A04 Research Proposal (60%)

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| **Due dates** | **Submission/s** |
| A04a, Research Question | Week 4, 14 Mar, 2355/1155pm |
| A04b, Draft proposal | Week 8, 11 Apr, 2355/1155pm |
| A04c, Peer review of Draft | Week 9, 18 Apr, 2355/1155pm |
| A04d, Final proposal | Week 11, 2 May, 2355/1155pm |
| A04e, Team evaluation | Week 11, 2 May, 2355/1155pm |

# Overview and motivation

Early in the Term, you will be assigned to a **team of 4-6 students**, and that team will research a topic under one of the Engineering Research Challenges, developing a research question, and then a proposal for conducting that research, appropriate to one of the scenarios presented below.

Note that there is a process for selection of teams by the Course Coordinator, based on a survey in SurveyMonkey, accessed through Moodle. You should complete this survey as soon as you can.

Note also that teams of a different **initial** size will be considered only under exceptional circumstances, and non-one will be allowed to work on their own. If team members withdraw early enough in the term, teams may be merged. Loss of team members after early tasks have been completed may mean smaller teams continue their work, rather than disrupting other teams. This cannot be helped, nor changed, and reflects real-world circumstances, under which tasks sometimes need to be completed by a team smaller than original intended or envisaged. We have had teams shrink to two members, and the task has still been completed, and on time.

Back to the task itself…

The Research Proposal is the major assessment task in this course, bringing together in a specific context and in a single document many of the ideas covered in the learning materials and activities, along with the collective experience, interest, knowledge, perspectives, skills and attitudes of the team members.

Students continuing on to undertake a Research Project in their Masters program can use it as a way of developing a proposal to show to potential supervisors. Students who have been exempted from the Research Project can use it as practice for developing research proposals in an industry setting. Whichever focus you take, the document must satisfy the requirements described below.

# Learning outcomes

Upon successful completion of this task, you will have:

* critically reviewed, in some depth and detail, the literature on an aspect of one Engineering Research Challenge (ERC) in detail, and;
* proposed a research plan to answer a research question under one ERC topic.

# Format

During the term, your team will identify an engineering research problem in a discipline that you find interesting and plan a research project to investigate a solution. Note that you may not be able to work in your specific, individual area of interest or professional activity, but in a team that has, at least, a broad, shared interest.

You must first select one of two scenarios for your research proposal:

* A proposal for a 12-month research project to be undertaken at a university, such as a Masters Thesis project. The ‘target audience’ is your desired academic supervisor (however, you must write in a way that a non-expert could also understand your proposal). Assume they have many students applying to do projects with them and you need to convince them to choose you.
* A proposal for a 12-month research project to be undertaken in an industrial setting. The target audience is your boss (however, you must write in a way that a non-expert could also understand your proposal). Assume you are working in a company in an R&D team that has a certain budget for projects for the year. You want to convince your boss that your project idea should be funded and go ahead.

In either case, you want to show that you have a good idea and a solid plan, that you know what it is you need to do and how you will approach the research. In both cases, remember that this is a piece of research to be undertaken by one person (maybe you!) or a small team of people (your team) within 12 months. The question to be answered and the proposal develop from it need to be suitably constrained to meet that expectation.

Your final report will **be 4,000–5,000 words**. Be sure to include pictures, graphs and tables where appropriate (citing the source of any idea, text, image or data you did not develop or produce yourself). Any word limits below are intended as a guide only, rather than being prescriptive, serving to guide you to a structure that meets the overall word limit.

# Final report structure

Researchers frequently need to write applications for funds to carry out research projects. A typical research funding application would contain: a high-level introduction, some context for the work, a description of the project and a budget. It is also important to explain the expected impact of the project. Your report will be structured in a similar way to these applications, but without the need to provide a budget or budget justification (though you may wish to provide some indication of the level of funding required). It should have the following structure:

## Title page

Information on the title page should include the name of the institution, faculty and course, assessment name, collaborative research group, assessment title, your names and Student ID numbers, plus the date submitted (ensure this is current, consistent with the date you submit online).

