The Department of Bioengineering Undergraduate PROJECT Handbook

BE3 – HBIP BEng individual project
BE3 – MMGP MEng group project
BE4 – MMIP MEng individual project

Second year Bioengineers (with Queen Victoria)
6th October 2014
# Contents

The BEng and MEng Projects .................................................................................................................. 3

Projects with ethical Aspects ..................................................................................................................... 4

Project selection process .......................................................................................................................... 6
  - Project allocation form (electronic) – individual projects ................................................................. 6
  - Project selection form – Year 3 MEng group projects ................................................................. 7
  - Safety Form ................................................................................................................................. 7

BE3 – HBIP BEng Individual Project ......................................................................................................... 8
  - Choosing an individual Project ....................................................................................................... 8
  - Work on project ............................................................................................................................. 8
  - Assessment ....................................................................................................................................... 8

BE3 – MMGP MEng Group Project .............................................................................................................. 9
  - Choosing a Group Project ................................................................................................................ 9
  - Work on project .............................................................................................................................. 9
  - Assessment ....................................................................................................................................... 9

BE4 – MMIP MEng Individual Project ......................................................................................................... 10
  - Choosing an individual Project ....................................................................................................... 10
  - Work on project ............................................................................................................................. 10
  - Assessment ....................................................................................................................................... 10

Useful Information .................................................................................................................................... 11
  - Meeting Your Supervisor ................................................................................................................ 11
  - Equipment ......................................................................................................................................... 11

Project assessment ..................................................................................................................................... 12
  - Preliminary Presentation (BE3 – HBIP / BE3-MMGP / BE4 – MMIP) .............................................. 12
  - Planning report (BE3 – HBIP (Year 3 BEng) / Individual BE4 – MMIP (Y4 MEng)) ............. 13
  - Planning report - Group project (Year 3 MEng: BE3 – MMGP) ................................................ 14
  - Log Book (ALL) ............................................................................................................................ 15
  - The final project report (ALL) ........................................................................................................ 15

Additional Material .................................................................................................................................... 18
  - Posters (BE3 – HBIP) ...................................................................................................................... 18
  - Group poster presentations (BE3 – MMGP) .................................................................................... 18
  - The Oral Presentation (BE4 – MMIP) ............................................................................................. 18

Pitfalls .......................................................................................................................................................... 19

Appendix 1 - Plagiarism ............................................................................................................................ 20

Appendix 2 - Degree classes and Assessment criteria ............................................................................. 22

Appendix 3 – Project supervisors’ E-mail addresses ............................................................................. 24
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 and communication skills that are highly valued by employers and international research groups. The project is worth 30% of the final year marks.

BEng students carry out one research project and MEng students carry out two research projects during their degrees. These are:

BE3 – HBIP BEng Project

This is an individual project carried out by 3rd year students on the BEng degree course. Throughout the year students will carry out an extended research project. It will be assessed by an interim report submitted at the beginning of January, and a written dissertation and a poster presentation at the end of the academic year. You will be required give a short presentation of your project and results obtained so far to your supervisor and your supervisor's students in the second-to-last week of Autumn term. Your supervisor will consider this presentation when marking your interim report.

BE3 – MMGP MEng Group Project

This is group project carried out by 3rd year students on the MEng degree course. Individual members carry out separate interim reports to be handed in at the beginning of January. Work on the project is carried out throughout the year and will be assessed by a written dissertation and a group poster presentation at the end of the academic year. You will be required give a short presentation of your project and results obtained so far to your supervisor and your supervisor’s students in the second-to-last week of Autumn term. Your supervisor will consider this presentation when marking your interim report.

BE4 – MMIP MEng Project

This is an individual project carried out by 4th year students on the MEng degree course. Throughout the year students will carry out an extended research project. They will be assessed by an interim report submitted at the beginning of January, and a written dissertation and an oral presentation at the end of the academic year. You will be required give a short presentation of your project and results obtained so far to your supervisor and your supervisor's students in the second-to-last week of Autumn term. Your supervisor will consider this presentation when marking your interim report.

Projects are carried out under the direction and guidance of members of the academic staff and their research groups. They are by far the most important pieces of work in the degree programme. They provides the opportunity for you to demonstrate independence and originality, to plan and organise a large project over a long period, and to put into practice some of the techniques you have been taught throughout the course. Whatever your level of academic achievement so far, you can show your individuality and inspiration in this project. It should be the most satisfying piece of work in your degree.

