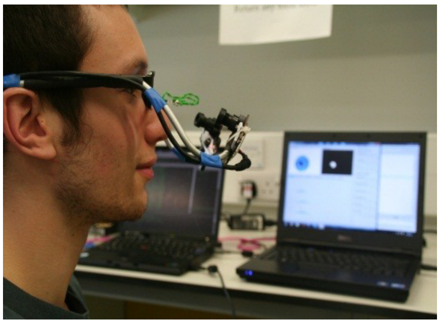
Imperial College London

Department of Bioengineering



MSc Project Guide
2025 - 2026

CONTENTS

DEADLINES

Key events	Deadlines
Project kick off meeting (by module leads)	At the start of spring term
Planning Report & project definition	Thursday 23rd April 2026, 4pm
Project Pitch Presentation Day (Oral Presentation)	June 8th 2026
Final Report	Monday 7th Sept 2026, 4pm

Both reports must be submitted via Blackboard https://bb.imperial.ac.uk

(Blackboard page BIOE70004 - MSc Major Individual Project 2025-2026 has more details)

Key contacts

The Project Co-ordinator: Prof. Julien Vermot (bg-studentprojects@imperial.ac.uk). Please note that project-related inquiries sent to any other email (e.g. Prof. Julien Vermot's imperial email) **WILL NOT** be processed. We will aim to resolve your issue in 5 working days in normal circumstances.

Admin support: Mr Martin Holloway (m.holloway@imperial.ac.uk) and Ms Nicole Harbert (n.harbert@imperial.ac.uk).

Project module leads:

Each research stream has a project module lead who will provide academic oversight.

BME Biomech –	Dr Newell, Nicolas (n.newell09@imperial.ac.uk)
BME Biomat –	Prof Green, Rylie (rylie.green@imperial.ac.uk)
BME Med Phys –	Dr Lally, Pete (p.lally@imperial.ac.uk)
BME Comp –	Prof Tanaka, Reiko (r.tanaka@imperial.ac.uk)
	& Dr Yang, Guang (g.yang@imperial.ac.uk)
BME Neurotech –	Prof Schultz, Simon R (s.schultz@imperial.ac.uk)
MSc Eng for Biomed –	Dr Hashemi, Parastoo (p.hashemi04@imperial.ac.uk)
MSc HBRobotics –	Prof Burdet, Etienne (e.burdet@imperial.ac.uk)
	& Prof Holger Krapp (h.krapp@imperial.ac.uk)

Technical supervisors:

There will be dedicated technical supervisors assigned to your project. They are likely a PhD student or postdoc highly skilled in the area of your project. They will provide technical supervision, in addition to the high-level academic supervision from the module lead.

INTRODUCTION TO THE MSC INDIVIDUAL PROJECT

The Individual Research Project is an important part of all Bioengineering degree courses. 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. Although an MSc is first and foremost a taught degree, we have incorporated a **project module** to maximise the breadth of your training. Starting in the second term, students will work on a research project for the rest of their course. Each student within a research stream will be automatically enrolled in the respective project module. The program consists of four phases:

<u>Phase one (Jan ~ Feb): basic skill training & project formulation</u>

- An introduction session to introduce the range of projects and highlight the project objectives
- Each student must take the academic writing workshop and at least 2 other technical workshops (not marked but proof of attendance required) - to gain practical skills required for the project.
- Each module may run a journal club session to check on readings. This is not marked but proof of attendance might be required as set by the **project module lead**.
- By the end of this phase, the students should have completed all necessary risk assessments/lab inductions.

<u>Phase two (Mar ~ May): project planning and proposal writing</u>

- Project planning meetings with GTAs (as set by the module lead)
- Planning report due after Easter **(April 23rd 2026, Thursday 4pm).**
- Optional proposal pitch conference: the students can sell their proposal and receive verbal feedback (this may vary across project modules as appropriate)

<u>Phase three (June ~ Mid-Aug): 10wk project execution</u>

- Fortnightly project meetings with the module lead to receive general feedback
- Technical help sessions (run by GTAs/technical supervisors)
- Project Pitch Conference Day (7min ppt + 5min Qs; marked; **June 8th 2025, all day**)

<u>Phase four (Mid-Aug ~ Sep): thesis writing</u>

- GTA help session for thesis writing (3 sessions, 2hr each)
- Final report due (**Sept 7th 2026, Monday 4pm**)

Please note that after the exam period, project work is to be conducted at full-time equivalent. Absence must be approved by the project module lead. The project is important in the degree programme. It provides the opportunity for you to demonstrate independence and originality, to plan and organise a small project over a 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 personal skill and creativity in this project. As with any postgraduate training, you are expected to work independently in between meetings. Each MSc project module has dedicated support available, and it is your responsibility to make use of these resources.

