



**The Department of Bioengineering
Undergraduate INDIVIDUAL
PROJECT Booklet**

**Year 3 BEng individual project
Year 4 MEng individual project**

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OVERVIEW OF THE BEng AND MEng PROJECTS

Research projects are an important part of the Bioengineering degree course. Projects give students an opportunity to apply the knowledge learned in the rest of the course to current research problems. They also help to develop important project management, team working, organisation, and communication skills that are highly valued by employers and international research groups.

Projects are carried out under the direction and guidance of members of the academic staff and their research groups. They are important pieces of work in the degree programme. They provide 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 your learning 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.

More details about projects can be found here:

<http://www.imperial.ac.uk/bioengineering/admin/current-ug/projects/>

The BEng project

This is an individual, research project carried out by 3rd year students on the BEng degree course. It will be assessed by a planning report submitted at the beginning of the spring term, and a written dissertation and a poster presentation at the end of the academic year. You will be required to give a short presentation of your project progress so far to your supervisor and your supervisor's research group in the spring term.

The MEng project

This is an individual, research project carried out by 4th year students on the MEng degree course. It will be assessed by a planning report submitted during the spring term, and a written dissertation and an oral presentation at the end of the academic year. You will be required to give a short presentation of your project progress so far to your supervisor and your supervisor's research group in the spring term.

ETHICAL ASPECTS OF THE PROJECT

Practical advice on first steps

In Year 1 and Year 2 you have received teaching and practice at 'Ethical Analysis', as an exercise and then as part of the Engineering Design Project. The same approach should be used in discussing the Ethical aspects of your 3rd or 4th year project. 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 be started, 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. In other words, your ethical analysis should take into account effects in all domains on all stakeholders.

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

PROJECT SELECTION AND ALLOCATION PROCESS

Key individuals

The Individual Project Co-ordinator is Dr Julien Vermot (office B213E). Supporting colleagues are Mr Martin Holloway (RSM 3.08) and the Student Office (RSM 321c).

Information stage

Dr Vermot and Mr Holloway present and explain to the students the project allocation process and the web platform used to select projects in the 1st or 2nd week of June. A webpage detailing the projects available will be published, where you will be able to vote for the projects you wish to take. You are also directed to the [Department's Research pages](#).

Individual project students can meet potential supervisors between the 8th of June and 3rd of July during office hours (link for office hours will be circulated via email). Potential supervisors and their research interests can be found at the Department's webpage, <http://www.imperial.ac.uk/bioengineering/people/academic-staff-and-research-fellows/>. In the course of discussions with the staff member you may devise a new project combining the interests of you both; that is fine.

Choosing an individual project

The idea for your project may be one of the proposals from a member of staff, your own, or perhaps a combination of the two. You should discuss the projects that interest you with the supervisors as soon as possible so that you have plenty of time to think about the best choices for you. Note that not every project is suitable for every student, for example, some may only suit students with a very specific set of interests. Each proposal will indicate these constraints in order to help you to make an informed choice.

Student selection stage

You are asked to register your project preferences online (the link will be sent to you on the 9th of June) **by Monday 12 July**. 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 they have selected a specific project, what are their research / study interests, etc; e.g. "I want to do a PhD in cardiac blood flow".

Staff selection stage / Project allocation stage for individual projects

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 for individual projects

Each student will receive a confirmation e-mail when their projects have been allocated. This will happen in September, before the beginning of the autumn term. You should contact your allocated supervisor and complete an electronic [Project Allocation Form](#) in the first week of term. The form will be completed online; your supervisor has to log on to the system and do it with you together. Depending on the nature of your project, you may need to carry out a risk assessment

together with your supervisor before you can complete this form. More information can be found in our intranet: <https://www.imperial.ac.uk/bioengineering/admin/info/safety/>

You are not permitted to start work on your project until the allocation and safety forms have been completed and submitted.

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 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 projects coordinator and the programme lead (Dr Ladame for MBE and Dr Masouros for BME) must approve the project and confirm that you will receive adequate supervision;
- students must be present during all terms and for exams and so it must be possible to work on your project while continuing your studies in College. Typically, this means that the external project is confined to London;
- students must be present for the project presentation day in June;
- all other deadlines and assessment criteria remain the same as for projects within the Department.

BENG INDIVIDUAL PROJECT

Work on project

Project work may start at the first week of term, subject to agreement and safety forms having been submitted. Work continues until the end of the Summer Term. The exact amount of time spent on projects is not fixed, but is on the order of 40-60 days full-time equivalent. Your project is worth 33.3% of your final year marks.

