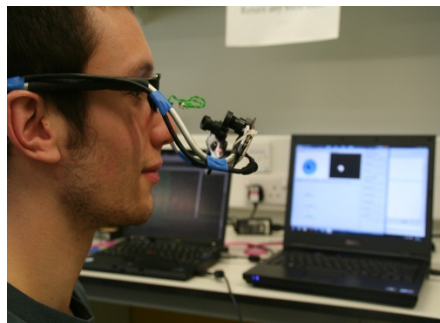


Imperial College London
Department of Bioengineering



MSc Project Guide
2020 - 2021

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DEADLINES

| | |
|--------------------------------------|--|
| Project selection | by Sunday 22 November 2020 at 11pm |
| Project Allocation (online) | by Mon 07 December 2020 at 5pm |
| Project Safety Registration (online) | by Fri 18 December 2020 at 5pm |
| Planning Report: | Monday 01 March 2021 at 2pm |
| Oral Presentation: | between July and September 2021 in research group |
| Final Report: | Friday 10 September 2021 at 2pm |

Submission of the reports must be done on Blackboard: <https://bb.imperial.ac.uk>

(Blackboard pages BIOE97053 - MSc Biomedical Engineering Individual Project 2020-2021
BIOE97052 - MSc Human and Biological Robotics Individual Project 2020-2021 and
BIOE97163 - MSc in Engineering for Biomedicine Individual Project 2020-2021 have more
details)

INTRODUCTION TO THE MSc INDIVIDUAL PROJECT

The Individual Research Project is an important part of the Bioengineering degree course. Projects give students an opportunity to apply the knowledge acquired during the taught elements of the course to current research problems. They also help to develop important project management, team working and communication skills that are highly valued by employers and international research groups.

Starting in December, students will carry out an extended research project for the rest of their course. After the exam period, project work will be full-time until the submission of the thesis in September. Project work will be assessed by a planning report, submitted in March, an oral presentation held between July and September within the research groups, and by the final project report.

Projects are carried out under the direction and guidance of members of the academic staff and their research groups. The project is the most important piece of work in the degree programme. It provides the opportunity for you to demonstrate independence and originality, to plan and organise a large project over a long period, and to put into practice some of the techniques you have been taught throughout the course. Whatever your level of academic achievement so far, you can show your individuality and inspiration in this project. It could be the most satisfying piece of work in your degree. As part of their postgraduate training, the students are expected to work independently in between meetings with the project supervisors. Supervision on a day-to-day basis is not meant to be available.

ETHICAL ASPECTS OF THE PROJECT

Practical advice on first steps

For many projects the ethical aspects will be obvious and easy to identify; animal research, live research in humans (or *in utero*) using volunteers or relatives, “big data” projects using information about existing patients or individuals, or assistive devices for athletes or subjects. However, some other lines of research may not be so obviously amenable to ethical discussion. In such cases, consider the following:

- For cellular or synthetic biology research, what is the source of the cells or organisms and the ethics of their provision. What might be the effects of the release or escape of these into the environment? What steps need to be taken for disposal of material at the end of the experiments?
- How might any data you collect in your research be used, misused or abused by individuals or organisations, and what steps are taken to prevent such misuse? Are these preventative measures sufficient, adequate, cost effective, and safe?
- What are the environmental effects of the release or disposal of any specimens, reagents or by-products of the project?
- What is the eventual purpose or use of the system or principle being studied in your research, and who might benefit, be harmed, or exploit this?
- If the research is successful and a new principle/system/device/substance is developed, how will that be shown to be safe and ethically justifiable? How much or how many end-user or clinical trials would be needed to prove this?
- Does the project or its eventual outcome justify the effort and resources being dedicated to its pursuit? What safeguards or balances are, should be, or could be introduced to ensure the most effective and beneficial application of resources is

achieved? Who should be responsible for this and on what basis should the decisions be made?

Approval of Projects with ethical implications

According to the Imperial College (<https://www.imperial.ac.uk/research-and-innovation/about-imperial-research/research-integrity/>), to which all members of academic staff are committed to adhere, support and promote, any project work must comply with the key principles of the code. For research students, these include:

- Careful consideration and implementation of formal processes which guarantee the safety of your colleagues (including your own) when engaging in research and teaching;
- Protection of data and privacy of students, colleagues and volunteers engaged in College-related activities.

Before a project with ethical implications can commence, it has to go through an Ethics approval process. This process is overseen by the Imperial College Research Ethics Committee (<https://www.imperial.ac.uk/research-ethics-committee/committees/icrec/>). This committee was founded to deal with research projects that involve human participants or volunteers directly or indirectly. Such projects are, for example:

- Questionnaire studies involving volunteers;
- Work on developing new surgical or diagnostic equipment;
- Projects using observational or survey data.

Some projects need to seek Ethics approval upon allocation, and students are expected to liaise with their supervisor to submit an Ethics approval request before they can start working on their project.

What to consider when working on projects with ethical implications

- Potential research subjects need to be fully informed about the purpose of the project, the type of research methods, as well as the likelihood, degree and nature of possible risks.
- All information shall be compiled in a leaflet and given to potential subjects; they should have at least 24 hours to consider taking part.
- Potential subjects can choose whether they want to participate or not. Their consent needs to be written down for the records.
- Verbal consent is only sufficient with prior written approval from the Ethics Committee.
- Ensure that participating subjects and/or volunteers are informed that they can withdraw from the experiment at any time; it should be clear that their involvement is voluntary and that they shall not be disadvantaged in any way.
- Where personal information is *stored on a computer*, the College has an obligation to comply with the Data Protection Act 1998. Further information can be found here: <https://www.imperial.ac.uk/research-and-innovation/about-imperial-research/research-integrity/data/>

Working with personal (patient) data

- Where a project is using personal information, the report or thesis needs to have provisions that the subject will be fully informed in advance, including information on the nature of the data required and how the data will be used.
- Subjects need to have the freedom to decide whether or not their data may be used or communicated.
- For research involving human tissue, such tissue should be anonymised. Sample codes should be used (pseudonymisation). Such projects not only need the approval

of the ICREC but must also comply with the requirements of the [Human Tissue Act](#), including ensuring samples can be traced back to the donor.

Recording ethical implications in the report

Reports and theses need to have a statement, saying that (when appropriate to the project):

- The project has been approved by the Imperial College Ethics Committee, including the approval number.
- The patients/participants gave consent to use their data.

Your planning report also needs to contain a section of **Ethical Analysis**, which should evaluate the ethical basis, background, and implications of the project, in regard to subjects and specimens used and their provenance, data derived or measured and its use, and the long term effects and meaning of the work, as well as the effects of the work on colleagues, the college, society and the environment. This will be included in the marking of the report.

If you are in doubt about any of these issues, you should speak with your supervisor.

PROJECT SELECTION AND ALLOCATION PROCESS

Key individuals

The Project Co-ordinator is Dr Julien Vermot (office B213E). Supporting colleagues are Mr Martin Holloway (RSM 3.08) and Ms Nicole Harbert (Student Office RSM 3.21c).