PROJECT Operation

Project information & allocation

Project allocation will be managed by the module leads, thus the exact allocation process may differ across MSc streams. In general, a preliminary list of themes/project topics will be provided end of November, but the process remains specific to the module lead. The module lead may putatively place each student in topical groups, based on their expressed interests and goals. Over the course of the Spring term, each student will progressively develop the topic into a full project proposal, with oversight by the module lead. This proposal will then form the basis of the assessed planning report.

Work on project

As part of your MSc requirement, you must have completed the Plagiarism Awareness course online by the end of the Autumn term. This is a requirement set by the Graduate School. More details on Plagiarism are given in Appendix 1. You need to self-enroll 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 work should start with the start of the Spring term in January. The exact amount of time spent on projects is not fixed, but you are expected to spend a minimum of 8 hours per week during term time and full time (~40hr) in the summer (June~Sept), after the exams. **The MSc program does not include summer vacation** and any vacations are not encouraged unless approved by your supervisor. To monitor progress and your effort on the project you are responsible to keep a Project Log Book (physical or digital) that may be checked with your final report.

Safety Form

Depending on the nature of your project, you may need to carry out a risk assessment together with your supervisor before commencing laboratory work. If you need to perform anything in the lab, you must fill out the appropriate safety form for that space prior to working. More information can be found in our intranet: https://www.imperial.ac.uk/bioengineering/admin/info/safety/.

Technical workshops

Doing research requires not only the knowledge learned from taught modules, but also hands-on technical skills. We have created several technical workshops in varying topics to address this; each hands-on workshop typically lasting 2~3hr and aims to get you started with some technical training. You must follow up with the learning resources afterward to develop the skill. The **Academic Writing Workshop** is compulsory for every student (including English native speakers). We will focus on how to put together a strong and well-presented technical report. Each MSc student is required to take **at least one other technical workshop**. Your module lead can advise on the workshop choices based on your project needs. Workshops are not marked, but the instructor will note the attendance. The workshop sign-up will occur at the **project presentation meeting**.

Four workshops will be proposed. ¾ workshops must be attended and attendance will be checked. Each workshop missed without proper reason (e.g. illness) will lead to a fixed 15% deduction from the professional conduct mark.

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. This largely depends on your original ideas and problem solving skills. 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 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 technical supervisor, or with your project module lead.

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 technical 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	Thursday 23rd April 2026, 4pm
B) Oral presentation	10	Project Pitch Conference Day June 8th 2026
C) Final report	80	Monday 7th Sept 2026, 4pm

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. 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(s).

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.

References

List all sources used 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 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 10 minutes, followed by at least 5 minutes of questions. You must adhere to the allocated time and may be asked to stop if your talk exceeds 10 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 10 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

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 email bg-studentprojects@imperial.ac.uk as soon as possible.

The Board of Examiners require that your technical supervisor has seen 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

Project meetings

It is important that you understand that your project supervision (experimental or computational) will be supported by PhD students or postdoctoral researchers as **technical supervisors**. Your module lead will provide academic oversight and high level feedback. To maintain consistent supervision, the module lead will organize group meetings **twice a month during the month of June through August**. These meetings simulate normal lab meetings in a research team and you will be asked to present your progress to all other fellow students. These meetings will help you to get familiarised with the scientific process, experimental or theoretical methodology, and set an appropriate plan for the implementation of the project. **You are expected to prepare materials for these meetings**. The better you prepare, the more efficient these meetings will be. Efficient and thorough preparation will maximise your chance for success, and earn you credit and respect from your colleagues.

Your technical supervisor(s) will organize additional help sessions to support your project. Please note that a single tech supervisor might support multiple students. Please be courteous in sharing this resource with fellow students. When you go to see your tech supervisor, you should have prepared a written list of points you wish to discuss. Take notes during the meeting so you do not forget the advice you were given or the conclusions that were reached. Your logbook is the ideal place for these tasks.

