepts learned in earlier courses to their chosen research topic. For projects with hands-on laboratory components, this work complements laboratories undertaken in other Level 3 courses such as ZPEM3404 Ocean Waves & Modelling and ZPEM3528 Nuclear Physics.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Mastered generic research skills through the lecture/tutorial and group project components. These skills may include conducting literature searches, experimental design, the conduct of research, data analysis and visualisation
CLO2 : Ability to manage and direct a research project and engage in independent and reflective learning as required.
CLO3 : Practical application of specific in-depth knowledge in either Physics or Oceanography.
CLO4 : Communication skills in the written, oral and visual presentation of results.

Course Learning Outcomes	Assessment Item
CLO1 : Mastered generic research skills through the lecture/tutorial and group project components. These skills may include conducting literature searches, experimental design, the conduct of research, data analysis and visualisation	• Research skills and data analysis assignments • Project reports • Project presentation • Project logbook
CLO2 : Ability to manage and direct a research project and engage in independent and reflective learning as required.	• Project reports • Project presentation • Project logbook
CLO3 : Practical application of specific in-depth knowledge in either Physics or Oceanography.	• Research skills and data analysis assignments • Project reports • Project logbook
CLO4 : Communication skills in the written, oral and visual presentation of results.	• Research skills and data analysis assignments • Project presentation • Project reports • Project logbook

Learning and Teaching Technologies

Moodle - Learning Management System | Echo 360

Learning and Teaching in this course

Both parts of the course provide opportunities to develop skills in experimental design, Python programming, data analysis, scholarship and written and oral communication. Many of these skills are transferrable to problems outside of Physics and Oceanography, including non-academic contexts. These applications will be emphasized during lectures and tutorials.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Research skills and data analysis assignments Assessment Format: Individual	30%	Start Date: Not Applicable Due Date: Not Applicable
Project reports Assessment Format: Individual	45%	Start Date: Not Applicable Due Date: Not Applicable
Project presentation Assessment Format: Individual	15%	Start Date: Not Applicable Due Date: Week 13: 21 October - 25 October
Project logbook Assessment Format: Individual	10%	Start Date: Not Applicable Due Date: 04/11/2024 06:00 PM

Assessment Details

Research skills and data analysis assignments

Assessment Overview

Students will complete short assignments on the research and data analysis/programming skills covered during the first half of the course.

Course Learning Outcomes

- CLO1 : Mastered generic research skills through the lecture/tutorial and group project components. These skills may include conducting literature searches, experimental design, the conduct of research, data analysis and visualisation
- CLO3 : Practical application of specific in-depth knowledge in either Physics or Oceanography.
- CLO4 : Communication skills in the written, oral and visual presentation of results.

Detailed Assessment Description

Assessment in the first half of the course will consist of a quiz on research skills on Monday, 19 August (Week 6) during the timetabled session (**10%**) and two assignments assessing Python/ data analysis skills due at the end of Weeks 4 and 7 (**10% each**). The quiz and assignments are to be completed individually and submitted through Moodle/Turnitin. Each assignment should take students up to 4-5 hours outside of class to complete.

Project reports

Assessment Overview

Students will submit a preliminary project outline at the commencement of their projects,

followed by a substantive literature review midway through the project. The final project report will be due during the exam week at the end of semester.

Course Learning Outcomes

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- CLO2 : Ability to manage and direct a research project and engage in independent and reflective learning as required.
- CLO3 : Practical application of specific in-depth knowledge in either Physics or Oceanography.
- CLO4 : Communication skills in the written, oral and visual presentation of results.

Detailed Assessment Description

Preliminary project outline (one typed single space page) including background and aims. Due at the end of Week 6: **5%**.

A substantial literature review (up to 10 pages, including references), providing further background to the science on which the project is based and the methodology to be applied. Due at the end of Week 8: **10%**.

Final individual project report due Monday, 4 November (start of exam week): **30%**.

The final project report should extend to **at least 10 pages** including an introduction, *summary* of the literature, experimental/analytical details, plus appropriate data tables, diagrams and plots but with references/bibliography in addition. Specific guidance on the format expected for lab logbooks and reports will be provided by project supervisors.

Project presentation

Assessment Overview

Short presentation to be delivered towards the end of semester. Students should present an outline of their project together with a summary of progress to date.

Course Learning Outcomes

- CLO1 : Mastered generic research skills through the lecture/tutorial and group project components. These skills may include conducting literature searches, experimental design, the conduct of research, data analysis and visualisation
- CLO2 : Ability to manage and direct a research project and engage in independent and reflective learning as required.
- CLO4 : Communication skills in the written, oral and visual presentation of results.