Information stage

The project coordinator presents to all students in late October to explain the project system and the selection and allocation process. A webpage detailing the projects available will be published, where you will be able to vote for the projects you wish to take. Potential supervisors and their research interests can be found at the [Department's Research pages](#) and <http://www.imperial.ac.uk/bioengineering/people/academic-staff-and-research-fellows/>. You may also consider to carry out a project with a supervisor from affiliated Departments.

You can meet potential supervisors between up until the project selection deadline (Nov 22nd) during office hours; a link to the office hours will be circulated via email in good time. In the course of discussion with a staff member you may devise a new project combining the interests of you both; that is perfectly fine.

Projects outside Imperial College

Projects are normally supervised by academics within the Department of Bioengineering or another closely affiliated Department. Under exceptional circumstances, projects may be supervised by an external academic or industrial sponsor, although in these cases there must be a clear link to the Department. Any external projects that are not already listed under 'industry' are subject to approval. The guidelines for external projects are:

- students must organise the external project themselves;
- students will need to recruit a co-supervisor from the department who will maintain academic oversight to ensure quality standards are maintained;
- the Director of the MSc programme must approve the project and confirm that you will receive adequate supervision;
- students must be present during all terms and for exams. So, it must be possible to work on your project while continuing your studies in College;
- all other deadlines and assessment criteria remain the same as for projects within the Department.

Student Selection stage

You will be asked to register your project preferences online by November the 22nd. These consist of

- 3 thematic areas (in order of preference) where the Department is active in research <http://www.imperial.ac.uk/bioengineering/research/>;
- whether the project should be desk or lab based;
- four specific projects (in order of preference – no more than 2 from the same supervisor);
- free text explaining why you have selected a specific project(s), what are your research / study interests, etc; e.g. "I have a strong academic background in fluid mechanics and I want to do a PhD in cardiac blood flow". Remember that the potential supervisors are unlikely to know what your skillset is or in what you did your first degree; help them judge your suitability for the project.

Staff selection stage / Project allocation stage

Staff select students in 4 rounds, corresponding to the 4 student choices. Dr Vermot will then take a lead role in ensuring that all students have been allocated projects that match as best as possible their selection criteria.

Project allocation form

Each student will receive a confirmation e-mail when their projects have been allocated. You should promptly contact your supervisor and complete an electronic [Project Allocation Form](#) by the end of the autumn term. The form will be completed online; your supervisor has to log on to the system and do it with you together.

Safety Form

The form above allocation is also a safety registration form. You are not permitted to start work on your project until this form is completed and submitted. Depending on the nature of your project, you may need to carry out a risk assessment together with your supervisor before you commencing laboratory work. More information can be found in our intranet:

<https://www.imperial.ac.uk/bioengineering/admin/info/safety/>

Work on project

Project work may start as soon as it is convenient, subject to agreement and safety forms having been submitted. The exact amount of time spent on projects is not fixed, but you are expected to work a minimum of 8 hours per week during term time and full time in the summer term, after the exams; vacations are not encouraged over the summer term unless approved by your supervisor. To monitor progress and your effort on the project you will keep a Project Log Book that will be handed in with your final report.

By the end of the Autumn term, you must have completed the [Plagiarism Awareness course online](#). This is a requirement set by the Graduate School. More details on Plagiarism are given in Appendix 1. You need to self-enrol to the respective Blackboard (<https://bb.imperial.ac.uk>) course first. Instructions can be found at: <https://www.imperial.ac.uk/study/pg/graduate-school/professional-skills/masters/online/>.

PROJECT ASSESSMENT

Overview

It is important to understand the way your project will be assessed. A good first-class project involves a combination of sound background research, a solid implementation or piece of theoretical work, and a well-structured and well-presented report detailing the project's background, objectives and achievements. The very best projects invariably cover some new ground, e.g. by developing a system which does not already exist, or by enhancing some existing system, application or method to improve its functionality, performance etc.

A completely straightforward implementation project is unlikely to gain first-class marks, regardless of how well it is done. Similarly, projects which are predominantly survey reports will not gain high marks unless they are backed up with experimentation, implementation, or theoretical analysis, e.g. for performing an objective comparison of the surveyed methods, techniques etc.

If you are looking to achieve high marks in your project you should choose and carry out your project with great care. Remember also that your attitude to, and performance in, the individual project is taken very seriously by prospective employers and your progress is usually reported in some detail in academic references provided for you by staff members. Don't be afraid to discuss these issues with your supervisor, or with the project co-ordinator.

The project mark is worth 44% of your final degree mark; it is assessed by several routes. Each task is described in more detail in the following pages. All reports are submitted into Blackboard (<https://bb.imperial.ac.uk>) by the announced deadline. Failure to meet this deadline will result in failure of this unit. Hard copies are only needed if the supervisor requests one. The overall mark for planning and final reports is based on a mark for effort – awarded by your supervisor – weighted at 20% and a mark for the written report, weighted at 80%. Details on the assessment criteria for these elements are given in Appendix 2.

| Mode of assessment | % final marks | Deadline |
|----------------------|---------------|-------------------------------------|
| A) Planning report | 10 | Monday 01 Mar 2021 at 2pm |
| B) Oral presentation | 10 | Between Jul – Sep in research group |
| C) Final report | 80 | Friday 10 September 2021 at 2pm |

A) Planning report

General information

Students should prepare a planning report for submission in early January. A template on which you can base your report will appear on [blackboard](#) in good time. The planning report should not exceed 4000 words. This number is a limit, not a target, and it is set for a reason; it is an encouragement to be selective and concise. The word limit does not include the title page and the references (and any acknowledgment or tables of contents and figures you might want to include). A one-page appendix is permitted if you want to present some additional material, such as a timeline diagram, or some detailed results; the appendix does not count towards the 4000-word limit. You should not devote weeks to writing this report. The aim of the report is to summarise the background to your project, what you achieved so far, and what your plan is. In the case your work does not include preliminary data because of a lack of lab access due to COVID restrictions, please indicate in a statement written with your supervisor in the front page so the marker will not assess this.

Suggested structure

Your report should contain the following sections.

Project title page

This should include the project title and your name. You can also list the name of your supervisor if you wish.

Project specification

This section should state clearly what the project is intended to deliver. It should contain the aims and objectives / hypotheses of your work.

Ethical analysis

This should be a short section. Mention the ethical basis, background, and implications of the project in regard to subjects and specimens used and their provenance, data derived or measured and their use. Include the long term effects and meaning of the work, as well as the effects of the work on colleagues, the College, society and the environment as appropriate.

Background

Summarise the key findings from a range of published sources that you have used to identify research gaps, shape your aims and objectives, and justify the decisions you are making in your methodology. The text should be clear, with use of figures (with attribution) if helpful to the explanation.

Implementation Plan

This is a breakdown of the work done already and of the work to be done in the time remaining on the project. This could be presented in text or diagrammatic form. You should identify a set of milestones and provide a realistic estimate of when each of these should be completed if all goes well. It should also detail fall-back positions in case any stage of the development goes wrong. You may feel, in the early stages of your project work, that the times in this plan are guesses. As the project progresses, keeping track of and revising appropriately your initial estimates, but also, if necessary, altering the proposed work are vital in order to ensure that the project is successfully finished on time and on budget.