Equipment

You may be required to use equipment that belongs 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 the 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. 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 allocated to the project module (not all projects will require this budget). Depending on the project, the budget might be managed differently. Please discuss anything you need with your **technical supervisor(s)**. Each project module will centrally place orders on a weekly basis. If you miss the timeline for requesting order for the week, you will have to wait for another week. When looking for items to purchase, please prioritize college vendors as they will deliver the items faster. Ask your technical supervisor which vendors to use. As a rule of thumb, **expect ordering items to take 1~2 weeks to arrive** depending on the type of items and whether you missed the ordering deadline for that week. This means that you need to anticipate what you need for the project at least 1 week ahead. **Project delays due to ordering are NOT a valid mitigation excuse**.

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. 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 attend project meetings. Go to project meetings. Don't just spend a week turning up at people's 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 technical supervisor immediately, then work on some other aspect of the project until you can be seen. You gain no sympathy from anyone if you lose contact with your supervisor and produce a poor project as a result. Your technical 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. Plan your project in stages so that if things go wrong at any stage you have a completed stage to fall back on. Your module lead or technical supervisor can advise on the fall-back position during the regular project meetings.

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.

Exam interference. 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. To get the degree, you must pass all required taught modules as well as the project module.

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***.

The module leads and technical 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 a 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.
15. Recognise that your supervisor has other students and other commitments.

As a student you can expect your technical supervisor to:

1. 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.
2. 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.
3. 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.
4. Help enable you to write research papers that could be potentially published.

As a student you can expect your module lead to:

1. Be supportive of you both intellectually and personally. Your technical 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. Please note that they are not obligated to write you a reference.
2. Help develop your skills in technical writing, oral presentations, problem definition, statistical data analysis, and critical literature reviews.
3. Allocate funds and resources for your research project; the Student Office can also help with admin around this.
4. Comment on your project planning reports and give you feedback on your project execution during project meetings. This requires you to give a draft of your planning report in good time (at least one week) for them to review.

Together, students and supervisors are expected to:

Adhere to the College and Departmental guidelines and procedures.

ETHICAL ASPECTS OF THE PROJECT (SEE ALSO APPENDIX 3)

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 Ethics Code, 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 (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:- http://www.imperial.ac.uk/admin-services/secretariat/college-governance/charters-statutes-ordinances-and-regulations/policies-regulations-and-codes-of-practice/information-systems-security/iss-policies/

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.

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 professional conduct

The mark for professional conduct accounts for 20% the final report marks and is awarded jointly by your technical supervisor and module lead.

Grade	Mark Range	Effort / Quantity of Work
A*	85-100	Outstanding level of effort extending *far* beyond expectations published in project handbook (6-8 h / week for 20 weeks plus 1-month full time). Highly self-motivated with a consistent presence in and interaction with research group. Substantial amount of independent development and work on the project. Outstanding level of management and organizational skill, reliability, and punctuality. Outstanding ability to take initiative and propose constructive ideas. The candidate is polite and displayed an exemplary behaviour with supervisor's research group and within the lab.
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. Excellent level of management and organizational skill, reliability, and punctuality. Good ability to take initiative and propose constructive ideas. The candidate is polite and displayed an exemplary behaviour with supervisor's research group and within the lab.
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. Evidence of management and organizational skill, reliability, and punctuality. Good ability to take initiative and propose constructive ideas. The candidate is polite and displayed an exemplary behaviour with supervisor's research group and within the lab.
C	50-59	Modest level of effort that achieves some expectations in handbook. Motivated when provided with regular encouragement and advice. The candidate is polite and displayed an exemplary behaviour with supervisor's research group and within the lab.
D	40-49	*Effort / quantify of work*: Unsatisfactory level of effort that falls short of expectations in handbook. Frequent encouragement required to maintain some motivation and presence within the research group. *Professional Conduct:* Modest level of management and organizational skill, reliability, and punctuality. Modest ability to take initiative and propose constructive ideas. The candidate is not always polite and/or did not always display an exemplary behaviour with supervisor's research group and within the lab.
E	30-39	Largely absent and disengaged from the project. Displays little motivation and needs constant supervisor encouragement to attend meetings. Bad level of management and organizational skill, reliability, and punctuality. Low ability to take initiative and propose constructive ideas. The candidate is not always polite and/or did not always display an exemplary behaviour with supervisor's research group and within the lab.

Assessment criteria for planning report and presentation

The planning report is assessed by your supervisor(s), and the oral presentation from your technical supervisor and the module lead.