More details about projects can be found at the link below:

http://www.imperial.ac.uk/bioengineering/admin/current-undergraduate-students/projects/
PROJECTS WITH ETHICAL ASPECTS

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, 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/charter-statutes-ordinances-and-regulations/policies-regulations-and-codes-of-practice/information-systems-security/iss-policies/](http://www.imperial.ac.uk/admin-services/secretariat/college-governance/charter-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.
**PROJECT SELECTION PROCESS**

The Project Co-ordinator for 2016-17 is Dr Spyros Masouros (office B326). Supporting colleagues are Mr Martin Holloway and Ms Britta Ross (Student Office RSM 321c).

**Information stage.** The project coordinator meets with all students on Monday 3rd October to explain the project system and hand out this project manual. 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 staff web-pages.

During the first week of term (3rd-7th October) students will have time scheduled to meet potential supervisors, or check on project presentations online to find out about the projects. In the course of discussion with the staff member you may devise a new project combining the interests of you both. That is fine. **Office Hours provided by project supervisors will be published:** [http://www.imperial.ac.uk/bioengineering/admin/current-undergraduate-students/timetables/](http://www.imperial.ac.uk/bioengineering/admin/current-undergraduate-students/timetables/)

**Student Selection stage.** Students will be asked to register online their first, second and third choice projects by Fri 7th October (with the option of explaining why they want the project e.g. ‘I want to do a PhD in cardiac blood flow’ – for such a student it would be good if they could do such a project.)

**Staff Selection stage.** Once staff receive these selections from the students they will promptly make their decisions. This could be:-  

(1) Accept the student – at which point you will receive a confirmation email. It is essential that you then meet with your project supervisor and both sign the agreement form, and complete and sign the safety form - see next page.  

(2) The staff member suggest another of their projects as a substitute – or a new related project. If you agree then (1) above.  

(3) Do not accept your application – Possibly because the staff member has accepted too many other students.

**Repeat stage.** The relatively few rejected students will have their second choice considered. The staff member then agrees or not as detailed above. If necessary this process continues until all students have projects. In the case of a student unable to find a supervisor, I then take a lead role in helping them find one.

**Project allocation form (electronic) – individual projects**

When you have been selected for a project, you must complete an electronic **Project Allocation Form** giving  

- the supervisor(s) names. If supervisor is outside of the Department a Departmental co-supervisor should be agreed;  
- an indication of whether the project is computer-based or laboratory-based;  
- an agreed title.

The form will be completed online; the supervisor who has accepted you has to log on to the systems and do it with you together.

**Friday 14th October at 5pm.** If you do not submit a form by this time a project will be allocated to you by the Project Co-ordinator.
Project selection form – Year 3 MEng group projects

Your Group must complete an electronic Group project Selection Form giving

- the names of the group members;
- the supervisor(s). If the supervisor is outside of the Department, a Departmental co-supervisor should be agreed;
- an indication of whether the project is computer-based or laboratory-based;
- an agreed title.

The form is completed online; the supervisor needs to log on to that system: Deadline is Fri 14th October. If you do not submit a form a project will be allocated to you by the Project co-ordinator in consultation with the ME and EE group project supervisors.

Projects outside Imperial College

Projects are normally supervised by academics with 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:

A. STUDENTS MUST ORGANISE THE EXTERNAL PROJECT THEMSELVES.
B. STUDENTS WILL NEED TO RECRUIT A CO-SUPERVISOR FROM THE DEPARTMENT WHO WILL MAINTAIN ACADEMIC OVERSIGHT TO ENSURE QUALITY STANDARDS ARE MAINTAINED.
C. THE DIRECTOR OF COURSES MUST APPROVE THE PROJECT AND CONFIRM THAT YOU WILL RECEIVE ADEQUATE SUPERVISION.
D. STUDENTS MUST BE PRESENT DURING ALL TERMS AND FOR EXAMS. SO, IT MUST BE POSSIBLE TO WORK ON YOUR PROJECT WHILE CONTINUING YOUR STUDIES AT COLLEGE. THIS TYPICALLY MEANS THAT THE EXTERNAL PROJECT IS CONFINED TO LONDON.
E. STUDENTS MUST BE PRESENT FOR THE PROJECT PRESENTATION DAY IN JUNE.
F. ALL OTHER DEADLINES AND ASSESSMENT CRITERIA REMAIN THE SAME AS FOR PROJECTS WITHIN THE DEPARTMENT.