## Abstract

The abstract is essentially an executive summary, which gives a brief overview of the entire document. It is different from an ‘introduction’. An abstract should not include any material that does not appear also in the body, no figures or tables, and no referencing (include the references in the body). You should explain briefly, in non-technical terms what the project is, why it is important, how it will be approached and what could be the possible outcomes. It should be only one or two paragraphs in length (around 300 words).

## Introduction

The Introduction briefly explains the background or context of the project. It sets out how the project fits in broad context, what it involves, why it is important, and what will be the benefits of a successful outcome. It should be only one or two paragraphs in length (200-300 words).

## Literature Review

The Literature Review needs to set the narrower context for the project and describes in detail the background to the problem you plan to solve. You should describe the various aspects, limitations, constraints, and so forth, of the problem, and should describe and analyse any prior work either in this particular problem (or a closely related problem, if your problem hasn’t yet been addressed). The strengths and weaknesses of prior work need to be identified and you need to “carve out” the precise problem as an approach to address existing weaknesses (identify a ‘gap’ in knowledge or technology). In this section, you should also provide an analysis of the experimental techniques that are relevant to this problem, especially those techniques that have been used in prior work. Conclude your literature review with a gap analysis.

This section clearly requires careful citation of the literature.

A comprehensive background should be around 1,300–1,500 words.

## Significance and Innovation

This section should be around 100-150 words.

**Significance** — Describe how the research is significant and how it addresses an important problem. Describe how the anticipated outcomes will advance the knowledge base of the discipline. What is profound and transformational about your project? How will your project make a difference in your field and cognate fields – which other fields will be interested in what you are doing?

**Innovation** — Detail how the aims of and concepts in the Proposal are novel and innovative. Detail what new methodologies or technologies will be developed in the course of the research and how they will advance knowledge, and the way in which you believe the project is innovative (**how/why**) rather than describing the innovation itself.

## Proposal

The Research Proposal needs to describe a potential research project to investigate your problem. You should first suggest a potential solution to the problem you described in the Literature Review. (**Note:** Since this is speculative, you don’t actually have to provide a complete solution).

If you have done some analysis to check the feasibility of the solution, present that here.

Finally, describe how you plan to demonstrate that your solution works effectively and efficiently. This involves describing what experimental techniques you would use, and how you would analyse the results. The proposal should be around 1,200–1,400 words.

Break up the text, as **appropriate**, with relevant figures and diagrams, bullet points, selective use of bold/italics to highlight key statements. Some of the sub-headings (and related contents) in this section might include Approach, Methodology, Conceptual framework, Timeline, Dissemination of results, National/International benefits.

## Conclusion

Include a brief conclusion to draw together the key points of your proposal (100 words).

## References

Collect the sources of all sections of your proposal here. Format your sources consistent with the style of a research journal appropriate to your selected area of research and cite that journal choice at the top of this section.

## Appendices

In the final version of the Proposal (including the research question) you should, *as a minimum*, **document the changes you made in response to the feedback you received on your draft version**.

IMPORTANT CHANGE: Note that, for this Term, we expect you to submit your draft and final versions as Word documents. Based on feedback from your peers (through peer review) and/or feedback from the teaching team, you must mark up your final submission with the comments made by those people, at an appropriate point (if not immediately obvious), and show, in your final submission, how you have acted upon that feedback. This process aligns with grant funding processes, among others, so it has strong professional value. **Failure to do this can result in penalty of up to 10% of the Final Proposal mark.**

Additional appendices may be included as appropriate. Use appendices for any large figures or data sets that would interrupt the flow of your text. Appendices do not count towards word or page limits, but do not use Appendices to pad out the body of your Proposal.

# Advice

Consider the following guidelines when writing your report:

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| --- | --- |
| DO | DO NOT |
| Write the Proposal as a formal document. | Treat the Proposal as a minor extension of the workshop tasks. |
| Describe your ideas in your own words. | Use long quotes from other people, and especially without proper citation. |
| Use reputable references (articles from highly ranked journals and top-tier conferences). | Referencing inaccessible sources, web pages, internal reports |
| Follow the structure given above. | Copy any material without referencing the source |
| Write in a precise and concise style. | Use verbose or “flowery” language. |
| Keep close to the specified word ranges. | Exceed 5000 words total for the whole Proposal, and aim to keep the final version closer to 4000 words |

# Submission

## Research Question and ERC Selection

Submit, through the dedicated portal in Moodle, the question for which your team intends to develop a research proposal aimed at providing an answer. You will have been asked to consider already the broad category of Challenge, and the specific, numbered ERC, as part of the team formation process and your team should have agreed the category and ERC, if there was any dissent.

