Information for Research project in Quantitative Biology (QBIO7008)

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Electronic Course Profile

Slack: #research-projects

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Objectives

This course provides students with an opportunity to apply their newly-acquired quantitative skills - programming, statistics, and mathematical modelling - and biological understanding to solve a real research problem. More specifically, the objectives of this course are to:

1. identify and clearly define a research problem in biology that can be solved using mathematical, statistical and/or programming skills.
2. clearly communicate quantitative research findings.
3. generate reproducible research outputs.
4. collaborate with research advisors and other stakeholders.

The project does not need to deal with "big" data, but has to be quantitative, i.e., applying quantitative approaches, such as statistical models, theoretical models, or computational models, to existing data, to solve a basic or applied biological problem. Another important requirement is the principle of open reproducible science; anyone should be able to easily access data, code, mathematics, procedures, etc. used in the project, and should be able to understand and readily re-implement key features of the project.

Finding project ideas and supervisors

This course will be done under the guidance of, and in collaboration with, a research supervisor at The University of Queensland. Students must organise a supervisor, who should be an academic staff member in the Faculty of Science, before they can enrol in this course. The research interests and contact details of potential supervisors can be found on the School of Biological Sciences website (www.biology.uq.edu.au) and other schools' websites. Students can either:

(i) contact a potential supervisor themselves (preferably by email) to determine if they can supervise your project, or
(ii) discuss with the course coordinator what kind of projects might be available within the school.

Use of AI (Artificial Intelligence) tools

In this course, the use of AI tools, including generative AI, is only permitted for generating ideas and revising the text written by the student. It is not permitted to generate the text from the scratch.

If you are using AI tools, learn what they can and cannot do, then use them critically. AI models sometimes produce incorrect, biased or outdated information. Verify the accuracy of AI-generated

content using reliable sources before including it in your work. The student will be responsible for all outcomes including information generated/provided by AI. Also see UQ Library guide.

Use of AI in your assessment must be acknowledged (see UQ Library guide). Not referencing or acknowledging AI use may constitute student misconduct under the (PPL 3.60.01) (see Student Code of Conduct).

Assessments

The assessment will be based on the following four tasks.

Research proposal (due: 25 August 2023, 15:00)

Students should complete a research proposal for their research project. The research proposal should be structured according to the following headings:

1. Title

Should be concise but explanatory enough. Also provide the name of the student and supervisor(s).

2. Abstract

Should be 100-250 words. Provide the number of words.

3. Main text

Should have the following sections: 3-1. Background; 3-2. Proposed methods and approach; 3-3. Schedule; 3-4. Proposed outcomes and deliverables.

It should be clear what the research is, why the research is necessary, and what methods will be used. A clear timeline and a clear list of deliverables and outcomes should be provided.

The main text (excluding Figure/Table legends) should be 1,500-2,000 words. Provide the number of words at the beginning.

Using figures/tables (e.g., conceptual diagram and gantt chart) is encouraged. Figures/tables should be inserted with the legends at an appropriate place in the main text, not at the end. Each legend should be less than 200 words.

4. References

A list of cited references should be included after the main text. The format can be flexible but it should provide information that is necessary to identify each reference (e.g., for a journal paper: authors, year, title, journal name, volume, page numbers, etc). If in doubt, follow the instructions provided by the Journal of Animal Ecology (see References here: https://besjournals.onlinelibrary.wiley.com/hub/journal/13652656/author-guidelines-revisions).

There is **no limit** to the number of pages but it is recommended that each page has about 35 lines. Make sure to add page and line numbers throughout the proposal.

The research proposal will be assessed based on:

Quality and clarity of scientific thinking and content 60%

Breadth and relevance of references	20%
Organisation and writing style	20%

Final research report (due: 27th October 2023, 15:00)

Students should complete a final research report describing their research project and results. The report should be organised according to the following headings:

1. Title

Should be concise but explanatory enough. Can be different from the title of the proposal. Also provide the name of the student and supervisor(s).

2. Abstract

Should be 200-300 words. Provide the number of words. If in doubt, follow Nature's guidelines on how to write an abstract.

3. Main text

Should have the following sections: 3-1. Introduction; 3-2. Approach and Methods; 3-3. Results; 3-4. Discussion, and 3-5. Acknowledgements.

The main text (excluding Figure/Table legends) should be **less than 5,000 words** (but should not be too short; over 4,000 words are recommended). Provide the number of words at the beginning.

The introduction of the proposal can be re-used, but revising/improving it further is generally recommended.

Using figures/tables is highly encouraged. Figures/tables should be inserted with the legends at an appropriate place in the main text, not at the end. Each legend should be detailed enough for readers to understand the figure/table on its own and less than 200 words.

4. Data and Code Availability

In this section, the student should provide evidence that the project has been carried out according to principles of open reproducible science. This includes information on where the data and code used are available, and may also require evidence of project management and continuous integration with GitHub repository that is itself well organised (if relevant). More generally, other quantitative biologists should be able to easily access data, code, mathematics, procedures, etc., and should be able to understand and readily re-implement key features of the project.

5. References

A list of cited references should be included at the end of the report. The format can be flexible but it should provide information that is necessary to identify each reference (e.g., for a journal paper: authors, year, title, journal name, volume, page numbers, etc). If in doubt, follow the instructions provided by the Journal of Animal Ecology (see References here: https://besjournals.onlinelibrary.wiley.com/hub/journal/13652656/author-guidelines-revisions).

There is **no limit** to the number of pages but it is recommended that each page has about 35 lines. Make sure to **add page and line numbers** throughout the report.

The final research report will be assessed based on:

Clarity of both written and visual communication	40%
Completeness and comprehensiveness	40%
Principles of open reproducible science	20%

Seminar (08 November 2023, 12:30 at 08-501 Goddard)

Students will present a final seminar describing their research. Students should use their initiative to present their work in the most clear and compelling way. A general format would be background, research problem/question(s), methods, results, and conclusion. Seminars should go for 10-15 minutes + 5 minutes for questions.

The final seminar will be assessed based on:

Oral communication	25%
Data presentation and interpretation	40%
Quality of slides	20%
Answers to questions	15%

Research supervisor assessment (due: 10th November 2023, 15:00)

Students will be assessed by their research supervisor(s) on: 1) level of engagement with and commitment to the project; 2) project management; and 3) organization.