Risk Register

This is a short section. Identify the main risks associated with achieving your objectives and deliverables, label them in terms of likelihood and impact, and detail your mitigation strategy.

Evaluation

Detail how you expect to measure the success of the project. In particular, document any tests (physical, computational, theoretical) that are required to ensure that the project deliverable(s) function correctly, together with - where appropriate - details of experiments required to evaluate the work with respect to other products or research results.

Preliminary Results

Give details of the progress you have made in the project up to now. Remember it is a short report; you should not provide long technical descriptions here; the place for that is in your final report. For wet lab project, preliminary results are not marked if the student has been impacted by lack of lab access due to COVID restriction. In this case, the report should contain

a statement written with your supervisor in the front page so the marker will not assess preliminary results.

References

List all sources you referenced in your report giving full details appropriately so that the reader can access each source. Information on appropriate referencing can be found in the [library webpages](#). It is strongly advised to use a reference manager such as [Mendeley](#); it will save you a lot of time when preparing planning and final reports as it can produce the bibliography automatically for you using the style of your liking.

B) Oral presentation

General information

You will deliver an oral presentation on your research project to your supervisor and their research group. The presentation will be assessed by the group. It will be a presentation of 12 minutes, followed by at least 8 minutes of questions. You must adhere to the allocated time and may be asked to stop if your talk exceeds 12 minutes. Assessment will be on the basis of volume of work, content, organisation, visual layout, rapport, and answers to questions.

A good rule of thumb is approximately 1 slide per minute. Some slides are quick (e.g. just showing a picture), while others take more time (e.g. going through a data plot), so the exact timing will vary. But if you find yourself with 25 slides for a 12 min talk, it's time to start thinking about trimming down.

Tip: Giving a scientific talk is like telling a story. It's a true story that is supported by data and logic, but a story nonetheless because there must be a storyline or thread of ideas that carry the audience through the presentation. A bad talk fails to link ideas in a coherent fashion. A good talk takes the audience by the hand, introduces them to the problem, motivates its importance, and clearly describes the methods and results obtained. Finally, a good talk "closes the loop" by discussing how the results link back to and provide new insights regarding the original problem. Note that a story does not have to be told in chronological order; as a speaker you have the liberty to organise the flow of ideas to provide the greatest clarity, assuming that this does not alter the outcome of the results.

Recommended Reading

There is no step-by-step recipe for giving a good talk, just like there is no step-by-step recipe for having a good conversation with a friend. Preparation and practice, however, greatly help. For further advice on giving a good talk, please consult the following:

- Alon U, 2009. How to give a good talk, *Molecular Cell*, v36, p165-7;
- Booth V, 1993. *Communicating in Science*, Cambridge U Press. (see Chapter 2);
- Alexei Kapterev's [Death by power point and how to fight it](#); <https://www.slideshare.net/thecroaker/death-by-powerpoint>
- 2009 [TED talk by Prof Bonnie Bassler](#) on how bacteria 'talk';
- 2008 [TED talk by Al Gore](#) on climate change;
- Info about [the assertion evidence approach](#) <https://www.slideshare.net/thecroaker/death-by-powerpoint>

It is strongly recommended that you give a practice talk. Make sure that the audience for your practice talk is capable of providing (and you of accepting) candid feedback. Remember, it is better to make mistakes in front of friends, so ask for their advice and listen carefully to their feedback without getting defensive! Above all, make sure that your talk adheres to the time requirements!

Suggested structure

To provide some guidance, the presentation should contain the following items:

Title slide

The title should be concise, clear and accurate, and give your audience an indication of the subject matter in your talk. Avoid long titles, jargon and overly complex words. Clearly state your name and your supervisor's name. The title may change from the original title agreed with your supervisor, who needs to approve a title change.

Introduction

In one or two slides, you should briefly describe the motivation, hypothesis and goal/objectives of your project. Leave complex details for the background. Here, you should focus on the big picture, briefly describing why your project is important, stating clearly and concisely what your project aims to accomplish. Do not be afraid to slightly oversimplify difficult concepts at this point if it helps clarify your story; you can fill in important missing details later.

Background

Provide necessary background information for the audience to appreciate your research contribution. Leave out unnecessary details, and focus on only those concepts that are key to appreciating your own work. Images and diagrams are often better than words at clarifying difficult concepts. Be sure to give credit below any images copied from other sources. If you had to oversimplify your hypothesis or objectives in the introduction, here is a good time to revisit those with more detail.

Methods

Describe what you did, but more importantly be sure to describe why you did it. Resist the temptation to simply provide a step-by-step protocol, instead tell the audience what procedures you used and what questions you hope to answer by using those procedures. Use flowcharts to help illustrate multi-step processes. To avoid getting lost in details, make a clear picture of what your audience needs to know to appreciate your results. Do not be afraid to leave out details if they are not core to your story; leave these for someone to ask during question time (you can even make an extra slide that you pull up during question time if you anticipate some questions – which is always a good thing!).

Results

Describe the data or outcome of your project. The exact format of results will vary depending on the context of your work, but in all cases the results need to be clearly presented. Remember that your audience has likely never seen your results before, so go through the results carefully, first explaining what the results are (e.g. what the axes represent, what the different colours indicate, etc.), then explain what the results mean (e.g. temperature increases with time). Resist the temptation to use the "... as you can see here ..." phrase within 2 seconds of putting the slide up. People need time to understand and digest data, particularly if they are unfamiliar with the field. If you fail to be clear here, people will think that you gave a bad talk. You do not need to present every bit of data obtained during your project; do not be afraid to leave some things out if they are not core to your story.

Discussion and Conclusions

Resist the temptation to simply list out your major results; rather, describe what your results mean. Describe how your results improve understanding about the question or problem

that you raised in the introduction. Put them in context of other work conducted in the field. Consider whether your results support or refute your hypothesis, whether there are limitations or caveats to your results, and what may be the next steps.

Acknowledgements

Be sure to thank those people who helped you, including other students, researchers, your supervisor(s) or supportive friends without whom your project would not have been as successful. If your project was supported by a grant, you should acknowledge that funding source.

C) The final project report

General information

The project report is an extremely important aspect of the project and its quality will have a major influence on the final project mark. It serves to show what you have achieved and should demonstrate that:

- you understand the wider context of biomedical engineering;
- you can apply the theoretical and practical techniques you have been taught to the problems that you are addressing;
- you are capable of criticising objectively your own work, placing it in comparison with published literature, and making constructive suggestions for improvement or further work based on your experiences so far;
- as a professional biomedical engineer, you can document clearly and concisely your thinking and working processes for third parties who may not be experts in the field in which you are working;
- you can express this information in a concise manner.

With the exception of the project supervisor, the report assessors will not have followed your project throughout and for this reason will rely heavily on the report to judge the quality of your work. The same applies to the external examiners whose job it is to provide an opinion, heavily influenced by the individual project, to the exam board on borderline candidates.