Remember that your research question should not be something that can be answered by simply retrieving existing data but rather points to a gap in knowledge that your project will (help) fill. Answering the research question should not just require you to assemble a set of facts/data but require the development and testing of theories that can predict or explain phenomena – research to be conducted.

As highlighted already above, your research question should be concise, ultimately producing some kind of ’yes/no’ answer to which the outcome of research can point, and focused enough that it is answerable in a 12-month research project.

## Draft Proposal

For the Draft, you should submit, *at least*, the first stage of your Proposal, consisting of Title, Introduction, Literature Review, and Significance and Innovation, though if your team makes good progress, you can submit additional sections.

You need to submit a copy of the Draft Proposal to three portals, a PDF version to the “Draft Research Proposal submission for similarity check (Turnitin)”, a Word version to the “Draft Research Proposal submission for peer review (Workshop)” and a Word version to the “Draft Research Proposal submission for TA feedback (Assignment)” activities on Moodle. The closing date and time for all submissions is the same.

## Final Proposal

For the final submission, you must provide the definitive version of all sections specified in the Final Proposal structure given above.

While preparing your final version, you should consider the comments/suggestions you received for the Draft, from teachers and peers. As highlighted above, the final version for marking by TAs must be a marked-up version, showing how you have improved your work from draft to final. You can also include an Appendix if you have dealt with more general comments, requiring changes or improvements in multiple places.

You need to submit a PDF copy of the final version of the Research Proposal to the “Final Research Proposal - submission for similarity check” and a word version to the “Final Research Proposal submission for marking” activities on Moodle. The closing date and time for both submissions is to be negotiated, but they will be the same.

# Assessment criteria

The Research Proposal is worth 60% of your final course mark. All marking will be performed according to the rubrics included below. The marks are spread across the three submissions as follows.

|  |  |
| --- | --- |
| Marks | Marks |
| Research question | 5 |
| Draft Proposal | 20 |
| Peer review – draft Proposal | 5 |
| Final Proposal | 25 |
| Peer evaluation – team members | 5 |
| Total | 60 |

## Working in a team

Students will be assigned to and, as much as possible (circumstances permitting), must work in a team of 4-6 members, aligned with one of the course learning outcomes, around teamwork. The number of members has been chosen to create a team dynamic, while not being so large that logistic problems are likely to arise and also, not creating too many groups (as a logistic issue in the course). Working alone is completely unacceptable, and requesting to working in a pair or trio (2-3), is typically unacceptable except under exceptional circumstances, as this, particularly solo work, does not meet the learning outcome requirements of the course. Teams will be formed by me, the Course Coordinator, based on characteristics of team members derived from questions asked of you in an online survey (details to be advised separately, through Moodle). The survey questions have been negotiated between staff and students, with the aim to create groups that have key similarities and differences. Online facilities will be provided to facilitate your interaction, but your team may need to find further, creative solutions to enable your team work (collaboration). As part of a team, you will complete an evaluation of your team members, along with submission of the final version of the Research Proposal, and that evaluation may, and indeed has been be used to adjust marks to reflect individual student contributions to the team outcome. All of these processes reflect the professional world, seeing people working in teams, at times remotely from one another, and being accountable or responsible for effort and outcomes of a team project.

## Calculation of your final mark for each submission

1. Preliminary total mark out of 100%

* The mark for the draft Proposal will be given by a teaching staff member. The marks and comments given during peer review may be used to moderate the staff mark, but they will not be used to calculate the initial mark. We have found that, while comments from peers are typically very useful, the marks assigned, especially when students are new to assessment, can be either overly generous, or unusually harsh, but often unfair. This has led to modification of this aspect of this assessment task, based on consideration of student feedback and our own observations.
* The teacher mark, with any moderation based on peer feedback, or moderation between staff members, will give you a preliminary mark out of 100%.
* Failure to complete your peer review assignments results in a loss of marks.