Grade	Mark Range	Planning Report	Oral Presentation
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.	Outstanding presentation. Evidence of outstanding analytic ability, volume of work and presentation skills.
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	Excellent overall presentation. substantial level of analysis clearly presented. Evidence of independent enquiry or creativity. Wide knowledge of the project area.
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.	Well structured. Clear presentation. Some analysis clearly presented. Some evidence of independent enquiry or creativity. Good knowledge of the project area
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.	Substantially correct. Basic understanding of relevant principles. Adequate technical content. Adequate presentation.
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	Some technical content. Incomplete understanding of relevant principles. Somewhat lacking in presentation.
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.	Little or no technical content. Major failures in presentation. Major conceptual misunderstandings.

Assessment criteria for the ethics part of the planning and final reports

Grade	Mark Range	Description
A*	85 - 100	As for "A" grade, but also takes a creative and wide-reaching investigation of the ethical implications and effects of their own work on the wider world.
A	70 - 84	Takes a comprehensive and global view of the implications and outcomes of the research and the interests of and effects on all stakeholders; including the environment, humankind, society and the public, the college, your fellowstudents and college members, those directly involved in the pursuit or products of the research, issues of sustainability, finance, social responsibility, ownership of findings or outcomes; all need to be addressed. Wide ranging and assiduous search of relevant literature; clear and full references andcitations
B	60 - 69	Good awareness of the importance of ethical consideration in all scientific endeavours. Considers to some extent the implications and outcomes of the project on wider stakeholders, and considers the interests and effects on these. Some recognition that engineers might have ethical responsibilities and some discussion of these. Reasonable search of relevant literature and acceptable references and citations.
C	50 - 59	Some awareness of the importance of ethical consideration in all scientific endeavours. Some recognition that engineers might have ethical responsibilities. Some search of relevant literature and some references.
D	40 - 49	Incomplete understanding of ethical principles or debate; limited consideration of the impactof the project on others than the student's self. Little or no consideration of wider members of the scientific community, society or the biosphere. Incomplete coverage of literature, poor linking of information.
E	30 - 39	The student does not engage with ethical issues or discussions at all, but excuses this lack by "this project has no animal testing or live subject interactions, and therefore ethical permission is not required." Little or no evidence of literature searching, typically based on a single / few web based sources. No or few references

Assessment criteria for the written 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 members of academic staff other than your module lead.

Grade	Mark Range	Description
A* (1st upper)	90-100	The work is exemplary and is potentially publishable with minimal further editing. Complex observations and evaluations of literature that are of a professional standard have been made. The source material, field or laboratory work have been measured and recorded accurately, systematically and in meticulous detail. Data collection and presentation conform to industry/scientific journal standards. The use of technical terminology is accurate. 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. 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. 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. A thorough understanding of the work in its wider context has been demonstrated. Excellent problem-solving skills and the ability to make well- reasoned independent interpretations have been demonstrated. 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. Figures are relevant, incorporate relevant and originally presented content, are of publishable quality and significantly enhance the understanding of the work.
A+ (1st mid)	80-89	The work is excellent and of a publishable standard with some additional editing. Very careful observations and evaluations of the literature have been made. The source material, field or laboratory work have been measured and recorded accurately, systematically and with very good attention to detail. Data collection and presentation conform to industry/scientific journal standards. The use of technical terminology is accurate. 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. 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. 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. A good understanding of the work in its wider context has been demonstrated. Very highly-developed problem-solving skills and the ability to make independent interpretations have been demonstrated. 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. Figures are relevant, mostly incorporate relevant and originally presented content, are of excellent quality and enhance the understanding of the work.
A (1st lower)	70-79	The work is very good and of a publishable standard with significant additional editing. Careful observations and evaluations of the literature have been made. The source material, field or laboratory work have been measured and recorded accurately, systematically and with good attention to detail. Data collection and presentation conform to industry/scientific journal standards. The use of technical terminology is accurate. 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. 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. 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. A sound understanding of the work in its wider context has been demonstrated. Highly-developed problem-solving skills and the ability to make some independent interpretations have been demonstrated. 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. 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.