Many students underestimate the importance of the report and make the mistake of thinking that top marks can be achieved simply by working hard and producing a good product. This is fundamentally not the case and many projects have been graded well below their potential because of an indifferent or poor write-up. In order to get the balance right you should consider that the aim of the project is to produce a good report, and that software, hardware, theory etc. that you developed during the project are merely a means to this end. Don't make the mistake of leaving the write-up to the last minute. Ideally you should produce the bulk of the report as you go along and use the last week or two to bring it together into a coherent document. It is very strongly advised that you complete a draft of your Introduction and Methods sections by mid-August and to be continuously building up a database of references for inclusion in the dissertation; using a reference manager such as [Mendeley](#) is an efficient way of doing it and is very strongly advised. Ask your supervisor for sample reports if needed. If you encounter any problems, please let the Projects co-ordinator, Dr Julien Vermot (j.vermot@imperial.ac.uk) know as soon as possible.

The Board of Examiners require that your supervisor has seen and approved your report before you submit it. Therefore, you should aim to have it ready to show to your supervisor at least three days before the final submission date the very latest. The report must be submitted electronically on [Blackboard](#) before the deadline. The report should be contained in one file and not exceed 25 MB in size. If you exceed this limit discuss with your supervisor how to compress the document.

Record of your work

You are strongly encouraged that in addition to the report a 'Record of your Work' be submitted (e.g. log book, data records, computer codes, etc.), even though this will not be formally assessed. Good record keeping will save you many hours at the end of the project trying to remember what you did, what protocol you used where, and where that excellent graph is or comes from. For computer-related projects it is not so much the log book, but the

code (with extensive comments line by line). If you work on a lab project, you are more likely to use a log book to document procedures and protocols. The reasoning for this is that a research thread needs to be kept, according to the research mission of the Department. There is no prescribed format; it can include pictures, illustrations, graphics, etc that you cannot fit into your report. Please submit these to your supervisor directly or to the Student Office.

Suggested report structure

The physical layout and formatting of the report is important, and yet is very often neglected. A tidy, well laid out and consistently formatted document makes for easier reading and is suggestive of a careful and professional attitude towards its preparation.

A template on which you can base your report will appear on [blackboard](#) in good time. The report should not exceed 6000 words and should not contain more than 20 figures (and/or tables); these numbers are limits, not targets. Reports that do not comply with this guideline are unlikely to be given a mark of more than 59% (see assessment criteria at the end of this handbook). Title page, abstract, acknowledgements, potential table of contents, table of figures and tables, and the reference list will not count towards the word limit. Extra material can be appended to the report to allow you to disseminate all the necessary information to someone who might want to repeat your work or pick up the project details at a later stage. The appendix will not be specifically marked and will not count towards the 6000-word or 20-figure limits, but its appropriate use to disseminate all information will be judged by the assessors. See the next page for examples of the sort of content that would go in an appendix.

If your project has ethical implications, state formally in the body of the report that the project has been approved by the Imperial College Ethics Committee, including the approval number and confirm that the patients/participants gave consent to using their data.

A typical technical or research report will have an abstract, an optional acknowledgments section and a bibliography in the end. The body of the report usually contains the following sections, however, the work for some projects might be better disseminated with a different layout.

1. Introduction
2. Methods
3. Results
4. Discussion

Abstract

Include all of background, aim, method, results, and discussion/conclusion. Could be one sentence each. As you see fit. It should be written for a general audience. Up to 250 words.

Acknowledgements

This section is optional. It is, however, usual to thank those individuals who have provided particularly useful assistance, technical or otherwise, during your project.

Introduction

Summarise the key findings from a range of published sources that you have used to identify research gaps, shape your aims and objectives, and justify the decisions you are making in your methodology. The text should be clear, with use of figures - with attribution - if helpful to the explanation.

Include a clear aim (and maybe specific objectives) and / or your hypotheses at the end of the introduction. For example, the overall aim was to do this and specific objectives were to do 1, 2, and 3. Your intro should lead to the aim: This is a problem; something was done in the

past (literature review), but not as well / enough (i.e. be critical); therefore I am going to do something better / different → aim.

Methods

Be as detailed as possible, in that one should be able to reproduce what you did. As always, don't include unnecessary information. You should justify every decision you make or technique you use.

Results

Be punchy and dry. You can tell us what your results mean in the discussion. Think carefully how you present your results so that you put the intended point across to your readers.

Discussion

This is where you conduct an objective evaluation of the project's successes and failures and compare it to existing literature. It is important to understand that there is no such thing as a perfect project. Even the very best pieces of work have their limitations and you are expected to provide a proper critical appraisal of what you have done. Your assessors are bound to spot the limitations of your work and you are expected to be able to do the same.

Start with a quick summary of what you've done and found, i.e. 1-2 sentences, then discuss them. What do your results mean? Derive conclusions off them, but make sure they are justified. Use expressions such as 'it is likely', 'this suggests that' etc. Compare your results with literature. Discuss any limitations of the study. Suggest improvements and how future work could deal with the problems you encountered. Avoid words such as 'very', 'good', 'little'; talk with numbers.

Conclusion

(if you want; it could be the last paragraph of the discussion instead of a separate section)

Give us the take-home message and how your design / findings could be used / explored further. It should be 1 paragraph.

References

List all sources you referenced in your report giving full details appropriately so that the reader can access each source. Information on appropriate referencing can be found in the [library webpages](#). It is strongly advised to use a reference manager such as [Mendeley](#); it will save you a lot of time when preparing planning and final reports as it can produce the bibliography automatically for you using the style of your liking.

Annex(es)/Appendix

Use this space for any additional information. Refer to the annex in the main text, else the reader is not going to have a reason to look at it. You could have more than one annex, as appropriate. The annexes contain information which is not essential for the 'story' to be told, but helpful to the reader that might want to dig into the detail or take your work forward. Information included here typically is program listings, user guides, complex circuit diagrams, tables, proofs, additional results, graphs or any other material which would break up the theme of the text if it appeared in the main body. Large program listings or actual files may be submitted with the report, although it is preferable either to provide them to your supervisor on a pen drive, or to cite their web path name in the report. For group projects, an Annex should include an indication of which group member worked on which parts of the project.

USEFUL INFORMATION

Meeting your supervisor

You must make sure that you arrange regular meetings with your supervisor. These are documented by your supervisor signing your Log book. The meetings may be brief once your project is under way but your supervisor needs to know that your work is progressing. You should inform the supervisor of your College e-mail address and any changes to it, so that they can contact you, if necessary. If you need to talk to your supervisor between meetings and cannot locate him/her in their office, send an e-mail to them to suggest a time when they will be available. When you go to see your supervisor you should have prepared a written list of points you wish to discuss. Take notes during the meeting so that you do not forget the advice you were given or the conclusions that were reached. Your Log book is the ideal place for these tasks.

Equipment

You may be required to use equipment that belong to the Department or individual research groups. Such equipment is often expensive research grade equipment and almost certainly used by either other project students or members of the research group. You do not have right of access at any time you choose, as in any research environment access to equipment has to be negotiated with other users and with your supervisor. Consequently, you need to plan experiments in advance, and assemble the resources you need to make best use of your time on equipment.