1. Similarity deductions

* TurnItIn will generate a percentage similarity score for your assignment. It is not a realistic goal to achieve 0% similarity, however, below 15% is a reasonable expectation (excluding the bibliography).
* Therefore, and after due consideration of evidence, 2% may be deducted for each similarity score percentage point exceeding 15%. Note that this is not imposed automatically – it will be checked by your staff assessor to determine the nature of the similarity, and whether it constitutes plagiarism. Further, in significant instances of plagiarism, a mark of 0 (zero) may be imposed immediately, and, as this is a graduate course, more significant penalties may be imposed. Read on…
* For example, if your preliminary mark is 70%, but your similarity score is 20%, you may be awarded only 60%. This is calculated as follows: 70 – 2x (20-15) = 60%.
* However, blatant plagiarism is simply not acceptable. If your submitted proposal is found to be in breach of university academic conduct policy, then a range of penalties may be imposed. You may be allowed and required to rewrite and resubmit the proposal, with a substantial mark penalty imposed (to be decided, based on the extent of the misconduct). You may be awarded zero for the task and, in very severe cases, this could have serious implications for your ability to pass the course. In fact, given this is a graduate course, a blatant and cynical case of plagiarism can result in failure in the course itself! Reporting of such cases can also see the university impose further and more severe penalties.
* It is very important, given that this is a team task, that you work together to ensure plagiarism is avoided, and that each of you, individually, consider your responsibility to your teammates.

1. Late penalties

* Under UNSW3+, with compressed teaching periods, timely submission is essentially for timely provision of feedback, including that from peers, and, especially at the end of term, finalisation of marks and grades. Thus, the submission dates and times are adhered to very strictly. Notwithstanding legitimate reasons for lateness, penalties will be applied.
* If the proposal is submitted less than 24 hours late, 0.5% per hour will be deducted.
* If the proposal is submitted more than 24 hours late, in addition to the penalties above, 20% per day (or partial day) late will be deducted.

1. Team member evaluation

* Each member of the team will complete a peer evaluation of their team mates for each submission – it is to be negotiated as to whether this is anonymous or not.
* If evidence is consistent that a team member has failed to contribute sufficiently to the team task, the commentary evidence will be considered, along with the suggested mark reduction, and the Course Coordinator will then impose an appropriate reduction in marks. **Note that this process is taken very seriously; students have received reductions of up to 90% (typically 20-50%). Not taking full responsibility for your role as a team member is considered a serious problem, not just in this course, but also by the university**, as UNSW receives complaints about teamwork primarily about team members receiving marks that they have not earned. I would rather deal with team members who have been marked down, than active team members who feel they have worked with ‘freeloaders’. I also wish to note though that it is hard for team members to make absolutely equal contributions; in the assignment ad completion of work in the team task, please consider whether effort has been *equitable*, rather than *equal*. I also expect, if there are difficulties with team members, that you, as graduate students, will attempt to rectify the situation as soon as possible. If this is not possible, then the situation must be reported to the Course Coordinator as early as possible, so the situation may be rectified. If the problems continue, then this will be dealt with through the final team evaluation.
* Failure to complete the team member evaluation will result in a loss of marks for that task.

1. Incorporation of review feedback

* While not a formal part of the marking rubric (criteria have to be developed), feedback from Teaching Assistants suggests strongly that Final Proposals from previous cohorts could have been improved by better and explicit integration of feedback. To drive this process, each team must provide a ***rejoinder*** following peer review of the Draft Proposal. A rejoinder is a reply to feedback, how you have dealt with (or not) feedback provided by peers and/or TAs. This is typically a document, as dot points or a table, that states whether or not you used a piece of feedback, why or why not, and how you used it. As highlighted above, this time in the course, we require a marked-up submission of the final proposal, showing where ideas, comments questions as feedback have been integrated into the final proposal. More general feedback can be included in a document or table, as an Appendix.
* By driving better focus on feedback, the teaching team feel the quality of the final version of the Research Proposal will be lifted. Marks (up to 10% of the mark awarded) will be deducted if the markers cannot see clearly how feedback has been received and dealt with.