B (upper 2nd)	60-69	The work is good. Good observations and evaluations of the literature have been made, but few are complex. The source material, field or laboratory work have been measured and recorded accurately, but more attention to detail is required. 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. 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. Some complex interpretations have been made and have been communicated well. Interpretations are accurate, justified and show good knowledge of the relevant literature. 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. A reasonable understanding of the work in its wider context has been demonstrated. Good problem-solving skills and the ability to make some independent interpretations have been demonstrated. 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. Figures are relevant, partly incorporate relevant and originally presented content, are of good quality and add to the understanding of the work.
C (lower 2nd)	50-59	The work is mostly sound. Observations and evaluations of the literature are largely satisfactory but lack detail in one or more aspects. The source material, field or laboratory work have been measured and recorded accurately, but more care and/or attention to detail are required. Data collection and presentation fall short of industry/scientific journal standards in one or more areas. The use of technical terminology is sometimes incorrect. 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. 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. Discussions and Conclusions show evidence of some independent thought, but do not confirm or challenge existing models. Limited understanding of the work in its wider context has been demonstrated. Problem-solving skills have been demonstrated, but independent interpretation is limited in scope. 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 academicjournal. Some figures used are not relevant, incorporate limited relevant or originally presented content, and/or are of poor quality.
D (3rd & fail)	40-49	The work is sound in parts but falls below a satisfactory standard in several areas. Only general observations and evaluations of the literature have been made. The source material, field or laboratory work have been measured and recorded but commonly with insufficient accuracy and/or detail. Data collection and presentation consistently fall short of industry/scientific journal standards. The use of technical terminology is often incorrect. 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. 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. Discussions and Conclusions are commonly inconsistent and do not confirm or challenge existing models. A poor understanding of the work in its wider context has been demonstrated. Few problem-solving skills have been demonstrated and independent interpretation is very limited in scope. 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. Many of the figures and much of the content are not relevant, incorporate negligible originally presented content, and/or are of poor quality.
E (fail)	30-39	The work fails to reach an acceptable standard in most areas. Few observations and evaluations of the literature have been made and many of those that have been made are flawed. Little source material, field or laboratory work has been reviewed and data are inaccurate and/or incorrectly recorded. Data collection and presentation fall well short of industry/scientific journal standards. The use of technical terminology is very often incorrect. 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. 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. Discussions and Conclusions are inconsistent and do not confirm or challenge existing models. No understanding of the relevant literature has been demonstrated. No understanding of the work in its wider context has been demonstrated. Problem-solving skills are very poorly developed and independent interpretation is absent or extremely poor. 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. Figures used are not relevant, incorporate negligible originally presented content, and/or are of poor quality.

APPENDIX 3 – Ethics

Engineering Ethics for Bioengineering

The public and the Engineering Council expect solid ethical behaviour and thinking from engineers. The Engineering Council have a Statement on Engineering Ethics, which highlights four pillars on which the ten principles of Ethical Engineering Behaviour stand.

These Pillars are:

a. Honesty and integrity
b. Respect for life, law, the environment and public good
c. Accuracy and rigour
d. Leadership and communication

Ethics is not just about animal or patient testing. Ethics is about making the right choices in what we do and say, and understanding why those choices are right or not. The lecturer at the heart of the Cambridge Analytica scandal said “I wasn’t doing anything wrong”: it is true he was not breaking any laws, but quite clearly he was acting unethically. So what was wrong with his thinking?

Ethics is about what is true, right or fair; on what basis it can be said to be true, right or fair, and by whom. In particular, engineering ethics requires us to think about ALL stakeholders in any endeavour. The Engineering Council have clear and strong guidelines on this, and you have been informed about these and given the links.

Personal ethics (or personal moral bases) are often about what we don’t do and why, but Professional Ethics (such as Engineering Ethics) often go further and have a positive aspect: about things we should do or must do as well as what we don’t do. So, for example, Engineering Ethics includes a Whistleblower Clause: that an engineer is duty bound to call out bad or wrong behaviour or work. This also has been adopted into the Imperial College expectations regarding bullying or discrimination (of any sort): that if one observes this one should call it out.

As Imperial Undergraduate students you would have undertaken Ethics training in First Year, prepared an ethical analysis of a case study, and had refresher material in your second year. You would further have undertaken an ethical analysis of your Design & Professional Practice 2 project.

In the ethics training, we consider three lead questions:

1. Is it true?
2. Is it fair?
3. Is it wise?
4.

These then break down into six domains of ethical consideration:

Is it true:

A. Scientific Integrity: how sure can we be that our findings/results are true and reliable? We owe a duty of honesty and care to our scientific colleagues and the wider public to ensure that what we claim/state/declare is really true and founded on solid scientific work. This is relevant to all bioengineering projects. That our methods and assumptions are trustworthy and reliable, that our conclusions and data analysis are truthful and solid, and that our publications are truthful and well supported, and that our statistical methods are appropriate and reliable.