You are permitted to develop software or hardware on your own equipment, provided that you can duplicate it here in College for the demonstration day. However, you should prepare a fallback position in case your equipment misbehaves. Remember in particular that the software on some cheap home computers is not reliable. A potentially good project may be spoilt by inadequate home equipment.

Finances for projects are strictly controlled; your supervisor will give you information about what is available.

Note that there is no excuse for failing to keep adequate computer backups. If you lose your program or your data or your report because of a system failure you will simply lose marks. No extensions will be given at the end of the project for you to re-type a lost report, for example.

Ordering consumables

Your project is supported by a budget, nominally of £350, that is credited at around the end of the year to your supervisor's staff account. The budget holder is your supervisor and s/he will approve your orders. Orders should be placed via the online form.

<https://www.imperial.ac.uk/bioengineering/admin/info/ordering/>

We prefer you ordering through the system because if your project can be labelled as medical research – and it nominally will – the costs will be exempt of VAT. If a supplier is not on the college system, then you might have to buy the items yourself and claim back; you can do that using the expense claim form E1.

<https://www.imperial.ac.uk/finance/financial-services/expenses/>

Pitfalls

Some of the most useful things to know about individual projects are the common pitfalls. Why do some projects go horribly wrong? Here are some of the common causes of failure:

Starting the project too late. Start the project as soon as you can – i.e. week 2 of autumn term. The longer you leave it the harder it is to get motivated, especially when all your friends seem to be flying ahead. Do not be distracted by pressing coursework deadlines from other courses and leave everything for after the exams. Remember your project contributes substantially to your final year mark.

Failing to meet your supervisor regularly. If you arrange a meeting with your supervisor, turn up at the agreed time. Your supervisors are busy, internationally active academics. Arrange meetings by e-mail asking when they would be free to discuss this or that particular problem. Don't just spend a week turning up at their office at random times to find they are not there. If you are stuck for any reason and you have no meeting arranged, contact your supervisor immediately, then work on some other aspect of the project until you can be seen. If one of your supervisors is outside the Department make regular contact with the project supervisor from within the department. You gain no sympathy from anyone if you lose contact with your supervisor and produce a poor project as a result. Your supervisor will be happy to help you but they can do nothing if they are unaware that you are having trouble.

Allowing too little time for the report. You should try to produce as much of your report as you can as you go along, even though you don't know in advance its exact structure. Particularly when you make figures or graphs make them to 'publication quality' as you go along so you don't have to revisit them at the last minute. The last two weeks of the project should be dedicated to pulling together the material you have accumulated and producing a polished final product.

Failing to plan a fall-back position if the planned work is not completed on time. Try to plan your project in stages so that if things go wrong in a later stage you have a completed stage to fall back on. Agree the fall-back position with your supervisor and revisit timelines with him/her at regular intervals.

Over/Under Ambition. Try to be realistic about what you can achieve in the time available. A good project requires a lot of input from you and should prove to be technically challenging throughout. At the same time, however, it is better to do a small job well than it is to fail to do a big job at all. Your supervisor will advise you on his or her expectations of the project and this will help you to set your sights accordingly.

As important as the project is, however, do not let it interfere with your exam revision. Even though you can work on your project during revision, you should try to plan not to spend any time on your project between the end of the spring term and your last examination.

STUDENT PROJECT SUPERVISION GUIDE – EXPECTATIONS

Student learning and development is carried out in partnership with the supervisor. The most common method of teaching throughout the course is through lectures, but there may also be a strong focus on online learning, independent project-based work and lab work. Expectations in the classroom may differ somewhat from expectations in the laboratory. This document is intended to provide a guide to help students and supervisors understand their mutual responsibilities in regards to research projects. The content is adapted from the [Success Guide for Master's Students](#).

Supervisors expect students to:

1. Take responsibility for your project: in the end, it is your work and your supervisors are here to help you accomplish your research objectives, but not to do the thinking for you.
2. Practice good time management: the project has to be finished in a short period of time, and you are expected to work full-time on your project after exams. Supervisors expect students to strive to accomplish good work.
3. Be prepared for frustrations and unexpected problems: check the pitfalls advice in the previous section of this manual.
4. Display initiative: ultimately, the person who drives the process and strives to understand the project is you. We expect you to be curious about your work and to think about how the work of others may have an impact on the research you are doing. As a project student, you will become a fully integrated member of your supervisor's research group, and are expected to attend lab meetings, participate in research discussions, and work as part of a team. You also are expected to attend research seminars, when they do not clash with teaching sessions in Autumn and Spring terms.
5. Learn and work on topics that are new to you, and strive to familiarise yourself with new concepts (e.g. learning to use software, techniques or tools that may be new to you).
6. Be ambitious and self-critical of your own work and results, and use these skills to be critical of results in the literature.
7. Be orderly, precise and detailed in record keeping, for example, in lab notebooks or when referencing.
8. Keep up with the literature in your field: this requires initiative, but successful research is rarely done in a vacuum. Reading can stimulate new ideas that you can take to your own research; just remember to cite the primary references that influenced your thinking and never just take ideas from others without acknowledging their contribution.
9. Look at examples of past projects and ask your supervisor for recommendations on good past projects. This is one of the best ways of learning what your supervisor expects in the written report.
10. Provide regular reports detailing your results: you should be conscientious about keeping a notebook and regularly enter the actions arising from meetings, and your data into tables and spreadsheets.
11. Seek feedback when you need it.
12. Always back-up your test data and electronic files.
13. Be aware of safety at all times and follow safety procedures, especially if you are working in a laboratory.

14. Develop your professional and transferrable skills by attending the transferable skills courses and lectures provided by the Graduate School, the Department or elsewhere in the College or external providers.

As a student you can expect your supervisor to:

1. Be supportive of you both intellectually and personally. Your supervisor essentially takes over the role of the personal tutor, and will come to know you much better than your lecture instructors. Keep this in mind when it comes to asking for recommendation letters.
2. Set up a viable project and ensure that you have a clear idea of aims and objectives and an initial work-plan. Some supervisors will outline the goals and initial activities of the project, but expect you to articulate the precise aims, objectives and methods yourself. If in doubt about these expectations, ask your supervisor to discuss this with you.
3. Be available (or provide an identified substitute) to talk about research problems at relatively short notice, although, at certain times of the year, you may need to give a few days' notice.
4. Help and guide you: the help is tapered as you develop confidence in your own abilities and research skills, to enable you to learn to work more on your own and to make more of your own decisions.
5. Help develop your skills in technical writing, oral presentations, problem definition, statistical data analysis, and critical literature reviews.
6. Help enable you to write research papers that could be potentially published.
7. Provide adequate funds for your research project (there is an initial budget); the Student Office can also help with some admin around this.
8. Read and constructively comment on your project planning and final reports. This of course requires you to give your supervisor a draft of your report in good time for them to review it.
9. Recognise that your supervisor has other students and other commitments.

Together, students and supervisors are expected to:

Adhere to the College and Departmental guidelines and procedures.