Safety Form

You and your supervisor are required to complete a project safety registration form electronically.

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. This is done online here:
https://share.imperial.ac.uk/foe/Bioengineering/LabInformation/Pages/Risk.aspx

YOU ARE NOT PERMITTED TO START WORK ON YOUR PROJECT UNTIL THE AGREEMENT AND SAFETY FORM HAVE BEEN COMPLETED AND SUBMITTED TO THE STUDENT OFFICE.
BE3 – HBIP BEEng INDIVIDUAL PROJECT

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.

If you have your own idea for an individual project you should discuss this with a potential supervisor as soon as possible.

Work on project

Project work starts from Monday 10th October. 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 this is because the project is worth 27% 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: After the summer exams, until the end of the project, work is full-time.

To monitor progress and your effort on the project you will keep a Project Log Book that will be signed by your supervisor at regular intervals and handed in with your final report.

Assessment

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

<table>
<thead>
<tr>
<th>Mode of assessment</th>
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<td>Fri 16th Dec 2016 at 5pm</td>
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<td>Planning report</td>
<td>10</td>
<td>Mon 9th Jan 2017 at 5pm</td>
</tr>
<tr>
<td>Poster submission</td>
<td>20</td>
<td>Thur 22nd June 2017 at 5pm</td>
</tr>
<tr>
<td>Final report / log book</td>
<td>70</td>
<td>Tue 20th June 2017 at 5pm</td>
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Posters will be assessed on the Departmental Research (Project) Day Thursday 29 June 2017. A prize will be awarded for the best poster.
You MUST be present for this day. Special timetable will apply that day.

All posters and reports are submitted in pdf format to Blackboard: https://bb.imperial.ac.uk

Failure to meet this deadline will result in failure of this unit.
Hard copies are only needed if the supervisor requests one.
Choosing a Group Project

Choice is inevitably more restricted for a group project. There will be a limited choice of projects for students in each stream. However, different aspects of the project may well require a variety of skills. One of the characteristics of a successful group project is that the talents of the group members are used to the best effect.

If you have your own idea for a group project you should discuss this with possible project supervisors as soon as possible. The final allocation of project groups is at the discretion of the Project Co-ordinator in consultation with the ME and EE group project supervisors.

Work on project

Projects start from Monday 10th October. Members of the group meet with the project co-ordinator to decide on the general strategy for the project and allocation of tasks. The group then prepares a project plan and budget.

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 this is because the project is worth 20% of your third 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:** After the summer exams, until the end of the project, work is full-time.

To monitor progress and your individual effort towards the group project you will keep a Project Log Book that will be signed by your supervisor at regular intervals and handed in with your final report.

Assessment

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

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All reports are submitted in pdf format to Blackboard: [https://bb.imperial.ac.uk](https://bb.imperial.ac.uk) by the announced deadline. Hard copies are only needed if the supervisor requests one. Failure to meet this deadline will result in failure of this unit.

**Posters will be assessed on Tue 27th, Wed 28th, and Thurs 29th of June 2017.** The poster will be presented by the group as a series of short talks using the poster. A prize will be awarded for the best poster. **You must be present on all three days.**

The final report mark will be moderated by peer group assessment of your individual contribution to the project; this may change the report mark for each student by up to ± 25% of the actual mark given for the report. There will be an individual mark component for the poster presentation.
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. An important requirement for 4th years taking the BE4-MMIP Individual project is the need to include some advanced material from the 3rd year (and possibly 4th year) in their projects.

If you have your own idea for an individual project you should discuss this with a potential supervisor as soon as possible. The final allocation of supervisors is done at the discretion of the Project Co-ordinator in consultation with supervisors.

Work on project

Projects start from Monday 12th October. 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 this is because the project is worth 30% 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**: After the summer exams, until the end of the project, work is full-time.

To monitor progress and your effort on the project you will keep a Project Log Book that will be signed by your supervisor at regular intervals and handed in with your final report.

Assessment

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

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Talks will be assessed on the Departmental Research Day Thursday 29th June 2017. A prize will be awarded for the best talk. You must be present on this day. A special timetable will apply on the day.

