



Bioengineering Portfolio Design and Professional Practice

Faculty: Engineering

Department: Bioengineering

Module name: Design and Professional Practice 1

Degree: Biomedical Engineering, Molecular Bioengineering

Level: Yr 1

Approximate number of students: 180

Weighting and credit: Portfolio accounts for 40% of the module

Module ECTS: 5

Assessment overview

The Portfolio assessment is designed to help students in Biomedical Engineering and Molecular Bioengineering develop key professional practice and design skills, which will be critical to their personal development throughout their degrees

The assessment is formed of frequent assignments (one per week/per fortnight), with no set deadlines through the term. Part of the professional practice skill set is that students learn to work asynchronously and manage their own time. The Portfolio is primarily assessed individually, except for one group task on engineering ethics.

Design decisions

Assignment design

The portfolio collates a series of tasks that students perform throughout the duration of the module. These tasks involve:

- Reflection assignment: a short, written report where students reflect on the process of report writing and the feedback from their peers and their tutor.
- Quizzes: online multiple-choice questions that relate to a series of videos;
- Tear Down: taking apart an object to interrogate its design features and reflect on the design choices and manufacturing process
- Sketching: A short sketching exercise to help students practice their sketching skills and to encourage using images as an efficient way to present technical information.
- Presentation: a 5-minute verbal presentation on an area of Bioengineering that students are interested in;
- Technical Drawing
- Engineering Ethics: students work in tutor groups to create a report answering one of four ethical questions relevant to Bioengineering.

Marking criteria for all of those tasks can be found in the [downloads section](#).

Insights colour key

Educational Developer

Inclusivity

Learning Designer

Registry

Careers

Rationale for the design

The Portfolio approach is an authentic way of assessing the design process, rather than using a series of quizzes or exams. This approach encourages students to ask questions, to research materials and to be critical. The Portfolio approach also encourages students to develop their reflection skills, which is very different to how students are taught in a school environment. This module gives students room to reflect on their progress, and to receive feedback on the quality of that reflection.

Rationale for the delivery method

There are no structured in-person lectures associated with this module;



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students can access the lessons and assignments through Mobius on Blackboard. Some elements of the assignments are completed in-person, e.g. presentations to tutors, whilst others are completed online, e.g. quizzes that feed into the Tear Down. Two short workshops on engineering ethics and the Tear down assignment (one in each term) allow students time to explore these areas through group work before completing the assignment in their portfolio. The reason for this delivery method is that it allows for asynchronous learning.

Rationale for the software used

Mobius (a platform within Blackboard that is usually used for numerical modules) works well for the Portfolio. The platform is built as teaching software and therefore has useful features, e.g. there is a grade book, so you can perform simple progress analyses by looking at how students have performed across one assignment, or how an individual student has performed across multiple assignments.

Fit with other assessments and the programme/module

Five out of six Learning Outcomes for the module are covered by the Portfolio. The remaining learning outcome is assessed through the design challenge which takes place in the summer term. This challenge asks the students to work in a group to develop a solution to a relatively simple problem.

This assessment teaches students how to recognise different types of feedback, and how to act on it, which is useful for all other modules. Professional practice module is continued in Year 2 where further reflection and team working skills are developed. See this case study - [Integrating peer and self-assessment into module group work assessment design](#).

Practicalities

Preparing students for assessment

after each of the topics commences. While the portfolio collates a range of tasks that students are involved in, the one that can be particularly new to the students is reflection. One of the first assignments in the Portfolio is a reflection exercise, where students write about a “Joining Us” activity that they undertook in their first week at Imperial. For this first piece of formative assessment

the students are not given lots of guidance on what “reflection” entails. They are asked to think about the activity they did and then answer simple questions about it: How did you do it? Why did you do it that way? What feedback did you get from your tutor? Is there anything you would change?

Marking arrangements

There are five parts to the portfolio, which are summatively marked by GTAs each according to separate criteria. The GTAs mark using a marking rubric, matching each part of the portfolio to the appropriate learning outcome in the rubric (please see the overall portfolio marking criteria [here](#)):

- Use appropriate engineering tools and software’s to develop and communicate design concepts
- Communicate design concepts
- Discuss and evaluate the suitability of different materials and manufacturing methods to realise a proposed design
- Communicate technical ideas clearly both in writing and orally
- Discuss the importance of ethics in engineering and give examples of how this impacts professional practice
- Use feedback and reflective practice to improve your learning and future performance

When marking this portfolio, the assessors are looking for evidence of completing the learning activities and building the intended skills, not on producing a perfect write up of every task, nor of producing perfect products.