- Autumn term: work will be part-time. You will be expected to work at least 8 hours each week, the precise choice of timeslots will be determined by your option courses.
- Spring term: the first week of term will be dedicated to your project, followed again by part time working of at least 6-8 hours each week.
- Summer term: work is full time after the summer exams and until the final report submission.

To monitor progress and your effort on the project you will keep a Project Log Book (manual or electronic) that will be seen by your supervisor at regular intervals and handed in to them no later than the 24th of June 2021.

Assessment

As the project is an important part of your degree, it is assessed by several routes. Each task is described later in this booklet.

Mode of assessment	% final marks	Deadline
Interim presentation	-	by Fri 28 Jan 2022
Planning report	10	Wed 12 Jan 2022 at 3pm
Poster	20	Fri 17 June 2022 at 3pm
Final report	70	Wed 15 June 2022 at 3pm

Posters will be assessed on the Departmental Research (Project) Day, which is Thursday 23 June 2022. A prize will be awarded for the best poster. You MUST be present for this day. A special timetable will apply that day. All posters and reports are submitted in pdf format to 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 planning report is marked by your supervisor only. The overall mark for the final report is based on a mark for effort given by your supervisor and weighted at 20%, and a mark for the written report weighted at 80% and marked by your supervisor and one more member of staff. Details on the assessment criteria are given in Appendix 2.

BME MENG INDIVIDUAL PROJECT

Work on project

Project work may start at first week of term, subject to agreement and safety forms having been submitted. The exact amount of time spent on projects is not fixed, but is on the order of 40-60 days full time equivalent. Your project is worth 50% of your final year marks.

- Autumn term: work will be part-time. You will be expected to work at least 8 hours each week - the precise choice of timeslots being determined by your option courses.
- Spring term: the first week of the term will be dedicated to your project, followed again by part time working at least 6-8 hours each week.
- Summer term: work is full time after the summer exams and until the final report submission.

To monitor progress and your effort on the project you will keep a Project Log Book (manual or electronic) that will be seen by your supervisor at regular intervals and handed in to them no later than the 23rd of June 2022.

Assessment

As the project is an important part of your degree, it is assessed by several routes. Each task is described later in this booklet.

Mode of assessment	% final marks	Deadline
Interim presentation	-	by Fri 28 Jan 2022
Planning report	10	Wed 12 Jan 2022 at 3pm
Oral presentation	20	Thu 23 June 2022
Final report	70	Tue 14 June 2022 at 3pm

All reports are submitted in pdf format on 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. Talks will be assessed on the Departmental Research Day, on Thursday the 23rd of June 2022. A prize will be awarded for the best talk. You must be present on this day. A special timetable will apply on the day. The planning report is marked by your supervisor only. The overall mark for the final report is based on a mark for effort given by your supervisor and weighted at 20%, and a mark for the written report weighted at 80% and marked by your supervisor and one more member of staff. Details on the assessment criteria are given in Appendix 2.

MBE MENG INDIVIDUAL PROJECT

Work on project

Project work may start on the first week of the Spring term subject to agreement and safety forms having been submitted. The exact amount of time spent on projects is not fixed, but is on the order of 60-90 days full time equivalent. Your project is worth 58.3% of your final year marks.

- Autumn term: Although you will have been assigned a project and a project supervisor, your project will only start in the Spring term and the Autumn term should be dedicated to completing your elective modules. You are invited, however, to start familiarising yourself with the relevant literature.
- Spring term: the full term will be dedicated to your project (30-35 hours per week).

- Summer term: work is full time after the summer exams and until the final report submission.

To monitor progress and your effort on the project you will keep a Project Log Book (manual or electronic) that will be seen by your supervisor at regular intervals and handed in to them no later than the 23rd of June 2022.

Assessment

As the project is an important part of your degree, it is assessed by several routes. Each task is described later in this booklet.

Mode of assessment	% final marks	Deadline
Interim presentation	-	by Fri 18 Feb 2022
Planning report	10	Mon 14 Feb 2022 at 3pm
Oral presentation	20	Thu 23 June 2022
Final report	70	Tue 14 June 2022 at 3pm

All reports are submitted in pdf format on 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. Talks will be assessed on the Departmental Research Day, on Thursday the 23rd of June 2022. A prize will be awarded for the best talk. You must be present on this day. A special timetable will apply on the day. The planning report is marked by your supervisor only. The overall mark for the final report is based on a mark for effort given by your supervisor and weighted at 20%, and a mark for the written report weighted at 80% and marked by your supervisor and one more member of staff. Details on the assessment criteria are given in Appendix 2.