All reports are submitted in pdf format to Blackboard: https://bb.imperial.ac.uk by the announced deadline. Hard copies are only needed if the supervisor requests one. Failure to meet this deadline will result in failure of this unit.
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 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 written Log book is the ideal place for these tasks.

Equipment

You may be required to use equipment that belongs to the Department or individual research groups. This 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 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. It is not unusual for a potentially good project to be spoilt by inadequate home equipment.

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

Please 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.
**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 prospective 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 (BE3 – HBIP / BE3-MMGP / BE4 – MMIP)**

You are required to give a short (5-10min) presentation to your supervisor and your supervisor’s research group during the second-to-last week of Autumn term (deadlines fore-mentioned). This presentation will include details of your progress on the project, and of the results that you have obtained so far. Your supervisor will bear in mind this presentation when they come to mark your interim report.
Planning report (BE3 – HBIP (Year 3 BEng) / Individual BE4 – MMIP (Y4 MEng))

BE3 – MMIP / BE4 – MMIP students should prepare a planning report for submission in early January. A template to base it on will appear on blackboard in good time. The planning report should not exceed 6000 words. 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 title page.** This should include the project title and your name. You can also list the name of your supervisor if you wish.

**Project specification.** This should state clearly what the project is intended to deliver.

**The Ethical Analysis** 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.

**Review of background literature.** This should briefly summarise the key findings from a range of published sources. 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 that 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 fallback 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. However you will find as the project progresses that keeping track of and revising your initial estimates, and if necessary altering the proposed work, is a vital way to ensure that the project is finished in time.

**The evaluation section** should detail how you expect to measure the success of the project. In particular it should document any tests 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.

**The Preliminary results section** should document the progress you have made in the project during the Autumn term. Remember it is an interim report you should not provide long technical descriptions here - the place for that is in your final report.

**Bibliography.** 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 can produce the bibliography automatically for you using the style of your liking.
Planning report - Group project (Year 3 MEng: BE3 – MMGP)

BE3 – MMGP students need to submit a group planning report with the following conditions:

1. the group report must have a title page with all names of group members clearly listed.
2. the group planning report must have a contribution statement that each group member signs by typing their name at the bottom. This describes what each student has done so far on the project.
3. at the end of the report, all group members sign by typing their name at the bottom of the page to show that all agree to the content.
4. each member must write a logbook and keep track of their work and contributions.
5. a peer-assessment of effort so far on the project will take place after report submission – this may change the interim report mark for each student by up to ± 25% of the actual mark given for the report.

You will be given a template on blackboard in good time to base your report on. The planning report should not exceed 6000 words. 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. The report should contain the following sections.

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

Project specification should state clearly what the project is intended to deliver. The report must have a contribution statement that each group member signs by typing their name at the bottom. This describes what each student has done so far on the project.

The Ethical Analysis 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.

Review of background literature. This should briefly summarise the key findings from a range of published sources. 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 that 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 fallback 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. However you will find as the project progresses that keeping track of and revising your initial estimates, and if necessary altering the proposed work, is a vital way to ensure that the project is finished in time.

Budget. You should give a summary budget for your project that has been agreed with the other group members and the supervisor.

The evaluation section should detail how you expect to measure the success of the project. In particular, it should document any tests (physical or numerical) 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 section should document the progress made in the project during the Autumn term. Remember it is an interim report so you should not provide long technical descriptions here; the place for that is in your final report.

Bibliography. 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 can produce the bibliography automatically for you using the style of your liking.
Log Book (ALL)
You will need to keep a lab book / engineers log book. This will be submitted together with your final report. It is an important task of any researcher to document their research. 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.

You should keep a written record of your work in your Log book. For each session you go into the laboratory you should describe briefly the following:

1. What you did, why you did it, what you found and what that tells you.
2. You should keep a record of standard procedures (such as the composition of buffer solutions, or standard test waveforms).
3. The names of computer files containing raw data and analysed results.

This will save you many hours at the end of the project trying to remember where that fantastic graph is.

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.

The final project report (ALL)
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.

Many students 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. 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.

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.
Report layout

You will be given a template on blackboard in good time to base your report on. The report should not exceed 6000 words. Reports that do not comply with these guidelines 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. 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.

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

**Abstract:** The abstract is a very brief summary of the report's contents. It should be about half a page long. Somebody unfamiliar with your project should have a good idea of what it's about having read the abstract alone and will know whether it will be of interest to them. It should also include a statement of the number of words in the report (using Word count).