## Marking rubrics for the Research Proposal

Marking rubrics for the various parts of this assessment are given on the following pages. Note that these are provided as a guide to criteria and standards that help you produce an appropriate piece of work. Marking takes these to consideration and they are applied, but typically a rich assessment task is marked holistically and with qualitative feedback, while taking all criteria into account. Typically it is not atomistic and not a simple sum of marks for parts.

### Marking rubric for Research Question

| Criteria  (and weighting) | Description | Marking |
| --- | --- | --- |
| Question (10%) | Is the Research Question actually posed in the form of a question? | No (0)  Yes (0.5) |
| Scope  (10%) | Can the Research Question be answered reasonably through a 12-month industry or university research project? | No (0)  Yes (0.5) |
| Gap  (40%) | Does the Research Question target a gap or gaps in our knowledge of the topic that can't simply be answered by retrieving existing data? | Unsatisfactory (0)  Satisfactory (1)  Outstanding (2) |
| Hypothesis  (40%) | Does the Research Question require the development and testing of theories that can predict or explain natural phenomena or the performance of systems? | Unsatisfactory (0)  Satisfactory (1)  Outstanding (2) |

### Marking rubric for Draft

| Criteria (and weighting) | Deficient  (<40%) | Partly Competent  (40% to 60%) | Competent  (60% to 80%) | Mastery  (80% to 100%) |
| --- | --- | --- | --- | --- |
| Introduction (20%): setting the context and articulating a research question | The team has done a poor job of explaining the context and research aims to the reader – I'm not really sure what this is about. | The general topic is introduced. A research question may be stated but there is no clear explanation of why the question is still open and why it is significant. | The research question is clearly stated and identifies a poorly understood issue. The team makes the project background clear to the reader, and sets the significance of the research question within a discipline context. | In addition to the previous level, this introduction sets the research question and project background in a broader or wide context. |
| Literature review (50%): discussion of context, analysis of literature | The background does not seem to be related to the problem outlined in the Summary. References are minimal (five or less) and of dubious quality, or even non-existent. | Only provides a vague understanding of the problem context, with a modest reference list (6 – 9) articles, and not necessarily of good quality. It is not quite clear how prior work is relevant to the topic. | The context of the problem is covered reasonably well. There is a good reference list (10 – 20) of quality articles, or an extensive list of articles of varying quality. Prior work is described well and related to the problem. There is a good description of relevant experimental and/or analytical techniques. | The context of the problem is well- covered, using an extensive list (>20) of good quality articles. How the prior work fits into the problem space is clearly identified. Experimental/analytical techniques relevant to the field are described well. |
| Significance and Innovation (20%) | No mention about significance and innovation. OR What is written is irrelevant. It is hard to understand the significance of the project. The innovative aspect of the project is not explained. | Attempted to explain the significance and innovation but only vaguely conveys the message. | Significance and innovation is explained clearly. | Significance and innovation is explained clearly with appropriately identifying and labelling these aspects.. |
| Style (10%): Structure, readability, navigation, style, use of references | Much effort is required to read and understand the report: writing is poor, many mistakes with spelling and grammar, and possibly inappropriate langue style (e.g. too informal). May not follow the required structure. References are either not cited or cited in the wrong places. | The report is somewhat difficult to read: writing is just okay, broad ideas come across, spelling and grammar have some flaws, not quite appropriate language style. It follows the required structure somewhat. Citing of references is either lacking or not appropriate when used. | The report is reasonably easy to read: writing is clear enough, with good spelling and grammar, and reasonable choice of language style. It follows the structure OK. References are mostly well cited. | The report is easy to read: well- written, with very good spelling and grammar, and appropriate language style for a scientific report. It follows the required structure. References are cited properly. | |