Feedback arrangements

This module teaches students that there are different types of feedback, and how to recognise and act on that feedback. Frequent formative feedback helps students to develop their work throughout the year, while summative feedback at the end of the module gives them an indication of their progress.

Online adaptations

The module was first delivered in its current format in 2020 and the bulk of the delivery was initially planned for the summer term, using mostly in-person sessions. The Portfolio evolved from the need to adapt this module for remote teaching, e.g. asynchronous, spread through the year, with a few in-person sessions to complement delivery.



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Advantages of the assessment type

- More authentic than sitting an exam; students learn by doing.
- Weekly prompts give students a guide as to how they should be performing but gives them the flexibility to manage their own time.
- Students learn to be reflective.
- Students learn to act on formative feedback to improve their work.
- Even if students do leave tasks to the end of the module this can sometimes be a useful learning experience, if it makes students realise that they could have managed their time better.
- The design process is very authentic in terms of the skills developed.
- Practising individual reflection is extremely valuable as it aligns more with authentic practice that students will experience in a workplace. In terms of professional development doing an individual reflection is common and doing it helps students develop skills to get the job in the first place and work through performance review processes.

Limitations of the assessment type

- Students leave tasks until the end of the module and don't take advantage of the formative feedback on offer. Weekly prompts are provided, but deadlines are not enforced. A couple of students said time management was the most difficult thing, and that they had learned about managing time and the importance of planning, but these are just a few comments from the whole cohort.
- Variability of feedback provided by personal tutors.
- Logistics (of marking, and content delivery) can be difficult because there are so many different elements to the Portfolio.

Advice for implementation

- Work backwards from what you want the students to achieve, and how you would assess that learning outcome.
- If an important aspect of student learning on the module is the ability to manage their time well, which is an important part of professional practice, with a built in flexibility to help students develop that skill, it is useful to consider having an ILO that communicate this to the students.

- When deciding on the number of assessments ensure that the work required to perform them can be done within the allocated time as indicated by the ECTS value. It is also useful to take the broader programme level view to identify how assessments on one module overlap with others. This should help avoid overassessing and ensuring that assessment diet is appropriate for the hours of effort.
- If a module is picked up in later years, as is the case here, it is important to ensure that this progression is articulated sufficiently across the years.
- Keep an eye on the structure to see where you need to add extra support/give students more time.
- An assessment diet that gives students an element of freedom as to when complete elements of portfolio can be tricky time management wise. While the flexibility is important, it is good to give students an indication of how they should be progressing with a suggested timeline to scaffold their development of time management skills.
- Reflection can be very difficult for some students so make sure there is sufficient time and resource to prepare students to reflect successfully with some opportunities for formative feedback and enough time for them to apply this feedback to the summative assessment.
- Ensure that support is provided for students with specific learning needs in terms of reflection, group work and peer feedback. Preparing students for group work can help group members be more empathetic towards each other and make them aware of some difficulties others experience that can affect their performance which can be useful for peer feedback.
- Asking students to reflect on their own performance and the activities that they did is a very valuable part of student learning. It is about making it absolutely clear to the students what the learning outcomes are what the assessment criteria are. Also offering a level of preparation here is important, as it is done with shorter formative opportunities and explicit discussion around reflective models.
- Have a go and see what happens! You can think you've written a clear set of guidelines but can always iteratively improve these as students take



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the module.

- It is important to ensure that you have a good instructional design support to optimise the variety of tools used and the instructions around the tasks
- Students' experiences of feedback vary and influence their perceptions of what feedback is. It is important therefore to establish a common understanding around feedback and the many forms and many sources it may come in from the start. This will have impact on students' overall experience on the programme.
- For students to find feedback useful they must have an opportunity to use it. Therefore there needs to be a strong connection between formative and summative assessment, formative feeding into the summative. This can be achieved by providing feedback on drafts or designing assessment in parts where one part feeds into another.
- With an assessment design that is relatively flexible and aims to teach students to develop their time management skills, any additional feedback opportunities need to take into account students who have mitigating circumstances. Further opportunities need to be built in to accommodate students who might have missed deadlines due to circumstances beyond their control.