**Acknowledgements:** It is usual to thank those individuals who have provided particularly useful assistance, technical or otherwise, during your project.

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.

**Introduction / Background:** The background section of the report should set the project into context by relating it to existing published work. There are usually many ways of solving a given problem, and you shouldn’t just pick one at random. Describe and evaluate the most important of the possible approaches. Don't be afraid to acknowledge the sources of your inspiration; you are expected to have seen and thought about other people's ideas; your contribution will be putting them into practice in some other context. However, avoid plagiarism: if you take another person's work as your own and do not cite your sources of information/inspiration you are being dishonest; in other words you are cheating. When referring to other pieces of work, cite the sources where they are referred to or used, rather than just listing them at the end.

Having addressed the state of the art and criticised appropriately prior work, you should state the aim of your project explicitly. Include specific objectives and hypotheses if appropriate.

**Body of report (usually Methods – Results):** The central part of the report details the technical work undertaken during the project. The structure of these sections is highly project dependent. Usually they reflect the chronological development of the project, e.g. design, implementation, experimentation, optimisation, whereas some others can be broken down simply to methods – results. Your supervisor will advise you on the most suitable structure for these middle sections.

**Ethics:** This is not a separate section. 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.

**Discussion (including Future Work and Conclusion):** 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. You should include suggestions for future work which can take the project further; anything goes. The final paragraph of this section should be a summary of what was set out to be achieved, what was achieved, and why it is important or how it can be taken further.

**Bibliography:** 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 can produce the bibliography automatically for you using the style of your liking.
ADDITIONAL MATERIAL

Appendix: The appendices 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 typically included are things like program listings, 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, the Appendix should include an indication of which group member worked on which parts of the project.

User Guide: For projects which result in a new piece of software or hardware you should provide a proper user guide providing easily understood instructions on how to use it. A particularly useful approach is to treat the user guide as a walk-through of a typical session, or set of sessions, which collectively display all the features of your product. Technical details of how the product works are rarely required here. Keep it concise and simple. The extensive use of diagrams illustrating the product in action proves particularly helpful. The user guide can be included as an appendix to the main report.

Posters (BE3 – HBIP)

BE3 – HBIP BEng students will present their results as a poster at the end of the summer term. All students will submit a pdf file for an A1 landscape poster to Blackboard by 22 June 2017. The Department will then arrange for them to be printed. A poster session will be held on the Departmental Research Day Thursday 29 June 2017 where students stand by their posters and members of the academic staff walk round to mark the posters. The Blackboard has examples of posters.

Assessment will be on the basis of volume of work, poster content, organization, visual layout, and answers to questions.

Group poster presentations (BE3 – MMGP)

BE3 – MMGP MEng students will contribute a specific panel to the group poster.

The group will submit a pdf file for an A1 landscape poster to Blackboard by 22 June 2017. The Department will then arrange for this to be printed. A poster session will then be organised on Tue 27th, Wed 28th and Thurs 29th June 2017 where student groups stand by their posters and small groups of the academic staff walk round to mark the posters. When the staff group comes to assess the poster, each student will give (in turn) a 2-3 minute talk using his or her panel as an aid. You will be allocated 15 min in total per group followed by 5 minutes of questioning.

Assessment will be on the basis of volume of work, poster content, organization, visual layout, rapport, and answers to questions. Examples of posters can be found on Blackboard.

The Oral Presentation (BE4 – MMIP)

BE4 – MMIP MEng individual project students will give a formal presentation on their research work to academic staff and their peers on the Departmental Research Day, Thursday 29 June 2017. Talks will be 10 minutes long followed by 5 minutes for questions. Timing 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.

Most students get nervous before giving their talks, but in fact giving short talks is a very useful transferable skill that is highly valued by industry. Once you have gone through the process of planning, practicing and giving a talk this will not seem so much of a challenge.

Assessment will be on the basis of volume of work, content, organization, visual layout, rapport, and answers to questions.
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 marks 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 him or her 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. In particular when you make figures or graphs make them to ‘publication quality’ as you go along. 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.