### Marking rubric for Final Proposal

| Criteria (and weighting) | Deficient  (<40%) | Partly Competent  (40% to 60%) | Competent  (60% to 80%) | Mastery  (80% to 100%) |
| --- | --- | --- | --- | --- |
| Introduction (20%): high-level description of proposed project, selling benefits of project | After reading the summary, we are no wiser what the project is all about. Both the purpose and the benefits are unclear. | The purpose of the proposed project is a little unclear or incomplete. The benefits are not explained clearly. | The proposal is summarised reasonably well,but may be overly long or missing some points. The benefits are identified reasonably well. | The proposal (problem statement, proposed solution) is summarised clearly, concisely and completely. The benefits of the proposed solution are identified. |
| Background (20%): discussion of context, analysis of literature | The background does not seem to be related to the problem outlined in the Summary. References are minimal (5 or less) and of dubious quality, or even non-existent. Experimental and analytical techniques are not discussed. | Only provides a vague understanding of the problem context, with a modest reference list (6-14) articles, and not necessarily of good quality. It is not quite clear how prior work is relevant to the problem, and the description of experimental/ analytical techniques is sketchy or not particularly relevant. | The context of the problem is covered reasonably well. There is a good reference list (15-25 articles) of quality articles, or an extensive list of articles of varying quality. Prior work is described well and related to the problem. There is a good description of relevant experiment/ analytical techniques. | The context of the problem is well- covered, using an extensive list (>25) references to good quality articles. How the prior work fits into the problem space is clearly identified. Experiment/ analytical techniques relevant to the field are described well. |
| Method and Evaluation (20%): description of relevant experimental and analytical techniques | Little attempt has been made to describe how the project would be evaluated, or what information was given would not allow a researcher to independently carry out the evaluation. | Some experimental and analytical techniques are described, but either not well- described or not properly related to the proposal. It would be difficult for another researcher to use this information to replicate the work and conduct an independent evaluation. | An approach is described which looks likely to provide an evaluation of the success of the project, but may be lacking some details or may be not quite complete. Experimental techniques are described, but not related well to the project’s goals. Similarly, the description of analytical techniques is not sufficiently detailed that another researcher could replicate the evaluation. | A suitable approach is described to provide an evaluation of how well the project has succeeded. Experimental techniques are described in detail and related to the proposal. Analytical techniques for taking the experimental results and determining the project’s success are also detailed. Another engineering researcher would be able to take this information and independently perform the evaluation. |
| Significance and innovation (10%) | No mention about significance and innovation. OR What is written is irrelevant. It is hard to understand the significance of the project. The innovative aspect of the project is not explained. | Attempted to explain the significance and innovation but only vaguely conveys the message. | Significance and innovation is explained clearly. | The significance and innovation is clearly explained and the potential outcomes of the project are connected to the big picture context outlined in the introduction. |
| Project Maturity (20%): description and analysis of proposed research project | It is not clear that a research project is being proposed. There appear to be no goals or there is insufficient detail to determine what will be done. There is little or no attempt to analyse the proposal or its likely outcomes. | Some suggestions are given that hint at a research project, but there is not enough detail to be clear what are the goals or what will be done. Analysis is superficial and does not give a convincing case that the project might produce useful results. | A research project is described which is potentially plausible, but either the description is not complete or it is not entirely convincing. The goals of the project are reasonably clear. Some analysis has been conducted, but there are some doubts about the project’s likely outcomes. | A plausible research project is described in sufficient detail. The goals of the project are clear. Sufficient analysis is provided to make it clear that the project has a reasonable chance of success. and what the likely outcomes will be. |
| Style (10%): Structure, readability, navigation, style, use of references | Much effort is required to read and understand the report: writing is poor, many mistakes with spelling and grammar, and possibly inappropriate langue style (e.g. too informal). May not follow the required structure. References are either not cited or cited in the wrong places. | The report is somewhat difficult to read: writing is just ok, broad idea comes across; spelling and grammar have some flaws, not quite appropriate language style. It follows the required structure somewhat. Citing of references is either lacking or not appropriate when used. | The report is reasonably easy to read: writing is clear enough, with good spelling and grammar, and reasonable choice of language style. It follows the structure OK. References are mostly well-cited. | The report is easy to read: well- written, with good spelling and grammar, and appropriate language style for a scientific report. It follows the required structure. References are cited properly. |