PROJECT ASSESSMENT

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 and, particularly, if you are hoping to win one of the illustrious project prizes, 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 following components will be taken into consideration:

Background Preparation. This component assesses the way you arrived at your initial project specification, work programme and list of objectives. It particularly addresses the background research undertaken and the manner in which your approach and programme of work fits in with the current state-of-the-art.

General Competence. This assesses your overall approach to the project and your ability to overcome the inevitable complications which arise. The specific areas in which you will be assessed are management and organisation, reliability and punctuality, overall technical competence, and your individual contribution to the project.

Technical achievement. This assesses the main technical output from the project. It addresses specific issues such as the design, correctness, elegance, usability etc. of the final product and the significance of the work in relation to the state-of-the-art.

Report and Presentation. This assesses your ability to communicate your work and your findings to other people. The report is the single most important component of the project and you should invest a considerable amount of time in its preparation. You should read the 'Project Report' section below to get a feel for what is required.

Preliminary presentation

You are required to give a short (5-10min) presentation to your supervisor and your supervisor's research group some time at the start or middle of the Spring term. This presentation will include details of your progress on the project, and of the results that you have obtained so far. The objectives of this presentation is (a) to practice presenting / communicating your work, and (b) to receive feedback on your progress by your supervisor and their research group. The presentation is not formally assessed. Your supervisor will bear in mind this presentation when they come to mark your planning report.

Planning report

You are required to prepare a planning report for submission in January for BME, and February for MBE. A template to base it on will appear on [blackboard](#) in good time. The planning report should not exceed 4000 words. This number is a limit, not a target. Title page, abstract, acknowledgements, and bibliography will not count towards the word limit (everything else counts, including table and figure legends). You should not devote weeks to writing the 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 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, is a vital way 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. 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.

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.

Final report

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 objectively criticising 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 bioengineer, 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.

Do not underestimate the importance of the report and make the mistake of thinking that top marks can be achieved simply for working hard 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. 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.

The physical layout and formatting of the report is also 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.

You will be given a template on [blackboard](#) in good time to base your report on. The report should not exceed 6000 words. This number is a limit, not a target. 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, and bibliography will not count towards the word limit (but everything else does, including table and figure legends). 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, 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 the appendix.

A typical technical or research report will have 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 not required. 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. For wet lab project, in the 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 take it into account when marking.

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.

Poster presentation (BEng)

BEng students will present their results as a poster at the end of the summer term. You are required to submit a pdf file for an A1 landscape poster to [Blackboard](#) by the 17th of June 2022. The Department will then arrange for them to be printed. A poster session will be held on the Departmental Research Day, Thursday 23 June 2022, where students stand by their posters and academic staff walk round to mark the posters. Examples of posters can be found on Blackboard. Assessment will be on the basis of volume of work, poster content, organisation, visual layout, and answers to questions.

The oral presentation (MEng)

MEng individual project students will give a formal presentation on their project work to academic staff and their peers on the Departmental Research Day, Thursday 23 June 2022. Talks will be 10 minutes long followed by 5 minutes for questions. Timings will be strictly enforced. You will be expected to put your project in context with a brief introduction, then present your methodology, main results, and conclusions. Talks will be usually given using Microsoft Powerpoint or similar although other methods are possible. Assessment will be on the basis of volume of work, content, organisation, visual layout, rapport, and answers to questions.

Log Book

You will need to keep a lab book / engineer's log book. This will be submitted together to your supervisor at the end of the project. It is an important task of any engineer / researcher to document their work. Indeed, in industry, records must be kept to a very high standard as part of the GLP (good laboratory practice) or ISO 9001 accreditation of the company. In a university it is equally important as good records allow others to follow your work. For each session you go into the laboratory you should

- describe briefly what you did, why you did it, what you found and what that tells you;
- keep a record of standard procedures, such as the composition of buffer solutions, or standard test waveforms;
- the names of computer files containing raw data and analysed results.

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 fantastic graph is or comes from. Written lab records should be brought to each meeting with the supervisor and submitted along with the final report. The supervisor should sign your log book at the end of the autumn term and at a minimum every two weeks in the spring and summer terms. It is your responsibility to obtain this signature record.