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.
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 is taken from the student handbook:

“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

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<tbody>
<tr>
<td>A*</td>
<td>85-100</td>
<td>Outstanding breadth of knowledge about the project background including the relevant literature. Outstandingly thorough project planning; independent and innovative project specification. Very extensive initial results.</td>
<td>Outstanding presentation; evidence of outstanding analytic ability volume of work and presentational skills.</td>
<td>Outstanding survey of relevant recent literature. Inclusion of primary literature as well as reviews. Outstanding achievement and presentation beyond the expectation of the supervisor, and making little demand for supervisory support. Of near publishable quality. Complies with 6000 word limit</td>
</tr>
<tr>
<td>A</td>
<td>70-84</td>
<td>Excellent coverage of relevant literature. Excellent planning and presentation; substantial level of independent project specification, of analytic thought or creative ability. Extensive initial results.</td>
<td>Excellent overall presentation; substantial level of analysis clearly presented; evidence of independent enquiry or creativity; wide knowledge of the project area.</td>
<td>Excellent coverage of relevant literature. Some inclusion of primary literature as well as reviews if relevant. Excellent work and presentation; substantial level of independent enquiry, of analytical thought or creative ability. Excellent quantity of work. Complies with 6000 word limit</td>
</tr>
<tr>
<td>B</td>
<td>60-69</td>
<td>Good coverage of key literature articles. Good planning and presentation; some evidence of independent project specification. Good volume of initial results.</td>
<td>Well structured; clear presentation; some analysis clearly presented; some evidence of independent enquiry or creativity; good knowledge of the project area.</td>
<td>Well organised; clearly presented and adequately detailed; thorough grasp of relevant principles; some evidence of independent enquiry, of analytical thought or creative ability; assessment of alternative solutions, designs or approaches. Generally very good quantity of work. Complies with 6000 word limit</td>
</tr>
<tr>
<td>C</td>
<td>50-59</td>
<td>Coverage of some key literature articles. Project substantially correct; adequately presented; adequate project planning and specification. Few key initial results.</td>
<td>Substantially correct; basic understanding of relevant principles; adequate technical content; adequate presentation.</td>
<td>Substantially correct; basic understanding of relevant principles; substantially competent in design, calculation or organisation; modest evidence of creative or critical ability; adequately presented; adequate level of consistent effort.</td>
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<tr>
<td>D</td>
<td>40-49</td>
<td>Incomplete coverage of literature, poor linking of information. Incomplete understanding of the project specification; some competence in project planning. Sparse initial results.</td>
<td>Some technical content; incomplete understanding of relevant principles; somewhat lacking in presentation.</td>
<td>Some elements correct; incomplete understanding of relevant principles; some competence in routine tasks; somewhat lacking in presentation or in the application of consistent effort.</td>
</tr>
<tr>
<td>E</td>
<td>30-39</td>
<td>Little evidence of literature searching, typically based on a single / few web based sources. Little or no evidence of project planning; major defects in understanding of the project specification. No initial results.</td>
<td>Little or no technical content; major failures in presentation; major conceptual misunderstandings.</td>
<td>Work displaying little or no understanding of the relevant principles; failure to develop an approach that would achieve the desired outcome; major elements incorrect.</td>
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<tr>
<td>Class : Mark</td>
<td>Description</td>
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<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;: A</td>
<td>An excellent, well-planned piece of work that is well set out, lucid, unambiguous and factually complete. Indicates that the student has a good grasp of the concepts and mechanisms involved. Includes a critical or creative contribution. Good diagrams where appropriate.</td>
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<tr>
<td>Upper 2&lt;sup&gt;nd&lt;/sup&gt;: B</td>
<td>A clear exposition that contains the essential material, (including basic mechanisms, concepts) and sufficient additional material to show that the student has a good understanding of the subject. Good diagrams where appropriate. Normally free from errors in reasoning.</td>
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<tr>
<td>Lower 2&lt;sup&gt;nd&lt;/sup&gt;: C</td>
<td>An adequate presentation, which includes the essential material logically presented with indications that it is understood rather than simply regurgitated.</td>
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<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt;: D</td>
<td>Presentation of some of the basic facts/mechanisms but with little detail and some omissions and errors.</td>
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<tr>
<td>Pass: E</td>
<td>Facts rather thin, with some material confused or presented in an ambiguous manner that suggests that the student does not fully understand the appropriate concepts.</td>
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<tr>
<td>Fail: F</td>
<td>Clearly lacking in content. Confused or erroneous reasoning. Major point(s) omitted and errors of fact.</td>
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</tr>
</tbody>
</table>
## APPENDIX 3 – PROJECT SUPERVISORS’ E-MAIL ADDRESSES