APPENDIX 1 – PLAGIARISM

The College takes plagiarism very seriously and regards it a form of intellectual theft. All material taken from the literature, the internet or from the work of others must be correctly referenced with details of the source. If you are at all in doubt as to whether your actions might be plagiarism check with your supervisor or the course coordinator. Remember that the content of your work is your responsibility. Ignorance of plagiarism is not a defence. See page 2 of: <http://www.imperial.ac.uk/media/imperial-college/administration-and-support-services/registry/academic-governance/public/academic-policy/Examination-and-assessments---academic-integrity.pdf>

The following text provides some advice on plagiarism. You are encouraged to also visit the [Library's webpages](#) about plagiarism.

"You are reminded that all work submitted as part of the requirements for any examination and assessment (including coursework) must be expressed in your own words and incorporate your own ideas and judgements.

*Plagiarism, which is the presentation of another person's thoughts, words or images and diagrams as though they were your own and which is a form of **cheating**, must be avoided, with particular care in coursework, essays, reports and projects written in your own time and also in open and closed book written examinations. You are encouraged to read and criticise the work of others as much as possible, and you are expected to incorporate this into your thinking and in your coursework and assessments. But you must be sure to **acknowledge and identify your sources**.*

Direct quotations from the published or unpublished work of others, whether from the internet or from any other source, must always be clearly identified as such by the use of quotation marks, whether in coursework or in an open or closed book examination. A full reference to their source must be provided in the proper form. Remember that a series of short quotations from several different sources, if not clearly identified as such, constitutes plagiarism just as much as a single unacknowledged long quotation from a single source. Equally, if you summarise another person's ideas or judgements, figures, diagrams or software, you must refer to that person in your text, and include the work referred to in your bibliography. Departments are able to give advice about the appropriate use and correct acknowledgement of other sources in your own work.

Where plagiarism is detected this is most usually in project work or coursework ie work that is submitted in the candidate's own time but plagiarism can also occur in closed book written examinations. Such situations can arise where candidates have been able to learn text by heart [by rote] and simply reproduce what they have learnt without attribution. Where the examination is based on technical knowledge this may be acceptable and not regarded as plagiarism. In other subjects where candidates are asked to write essays the examiners may regard text reproduced without reference or critical analysis as plagiarism. Boards of Examiners are encouraged to clarify where appropriate in examination rubrics how sources should be acknowledged in those examinations.

*The direct and unacknowledged repetition of your own work which has already been submitted for assessment can constitute **self-plagiarism**.*

Where group work is submitted, this should be presented and referenced, with individual contributions recorded, in the convention appropriate to your discipline. You should therefore consult your personal or senior tutor or course director if you are in any doubt about what is permissible. You should be aware that you have a collective professional responsibility as a group for the integrity of all of the work submitted for assessment by that group. If you become

aware that a member or members of the group may have plagiarised part of the group's submission you have an obligation to report your suspicions to your personal or senior tutor or the course director.

*The **use of the work of another student**, past or present, also constitutes plagiarism. Where work is used without the consent of that student, this will normally be regarded as a major offence of plagiarism. Giving your work to another student to use (other than in a group assessment) may also constitute an offence.*

The College may submit your work to an external plagiarism detection service, and by registering with the College you are automatically giving your consent for any of your work to be submitted to such a service.

The College will investigate all instances where an examination or assessment offence is reported and apply appropriate penalties to students who are found guilty. These penalties include a mark of zero for the assessment in which the examination offence occurred or a mark of zero for all the assessments in that year or exclusion from all future examinations of the University (i.e. expulsion from the university)."

Types of plagiarism are explained here:

<https://www.imperial.ac.uk/admin-services/library/learning-support/plagiarism-awareness/undergraduates/>

APPENDIX 2 – DEGREE CLASSES AND ASSESSMENT CRITERIA

Assessment criteria for effort / quantify of work

The mark for effort / quantity of work accounts for 20% of each of planning and final report overall marks and is awarded solely by your supervisor.

| Grade | Mark Range | Effort / Quantity of Work |
|-------|------------|--|
| A* | 85-100 | Outstanding level of effort extending <i>far</i> beyond expectations published in project handbook (8 hours per week during term time and full time in the summer term). Highly self-motivated with a consistent presence in and interaction with research group. Substantial amount of independent development and work on the project. |
| A | 70-84 | Excellent level of effort fully satisfying expectations in handbook. Self-motivated with a consistent presence in the research group, only requiring occasional need for help with directions. |
| B | 60-69 | Strong level of effort that meets nearly all expectations in handbook. Motivated when provided with occasional encouragement and advice. A common presence in the research group. |
| C | 50-59 | Modest level of effort that achieves some expectations in handbook. Motivated when provided with regular encouragement and advice. |
| D | 40-49 | Unsatisfactory level of effort that falls short of expectations in handbook. Frequent encouragement required to maintain some motivation and presence within the research group. |
| E | 30-39 | Largely absent and disengaged from the project. Displays little motivation and needs constant supervisor encouragement to attend meetings. |

Assessment criteria for planning report and presentation

The planning report is assessed by your supervisor(s), and the oral presentation from your supervisor and the audience present (likely the supervisor's research group).

| Grade | Mark Range | |
|-------|------------|---|
| A* | 85-100 | Outstanding breadth of knowledge about the project background to form aims and hypotheses. Outstandingly thorough project planning. Independent and innovative project specification. Complete risk register with all main risks identified and an extensive mitigation plan given. Outstanding evaluation plan with evidence of independent thinking. Rigorous ethical analysis, taking into account effects in all domains, on all stakeholders. Extensive preliminary results with critical discussion.* |
| A | 70-84 | Excellent planning and presentation. Substantial level of independent project specification, of analytic thought or creative ability. Most main risks identified and an excellent mitigation plan given. Excellent evaluation plan. Excellent ethical analysis that takes into consideration most stakeholders. Substantial amount of preliminary results with critical discussion.* |
| B | 60-69 | Good planning and presentation. Some evidence of independent project specification. Some risks identified and the mitigation plan is sensible. Good evaluation plan. Good ethical analysis that takes into account some stakeholders. Some preliminary results.* |
| C | 50-59 | Project substantially correct and adequately presented. Adequate project planning and specification. Some risks identified; minimal or unrealistic mitigation plan. Adequate evaluation plan. Adequate ethical analysis; only a couple of stakeholders considered. Minimal amount of preliminary results.* |
| D | 40-49 | Incomplete understanding of the project specification. Some competence in project planning. Very few or no risks identified. Basic evaluation plan. Minimal ethical analysis; 1 stakeholder considered. Almost non-existent preliminary results.* |
| E | 30-39 | Little or no evidence of project planning. Major defects in understanding of the project specification. Minimal or no risk register. Minimal or missing evaluation plan. Irrelevant ethical analysis. No preliminary results.* |

* For wet lab projects, preliminary results are not marked if the student has been impacted by lack of lab access due to COVID restrictions.

Detailed assessment criteria for the written element of the final report

The written element of the final report counts for 80% toward the final report mark and is arrived at based on the criteria below. The final report is marked by at least 2 full members of academic staff.