Detailed Assessment Description

30 min group presentations (not including time for questions) will be scheduled for Week 13, with the order to be decided by lottery. Each group should present an outline of their project, together with a summary of progress to date and any preliminary results or conclusions. It is anticipated that the presentations will be held face-to-face with all members of the class and project supervisors in attendance for support and to ask questions. Members of each group are expected to contribute equally to the presentation (including speaking and preparing content), with a component of the grade allocated individually.

Assessment Length

30 min

Project logbook

Assessment Overview

Project supervisors will assess the quality of records being maintained during the project (e.g. literature reviews, program codes, data sets etc). To be assessed with the final project report at the end of semester.

Course Learning Outcomes

- CLO1 : Mastered generic research skills through the lecture/tutorial and group project components. These skills may include conducting literature searches, experimental design, the conduct of research, data analysis and visualisation
- CLO2 : Ability to manage and direct a research project and engage in independent and reflective learning as required.
- CLO3 : Practical application of specific in-depth knowledge in either Physics or Oceanography.
- CLO4 : Communication skills in the written, oral and visual presentation of results.

Detailed Assessment Description

A physical logbook (or electronic log using an agreed online platform) will be used for recording data and the documentation of analyses during the project. This will be submitted with the final report and graded on the basis of the depth and quality of the records maintained, plus general effort and diligence during the project.

General Assessment Information

Assessment in ZPEM3532 reflects both the research skills and project aspects of the course. In the first half of the course, students will be assessed on their ability to conduct literature searches, critically review Physics and Oceanography literature, prepare and analyse data within

a Python environment, and create informative and engaging plots and visualisations. During their projects, students will be assessed on their ability to formulate a clear project method, with reference to appropriate background literature and theory, to document the progress of the research work itself, and to summarise their results via written reports and an oral presentation.

Assessment criteria for projects

In report-type work (written or oral), assessors will look for a number of aspects of the work to be explained:

- *Motivation and Background:* why is this research important or useful? How does it fit into the "big picture"?
- *Scope and Aims:* what exactly was the candidate attempting to do? What part of the "unanswered question" does this research address, and why? Did the scope/aims change during the project and if so, how and why?
- *Method and Procedure:* how was the research "done"? Why was it done this way? Were there other options, and if so, were they explored? If not, why not?
- *Results and Interpretation:* what was seen? What does it mean, and why? Are other interpretations possible, how are they regarded and why?
- *Conclusions and Summary:* concisely package up the research;
- *Further Work:* where to from here? How could this research be improved and/or extended?
- *References:* acknowledge the shoulders upon which this research stands!

Assessors will look for relevance and quality in the material presented, searching for evidence of clarity of thought and process. Assessors may characterise HD-level work by the identification of higher-level thinking skills (such as synthesis, evaluation and interpretation) together with the analysis of data that might be expected as a matter of course in research, and demonstration of base-level skills such as the application of known and well-understood techniques. Attention will be paid to the proper and appropriate use of units, figures, diagrams, tables and referencing.

Overall, the "best" work will demonstrate a comprehensive understanding of the subject matter, display mastery of relevant skills, include evidence of high-level interpretive and analytical ability, together with a clear analysis of concepts by sophisticated or original means, producing work that is enlightening to the reader.

The major difference between oral and written reports is that an oral report requires the presenter to concentrate on well-chosen examples, or highlights, while a written report can delve into greater depth or breadth. As a general, very rough guideline, any more than one slide per minute is too much for an oral presentation; and any less than one per three minutes stands a risk of not presenting enough information.

Referencing

Students are required to reference using in-text citations and a reference list, following an accepted referencing style (e.g. Harvard, APA). Students must acknowledge *every* source of information used (including sources of all numbers, photos, diagrams, etc.) with an in-text citation. It is the student's responsibility to understand and correctly use referencing. Inadequate referencing may lead to investigation for plagiarism.

Use of generative artificial intelligence (AI) in assessments (e.g. ChatGPT)

As the assessments in this course involve some planning or creative processes, you are permitted to use software such as a generative AI (e.g. ChatGPT, Google Bard) to generate or refine your initial ideas. However, you must develop or edit those ideas to such a significant extent that what is submitted is your own work, i.e. only occasional AI generated words, phrases, computer code or images may form part of your final submissions. If using an AI tool, it is recommended that you keep copies of your initial prompts and outputs to show assessors if there is any uncertainty about the originality of your work. Note that all assessments will be checked against the University's AI and plagiarism detection software.

Unless explicitly allowed in an assessment, if the raw outputs of a generative AI tool form part of your submissions, it will be regarded as serious academic misconduct and subject to the standard penalties, which may include 00FL, suspension and exclusion. In situations where the use of such tools is permitted, any output of generative AI software must be attributed with full referencing.