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 £250 for desk projects and £350 for lab projects, 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 goods yourselves 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. Remember your project is worth 30% of your final year mark and it will not be possible to do enough work if you only work on the project after the exams. You should aim to have completed a substantial part of the project by the end of the spring term.

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.

UNDERGRADUATE STUDENT PROJECT SUPERVISION GUIDE – EXPECTATIONS

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

* For wet lab projects, preliminary results are not marked if the student has been impacted by lack of lab access due to COVID restrictions. Make this clear in your front page COVID statement on your report.

Detailed assessment criteria for the written element of the final report

The written element of the final report counts for 70% 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>
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<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>
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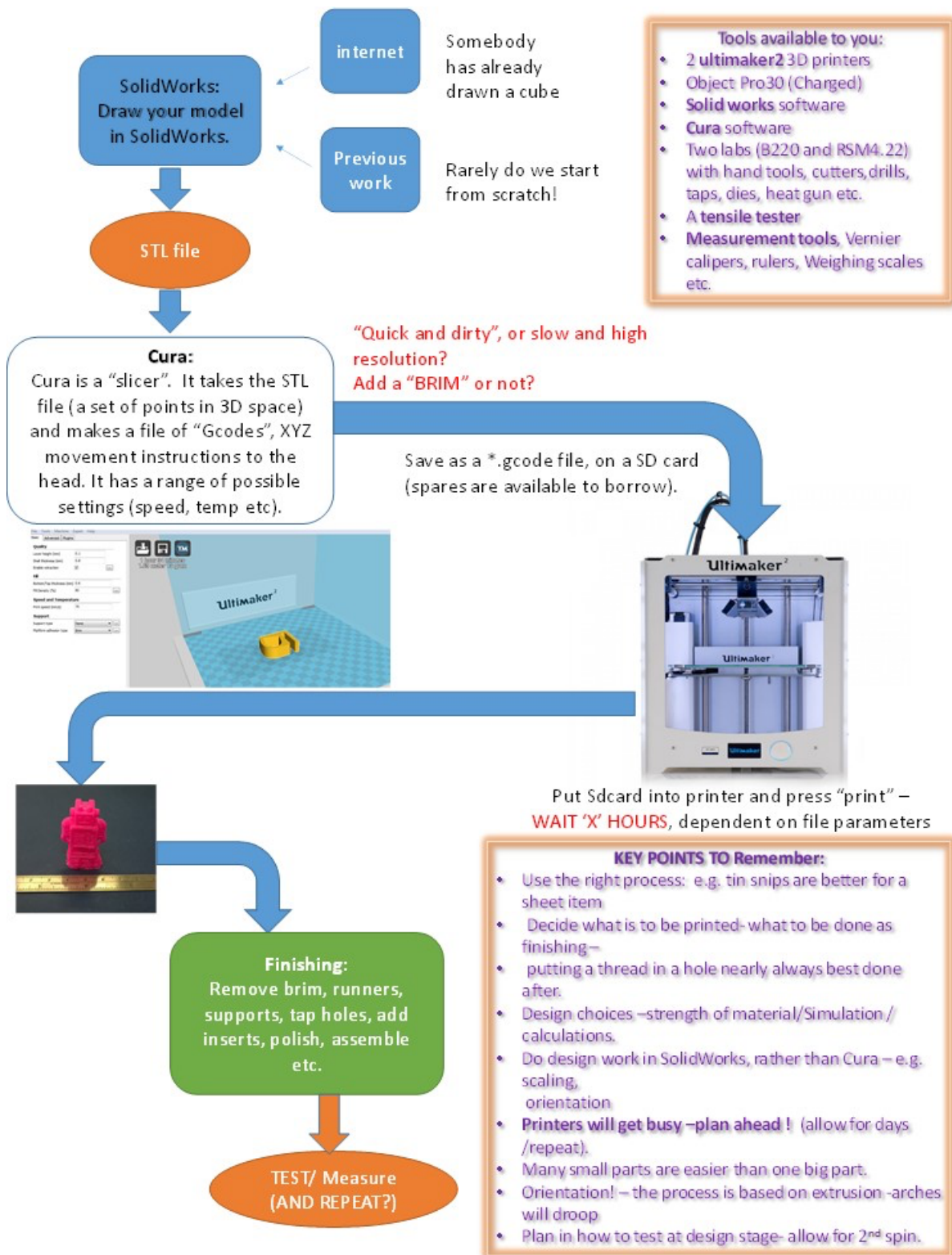
<p>B (upper 2nd)</p>	<p>60-69</p>	<p>The work is good.</p> <p>Good observations and evaluations of the literature have been made, but few are complex.</p> <p>The source material, field or laboratory work have been measured and recorded accurately, but more attention to detail is required.</p> <p>Data 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>
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<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>