<table>
<thead>
<tr>
<th>Name</th>
<th>Email Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Ben Almquist</td>
<td><a href="mailto:b.almquist@imperial.ac.uk">b.almquist@imperial.ac.uk</a></td>
</tr>
<tr>
<td>Dr Hari Arora</td>
<td><a href="mailto:hari.arora04@imperial.ac.uk">hari.arora04@imperial.ac.uk</a></td>
</tr>
<tr>
<td>Dr Fernando Bello</td>
<td><a href="mailto:f.bello@imperial.ac.uk">f.bello@imperial.ac.uk</a></td>
</tr>
<tr>
<td>Dr. Anil A. Bharath</td>
<td><a href="mailto:a.bharath@imperial.ac.uk">a.bharath@imperial.ac.uk</a></td>
</tr>
<tr>
<td>Prof Martyn G. Boutelle</td>
<td><a href="mailto:m.boutelle@imperial.ac.uk">m.boutelle@imperial.ac.uk</a></td>
</tr>
<tr>
<td>Prof Anthony M. J. Bull</td>
<td><a href="mailto:a.bull@imperial.ac.uk">a.bull@imperial.ac.uk</a></td>
</tr>
<tr>
<td>Prof Etienne Burdet</td>
<td><a href="mailto:e.burdet@imperial.ac.uk">e.burdet@imperial.ac.uk</a></td>
</tr>
<tr>
<td>Prof Colin G. Caro</td>
<td><a href="mailto:c.caro@imperial.ac.uk">c.caro@imperial.ac.uk</a></td>
</tr>
<tr>
<td>Dr Paul Chadderton</td>
<td><a href="mailto:p.chadderton@imperial.ac.uk">p.chadderton@imperial.ac.uk</a></td>
</tr>
<tr>
<td>Dr James J Choi</td>
<td><a href="mailto:j.choi@imperial.ac.uk">j.choi@imperial.ac.uk</a></td>
</tr>
<tr>
<td>Dr Claudia Clopath</td>
<td><a href="mailto:c.clopath@imperial.ac.uk">c.clopath@imperial.ac.uk</a></td>
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<td>Dr. Robert J. Dickinson</td>
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<td>Dr. Emmanuel M. Drakakis</td>
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<td>Dr. Tom Ellis</td>
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</tr>
<tr>
<td>Dr Aldo Faisal</td>
<td><a href="mailto:a.faisal@imperial.ac.uk">a.faisal@imperial.ac.uk</a></td>
</tr>
<tr>
<td>Dr Claire Higgins</td>
<td><a href="mailto:c.higgins@imperial.ac.uk">c.higgins@imperial.ac.uk</a></td>
</tr>
<tr>
<td>Dr Angela Kedgley</td>
<td><a href="mailto:a.kedgley@imperial.ac.uk">a.kedgley@imperial.ac.uk</a></td>
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<tr>
<td>Prof Richard I Kitney</td>
<td><a href="mailto:r.kitney@imperial.ac.uk">r.kitney@imperial.ac.uk</a></td>
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<td>Prof Rob Krams</td>
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<td>Prof Holger G. Krapp</td>
<td><a href="mailto:h.krapp@imperial.ac.uk">h.krapp@imperial.ac.uk</a></td>
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<tr>
<td>Prof Julian Jones</td>
<td><a href="mailto:julian.r.jones@imperial.ac.uk">julian.r.jones@imperial.ac.uk</a></td>
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<tr>
<td>Dr Sylvain Ladame</td>
<td><a href="mailto:s.ladame@imperial.ac.uk">s.ladame@imperial.ac.uk</a></td>
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<td>Dr Chiu Fan Lee</td>
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<tr>
<td>Dr Warren Macdonald</td>
<td><a href="mailto:w.macdonald@imperial.ac.uk">w.macdonald@imperial.ac.uk</a></td>
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<tr>
<td>Dr Spyros Masouros</td>
<td><a href="mailto:s.masouros04@imperial.ac.uk">s.masouros04@imperial.ac.uk</a></td>
</tr>
<tr>
<td>Prof Jimmy Moore Jr</td>
<td><a href="mailto:james.moore.jr@imperial.ac.uk">james.moore.jr@imperial.ac.uk</a></td>
</tr>
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