Late submission of assessment

Any student who is late (or anticipates being late) with an assessment submission or misses the oral presentation must contact the project supervisor at the earliest practicable date to discuss their absence. If the student provides evidence (e.g. a medical certificate or a note from a Divisional Officer) of the reason for their absence, then a late submission date (or alternative assessment date) may be arranged. In some circumstances of missed assessment a formal application for special consideration may be appropriate.

Grading Basis

Standard

Requirements to pass course

The assessment for the course has been designed so that an overall mark of 50% or greater indicates that the student has unambiguously demonstrated satisfactory completion of each Course Learning Outcome described above. For this reason, students who receive less than 50% overall for the course will receive a fail grade (FL).

All marks obtained for assessment items during the semester are provisional. The final mark as published by the University following the assessment review group meeting is the only official mark.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 15 July - 19 July	Tutorial	Research skills (Monday 1410-1600) and Python/data analysis (Thursday 1000-1150)
Week 2 : 22 July - 26 July	Tutorial	Research skills (Monday 1410-1600) and Python/data analysis (Thursday 1000-1150)
Week 3 : 29 July - 2 August	Tutorial	Research skills (Monday 1410-1600) and Python/data analysis (Thursday 1000-1150)
Week 4 : 5 August - 9 August	Tutorial	Research skills (Monday 1410-1600) and Python/data analysis (Thursday 1000-1150)
	Assessment	Python assignment 1 due (COB, Friday 9 August)
Week 5 : 12 August - 16 August	Tutorial	Research skills (Monday 1410-1600) and Python/data analysis (Thursday 1000-1150)
Week 6 : 19 August - 23 August	Tutorial	Research skills (Monday 1410-1600) and Python/data analysis (Thursday 1000-1150)
	Assessment	Research skills quiz (Monday 1410-1600)
	Assessment	Preliminary project outline due (COB, Friday 23 August)
Week 7 : 9 September - 13 September	Project	
	Assessment	Python assignment 2 due (COB, Friday 13 September)
Week 8 : 16 September - 20 September	Project	
	Assessment	Literature review due (COB, Friday 20 September)
Week 9 : 23 September - 27 September	Project	
Week 10 : 30 September - 4 October	Project	
Week 11 : 7 October - 11 October	Project	
Week 12 : 14 October - 18 October	Project	
Week 13 : 21 October - 25 October	Project	
	Presentation	Monday 1410-1600 and Thursday 1000-1150

Attendance Requirements

Students are strongly encouraged to attend all classes during the first part of the course and review lecture recordings where appropriate. Students are indeed expected to attend all lectures and tutorials unless their absence has been approved by the course coordinator. Students who have missed or expect to miss an assessment must inform the course coordinator by email at

the earliest practicable date. In typical circumstances of missed assessments, a formal application for special consideration via the prescribed University procedure may be appropriate. Alternative assessment can then be arranged. Otherwise, in the case of absence a mark of zero will be awarded for the assessment. Further information is available under "Assessments".

General Schedule Information

In the first half of the course, students will attend a weekly two-hour lecture/tutorial on research skills and methods, as well as a two-hour interactive tutorial/lab on the fundamentals of Python and data analysis. In the second half of the course, project work will make use of the timetabled four hours per week, plus the students' own time to pursue self-directed research as required by the project. As per UNSW guidelines, the workload for the course (inclusive of contact and non-contact time) is approximately 150 hours over 13 teaching weeks and 2 non-teaching weeks. The scheduled class times in Week 13 will be used for group project presentations.

Course Resources

Recommended Resources

During the first half of the course, students will work with Python code using Jupyter notebooks in the Anaconda environment installed on laboratory computers. Students are encouraged to install Anaconda on their own devices so that they can complete the assignments and analyse project data outside of the lab. Anaconda is freely available for download for Mac, Windows and Linux environments.

Course Evaluation and Development

Students will be asked to complete the myExperience survey towards the end of this course. Students can also provide feedback during the semester via: direct contact with their lecturers, project supervisor or the course coordinator, the "On-going Student Feedback" link in Moodle, Student-Staff Liaison Committee meetings in the School of Science, as well as informal feedback conducted by staff.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Simon Murphy		Building 26, Room 118 (upper level)	(02) 5114 5187	Available for walk-in consultations, or email for an appointment	No	Yes
Lecturer	Wayne Hutchison		Building 26, Room G22	(02) 5114 5040		No	No
Facilitator	Oleh Klochan		Building 26, Room G24	(02) 5114 5021		No	No
	Paul Fraser		Building 26, Room 104 (upper level)	(02) 5114 5246		No	No
	Xiao Hua Wang		Building 26, Room G21	(02) 5114 5044		No	No
	Difei Deng		Building 26, Room 107 (upper level)			No	No
	Zhibing Li		Building 26, Room G19			No	No
	Warrick Lawson		Building 26, Room 137 (upper level)			No	No