For wet lab projects, in case your work has been slowed down because of a lack of lab access due to COVID restrictions, please indicate in a statement written with your supervisor in the front page so the marker(s) will be aware of it and can take this information into account when marking.

| Grade | Mark Range | Description |
|-------------------------------|------------|--|
| A* (1 st upper) | 90-100 | <p>The work is exemplary and is potentially publishable with minimal further editing.</p> <p>Complex observations and evaluations of literature that are of a professional standard have been made.</p> <p>The source material, field or laboratory work have been measured and recorded accurately, systematically and in meticulous detail.</p> <p>Data collection and presentation conform to industry/scientific journal standards. The use of technical terminology is accurate.</p> <p>The quality of data analysed and literature reviewed is more than adequate to support the interpretations made and demonstrates considerable effort and outstanding use of time management throughout the project.</p> <p>Complex interpretations have been made and have been communicated at the highest possible level. Interpretations are accurate, well-justified and show thorough knowledge of all the relevant literature.</p> <p>Discussions and Conclusions are highly innovative, in-depth, confirm or challenge existing models and show an outstanding ability to synthesise and criticise data from a wide range of sources.</p> <p>A thorough understanding of the work in its wider context has been demonstrated.</p> <p>Excellent problem-solving skills and the ability to make well-reasoned independent interpretations have been demonstrated.</p> <p>The work is concise, logically structured, grammatically correct and conforms wholly to the assessment guidelines. Citations are relevant and broad in scope, and accompanying references are correct and conform to the style of an academic journal.</p> <p>Figures are relevant, incorporate relevant and originally presented content, are of publishable quality and significantly enhance the understanding of the work.</p> |

| | | |
|------------------------------------|--------------|--|
| <p>A+ (1st mid)</p> | <p>80-89</p> | <p>The work is excellent and of a publishable standard with some additional editing.</p> <p>Very careful observations and evaluations of the literature have been made.</p> <p>The source material, field or laboratory work have been measured and recorded accurately, systematically and with very good attention to detail.</p> <p>Data collection and presentation conform to industry/scientific journal standards. The use of technical terminology is accurate.</p> <p>The quality of data analysed and literature reviewed is more than adequate to support the interpretations made and demonstrate significant effort and very good time management throughout the project.</p> <p>Complex interpretations have been made and have been communicated to a very high standard. Interpretations are accurate, justified and show good knowledge of the relevant literature.</p> <p>Discussions and conclusions show some innovation, are in-depth, confirm or challenge existing models and show an excellent ability to synthesise and criticise data from a wide range of sources.</p> <p>A good understanding of the work in its wider context has been demonstrated.</p> <p>Very highly-developed problem-solving skills and the ability to make independent interpretations have been demonstrated.</p> <p>The work is concise, logically structured, grammatically correct and conforms wholly to the assessment guidelines. Citations are relevant and accompanying references are correct and conform to the style of an academic journal.</p> <p>Figures are relevant, mostly incorporate relevant and originally presented content, are of excellent quality and enhance the understanding of the work.</p> |
|------------------------------------|--------------|--|

| | | |
|-------------------------------------|--------------|---|
| <p>A (1st lower)</p> | <p>70-79</p> | <p>The work is very good and of a publishable standard with significant additional editing.</p> <p>Careful observations and evaluations of the literature have been made.</p> <p>The source material, field or laboratory work have been measured and recorded accurately, systematically and with good attention to detail.</p> <p>Data collection and presentation conform to industry/scientific journal standards. The use of technical terminology is accurate.</p> <p>The quality of data analysed and literature reviewed is more than adequate to support the interpretations made and demonstrate good effort and good time management throughout the project.</p> <p>Complex interpretations have been made and have been communicated to a high standard. Interpretations are accurate, justified and show sound knowledge of the relevant literature.</p> <p>Discussions and conclusions are well-considered, in-depth, confirm or challenge existing models and demonstrate an ability to synthesise and criticise data from a wide range of sources.</p> <p>A sound understanding of the work in its wider context has been demonstrated.</p> <p>Highly-developed problem-solving skills and the ability to make some independent interpretations have been demonstrated.</p> <p>The work is concise, logically structured, grammatically correct and conforms to the assessment guidelines. Citations are relevant and accompanying references are correct and conform to the style of an academic journal.</p> <p>Figures are relevant, partly incorporate relevant and originally presented content, are of very good quality and make a valuable contribution to the understanding of the work.</p> |
|-------------------------------------|--------------|---|

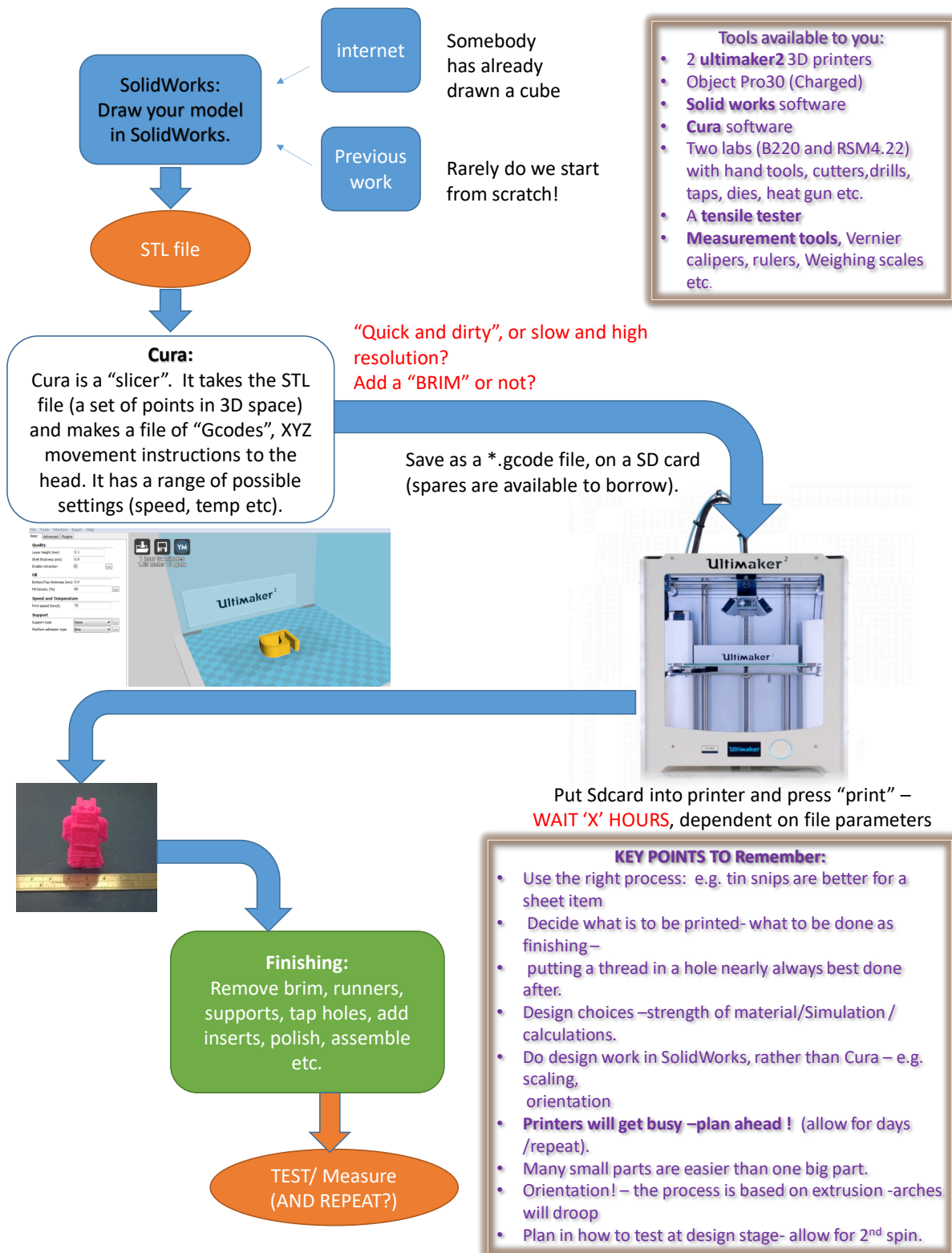
| | | |
|--------------------------------------|--------------|--|
| <p>B (upper 2nd)</p> | <p>60-69</p> | <p>The work is good.</p> <p>Good observations and evaluations of the literature have been made, but few are complex.</p> <p>The source material, field or laboratory work have been measured and recorded accurately, but more attention to detail is required.</p> <p>Data collection and presentation approach industry/scientific journal standards but fall short in one or more areas. The use of technical terminology is mostly accurate but falls short in one or more areas.</p> <p>The quality of data and literature reviewed is adequate to support the interpretations made and demonstrate reasonable effort and good time management throughout the project.</p> <p>Some complex interpretations have been made and have been communicated well. Interpretations are accurate, justified and show good knowledge of the relevant literature.</p> <p>Discussions and Conclusions show some consideration, confirm or question existing models in some aspects and demonstrate an ability to synthesise and criticise data from different sources.</p> <p>A reasonable understanding of the work in its wider context has been demonstrated.</p> <p>Good problem-solving skills and the ability to make some independent interpretations have been demonstrated.</p> <p>The work is relatively concise, has a good structure, is largely grammatically correct and conforms mostly to the assessment guidelines. Some citations are not relevant and/or key citations are absent. Accompanying references are largely correct and approach the style of an academic journal.</p> <p>Figures are relevant, partly incorporate relevant and originally presented content, are of good quality and add to the understanding of the work.</p> |
|--------------------------------------|--------------|--|