Is it fair:

B. Scientific collegiality: we owe it to our colleagues in the department and our wider field to deliver trustworthy work and not discredit Bioengineers or scientists. That means the sharper collegiality of building our Department as a leading and trustworthy centre of excellence, but also colleagues in other departments and colleges rely on us to build the public standing of bioengineers. Students owe it to other students to study and perform honestly and fairly, not seeking unfair advantage (no cheating or academic misconduct)
C. Protection of Human Subjects: relations between researchers and human subjects. This includes protection from harm; respect; autonomy’ beneficence’ and justice. It includes informed consent and assent, confidentiality and anonymity (GDPR), and not exposing subjects to research risks.
D. Animal Welfare: relationships between researchers and animal subjects. This is strongly controlled by the Home Office and the Animals (Scientific Procedures) Act 1986.

Is it wise?:

E. Institutional Integrity: relationships between researchers and their sponsors, funding agencies and government. This includes being careful about with whom we collaborate or from whom we accept support or funding, recognising or avoiding conflicts of interest or conflicts of commitment; regulatory compliance.

F. Social Responsibility: relationship between research and the common good. This also reaches wider than our normal thoughts of ethics to include fiscal responsibility, public service, public education, environmental impact, gaining/maintaining public support. So issues like Artificial Intelligence or Genetic Engineering and the potential longterm effects, societal impacts (always important in Healthcare Science)

In your section of your project report, you should consider all six of these domains and the effects on ALL stakeholders (including the environment, society and the biota) in the realms of wellbeing (health and welfare), autonomy (freedom and choice) and justice (fairness). Note that only C and D are about protecting the subjects of research or investigations – there are always wider ethical issues to be considered in Bioengineering projects. You should especially not neglect Domains A, B, E and F, but should also link your considerations into the ten clauses of the Engineering Council "Codes of Conduct for Engineers".

Principles at work

Of course, there has been much more discussion and debate about Medical Ethics, and it is generally considered that Medical Ethics is "the application of traditional moral theory to questions of ethics that arise in medicine"[1]. On that basis, Engineering Ethics is also the application of moral theory to engineering. Furthermore, it can be seen that, to examine ethical issues and processes one needs to examine and explore one's own Moral theories and beliefs.

However, it can be further argued that professional ethics are actually also distinct from Personal Ethics (as the Engineering Council recognise), and impose a moral framework and stance distinct from our own personal moral framework. This can be a challenge or a source of personal struggle.

It is generally recognised that there are four prime principles underpinning an approach to Medical Ethics: autonomy, beneficence, non-maleficence, and justice.

This is to say that, in an ethical approach, one should respect:

1. Autonomy: the freedom and free choice of every individual likely to be affected by the policy or action.
2. Beneficence: only actions which bring about good to the individuals considered should be undertaken, and doctors should always act in the best interests of patients whilst it is in their power to do so.
3. Non- maleficence (is in some ways a corollary to 2): no actions should be undertaken which may cause harm to the individual concerned (this is the famous principle enshrined in the Hippocratic Oath, for example), and likewise the doctor should not refrain from acting if this is going to cause harm to the individuals concerned.
4. Justice: all actions should be seen to be just and fair to all individuals concerned.

Some of the underlying principles that might inform and shape our responses include:

1. Utilitarianism – doing the greatest good for the greatest number of people.
2. Universalism: Right or wrong are always right or wrong, whatever the circumstances.
3. Deontology: that is the way the world (life, the universe, whatever) is, and so it logically follows from that. (Note that this is the core issue in Animal rights and Veganism – a personal belief that "All creatures are equal", or the converse).
4. Reversibility: what if the roles were reversed?
5. Equality – giving equal respect to all persons#.
6. Consequentialism – that the end may justify the means.
7. Personal integrity – that a noble person demonstrates their nobility by upholding/following noble principles always.

It should be clear that whatever project a student is undertaking there will always be ethical questions that can and should be asked about it, and the student should explore these thoroughly in the Ethical Analysis.

The key features to look for in the students' work is to explore all possible stakeholders under all six of the domains described above: anything less is an avoidance of their duty to think and act ethically as engineers.

Note that Engineering Ethics, with duties to Society, the public, the biosphere and all others may also be in conflict with some of these principles, and thus may need discussion and reconsideration. For some engineers this may be difficult to resolve and should be discussed with care.

References:
1. Rhodes R. The Trusted Doctor: Medical Ethics and Professionalism. Oxford, UK: Oxford University Press