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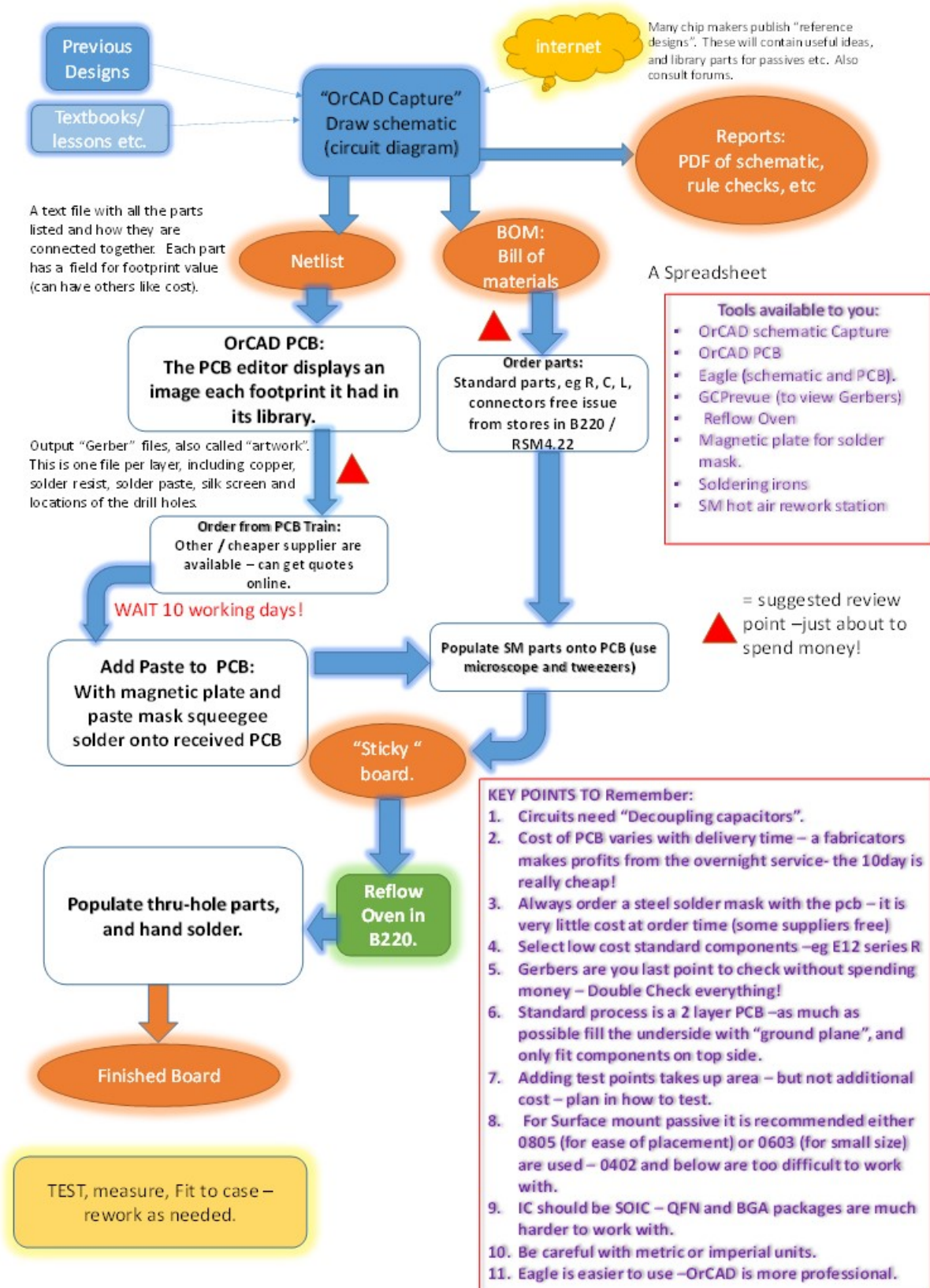
<p>D (3rd)</p>	<p>40-49</p>	<p>The work is sound in parts but falls below a satisfactory standard in several areas.</p> <p>Only general observations and evaluations of the literature have been made.</p> <p>The source material, field or laboratory work have been measured and recorded but commonly with 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>
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<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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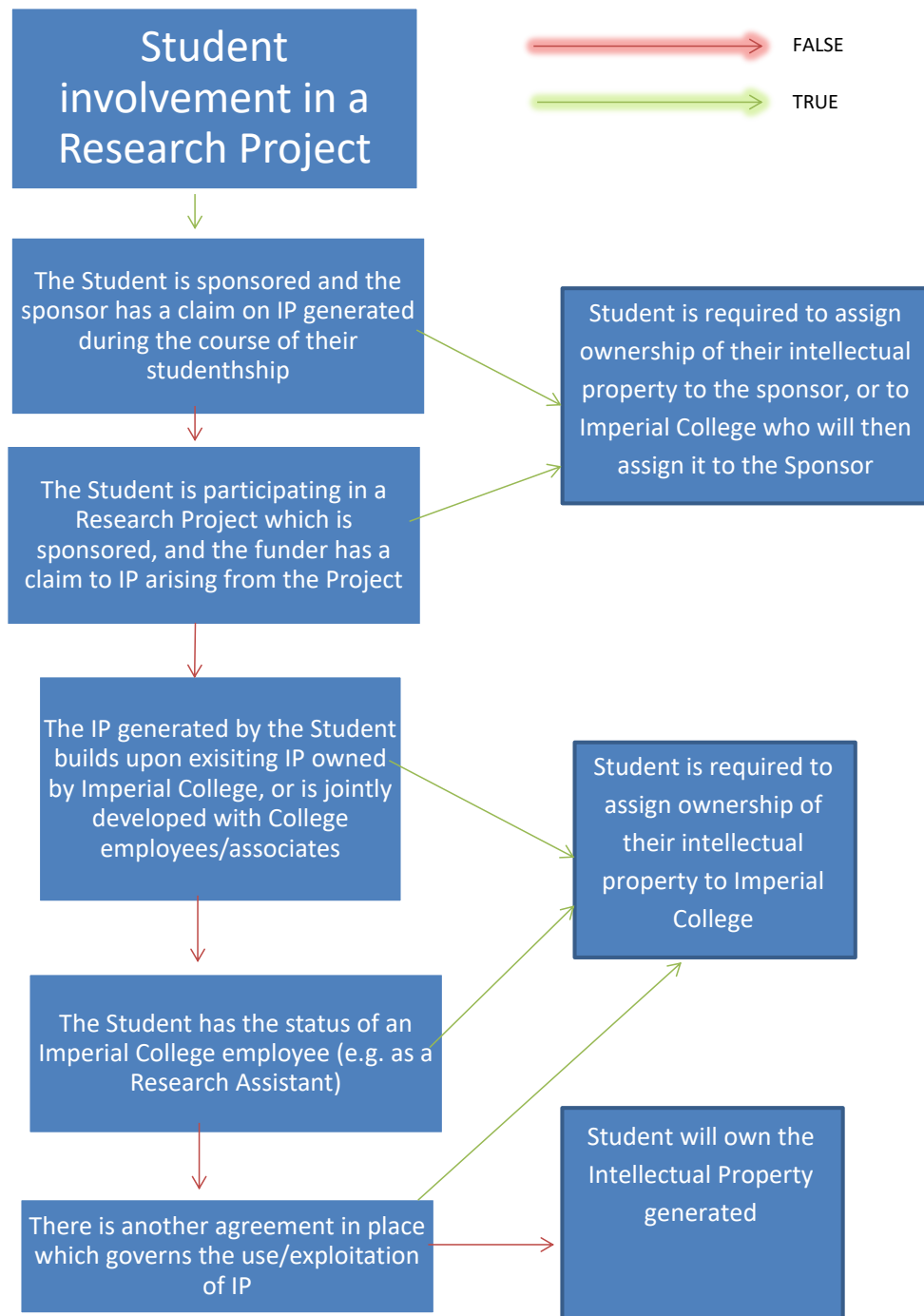
APPENDIX 3 – DESIGN FLOW FOR 3D PRINTING



APPENDIX 4 – DESIGN FLOW FOR A PRINTED CIRCUIT BOARD (PCB)



APPENDIX 5 – INTELLECTUAL PROPERTY* (IP)



*Please refer to the official guidelines of Imperial College London for more informations.