| | | |
|--------------------------------------|--------------|--|
| <p>C (lower 2nd)</p> | <p>50-59</p> | <p>The work is mostly sound.</p> <p>Observations and evaluations of the literature are largely satisfactory but lack detail in one or more aspects.</p> <p>The source material, field or laboratory work have been measured and recorded accurately, but more care and/or attention to detail are required.</p> <p>Data collection and presentation fall short of industry/scientific journal standards in one or more areas. The use of technical terminology is sometimes incorrect.</p> <p>More and/or better quality data and literature could have been reviewed to help support the interpretations made and better use of time could have been made throughout the project.</p> <p>Few complex interpretations have been made. Interpretations show some weaknesses and/or are not fully supported by the data presented and/or by the relevant literature.</p> <p>Discussions and Conclusions show evidence of some independent thought, but do not confirm or challenge existing models.</p> <p>Limited understanding of the work in its wider context has been demonstrated.</p> <p>Problem-solving skills have been demonstrated, but independent interpretation is limited in scope.</p> <p>The work contains some irrelevant or inconsistent material, has some issues with structure, shows grammatical inaccuracies and/or does not conform to the assessment guidelines in one or more areas. Some citations are not relevant and more citations are required to support interpretations. Accompanying references show inaccuracies and fall short of the standard for an academic journal.</p> <p>Some figures used are not relevant, incorporate limited relevant or originally presented content, and/or are of poor quality.</p> |
|--------------------------------------|--------------|--|

| | | |
|--|--------------|--|
| <p>D (3rd & fail)</p> | <p>40-49</p> | <p>The work is sound in parts but falls below a satisfactory standard in several areas.</p> <p>Only general observations and evaluations of the literature have been made.</p> <p>The source material, field or laboratory work have been measured and recorded but commonly with insufficient accuracy and/or detail.</p> <p>Data collection and presentation consistently fall short of industry/scientific journal standards. The use of technical terminology is often incorrect.</p> <p>Interpretations are very weak and are limited by the amount and/or quality of data collected or literature reviewed. Much better use of time could have been made throughout the project.</p> <p>Only very general interpretations have been made. Interpretations are very weak and/or not supported by the data presented and/or show very limited knowledge of the relevant literature.</p> <p>Discussions and Conclusions are commonly inconsistent and do not confirm or challenge existing models.</p> <p>A poor understanding of the work in its wider context has been demonstrated.</p> <p>Few problem-solving skills have been demonstrated and independent interpretation is very limited in scope.</p> <p>The work contains irrelevant and/or inconsistent material and has a confused structure. Grammatical inaccuracies are common and the work does not conform to the assessment guidelines. Inadequate/irrelevant citations have been made. Accompanying references show inaccuracies and fall short of the standard for an academic journal.</p> <p>Many of the figures and much of the content are not relevant, incorporate negligible originally presented content, and/or are of poor quality.</p> |
|--|--------------|--|

| | | |
|---------------------|--------------|---|
| <p>E (fail)</p> | <p>30-39</p> | <p>The work fails to reach an acceptable standard in most areas.</p> <p>Few observations and evaluations of the literature have been made and many of those that have been made are flawed.</p> <p>Little source material, field or laboratory work has been reviewed and data are inaccurate and/or incorrectly recorded.</p> <p>Data collection and presentation fall well short of industry/scientific journal standards. The use of technical terminology is very often incorrect.</p> <p>Interpretations are absent or extremely poor and are severely limited by the amount and/or quality of literature reviewed. Inadequate effort has been put into the project.</p> <p>Few interpretations have been made and those that have been made show flaws. Interpretations, where present, are very weak and overly reliant upon existing models.</p> <p>Discussions and Conclusions are inconsistent and do not confirm or challenge existing models. No understanding of the relevant literature has been demonstrated.</p> <p>No understanding of the work in its wider context has been demonstrated.</p> <p>Problem-solving skills are very poorly developed and independent interpretation is absent or extremely poor.</p> <p>The work contains much irrelevant and/or inconsistent material and has a very confused structure. Grammatical inaccuracies are common and the work fails to meet minimum assessment criteria. Inadequate and mostly irrelevant citations have been made. Accompanying references are inaccurate and fall well short of the standard for an academic journal.</p> <p>Figures used are not relevant, incorporate negligible originally presented content, and/or are of extremely poor quality.</p> |
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APPENDIX 4 – DESIGN FLOW FOR 3D PRINTING



APPENDIX 5 – DESIGN FLOW FOR A PRINTED CIRCUIT BOARD (PCB)

