Within the year group you will have taken many different pre-university qualifications each with a distinct structure, content and assessment methods. You will have studied three to five STEM (Science, Technology, Engineering and Mathematics) subjects. This implies that there are STEM subjects that you have not studied. Therefore the first year syllabus is about normalisation. That is,

- You will learn what we need you to know for the subjects you did not study.
- You will consolidate and deepen your knowledge and understanding in the subjects you did study.
- You will study modules that will be new to everyone in the year group e.g. Medical Science.
- You will gain new skills to complement the knowledge delivered in the taught modules.

By the end of the year everyone will have the same breadth and depth of knowledge in five STEM subjects (i.e. Mathematics, Further Mathematics, Physics, Chemistry and Biology) plus you will acquire new knowledge, understanding and skills.

Biomedical Engineering is the application of engineering principles to Biological and Biomedical systems. Many of these principles are expressed in mathematics notation. Therefore, a solid platform of mathematics is vital to our programme. We would like you to hit the ground running by doing some preparation for the first year mathematics course BE1-HMATH before you arrive on campus. This will be revision for you and since I know your mathematics grades, I do not expect this to be too onerous a task.

On arrival we will assume that everyone has a strong knowledge of the four core modules of the mathematics A-level. These modules are common to all the mathematics pre-university qualifications and provide a platform of pure mathematics on which we will build upon and specialise as applied mathematics.

We know that you had a deep knowledge of mathematics when you took your exams. However, we are all human, so we know that in the interim period that some of that knowledge may have become shallower. It is important that you start your degree programme with the same level of mathematical knowledge that you had when you took your exams. For various reasons, some of you may not have sat your last mathematics examination recently. Therefore, there is the risk that you have not thought mathematically for a while.

In the first (fresher’s) week of the Autumn term you will take a 1 hour mathematics (multiple-choice) diagnostic test. The purpose of the test is to evaluate your current knowledge of the 4 compulsory modules in the mathematics A-level. We could have used the syllabus defined by any of the UK A-level exam boards, but to provide a common reference we shall use the AQA specification for the modules Pure Core 1-4. The test will also give you an insight into the online Mastery assessment process which is used in the first year mathematics course.

To prepare for the mathematics diagnostic test, you may use the supporting resources on the AQA website. If you are looking for some online resources to assist you with your preparation then the College provides a resource called METRIC that includes tutorials and exercises on many areas of mathematics e.g. numbers and arithmetic, algebra, trigonometry, differentiation, integration and vectors. It serves as a bridge between pre-university and first year mathematics.
METRIC is accessed via the college Virtual Learning Environment (VLE) called Blackboard (Bb). All your courses (and course materials) will be on Bb. Please note that you will not be able to logon to the Bb courses until all the course enrolments have taken place. This will happen sometime in September before the start of the new term. Therefore, you will be able to use METRIC before arrival on campus. However, before the enrolments occur you will find a useful subset of METRIC available to the general public and thus may be accessed now. We will send you an email once the Bb enrolments have taken place, until then use the public subset.

To access the full version of METRIC, do the following:

- In a browser enter https://bb.imperial.ac.uk/
- Login with your college account username and password. In the unlikely situation that you have not activated your college computer account then you can activate your account remotely.
- After logging in to Bb you will find the link to METRIC in the left hand menu under Study Resources.

If you have any problems accessing METRIC then please email metric@imperial.ac.uk

Another popular website that has good audio-visual coverage of mathematics is the Khan academy. This provides an opportunity to focus on your self-diagnosed areas of weakness, that you might have.

The diagnostic test will conform to the closed-book examination regulations of Imperial College London. Please bring a pen and your college identity card. You will be given scrap paper and a tangible copy of the pure mathematics section of the AQA Pure mathematics formulae booklet. You will not be allowed to use a tangible or online calculator. You will be informed about the quiz time and venue at the start of fresher’s week.

To pass the diagnostic test you will need to obtain a good mark, however, you will only be told that you have passed or failed, you will not receive your numerical mark. The diagnostic test is formative i.e. your mark will not be counted towards your first year maths course. Your performance will be used to determine if you would benefit from additional mathematics tuition early in the first year. The diagnostic test may identify wrinkles in your understanding. If that is the case, we shall meet to discuss how we can improve your understanding. Typically, this will involve some additional one-to-one tutorials. Do take the test seriously but don’t be anxious about the outcome, it is exists to help you, if you need it.

A valuable skill that you will acquire in the first year is to solve mathematical problems computationally using a software tool called Matlab. This is a skill that you will use constantly throughout the degree programme and will probably continue into your professional working life. The early part of the first year mathematics course has to revise pre-university mathematics. If you find the content comfortable then use this time to acquire new Matlab skills.

In the Autumn term mathematics laboratories, Matlab is used to solve symbolic algebra problems. If you would like a foretaste of the mathematics laboratories then watch the videos (warts & all) below. The first 3 videos set the scene for the mathematics laboratories over the year and then the Autumn term. They should be watched before the first mathematics laboratory in week 2 of the Autumn term.

1. **Computational mathematics** in the first year.
2. An introduction to the MuPAD based laboratories.
3. An introduction to Symbolic Algebra using MuPAD.
4. Autumn term, Week 1 laboratory – heads-up.

In order to gain the most from each weeks scheduled laboratory there is a heads-up video which should be watched before the next laboratory. The fourth video shown above is the heads-up for the first scheduled laboratory (in week 2), the other weeks are also on YouTube.
The laboratory download includes the Matlab file used in the aforementioned videos, so that you can repeat the demonstrated activities and explore your own variations on the theme.

In the Spring term mathematics laboratories, Matlab is used to solve numerical algebra problems. Therefore, by the end of year you will have gained the skills to tackle the same problem from a symbolic and/or numerical approach e.g. to solve 2\textsuperscript{nd} order differential equations. The University of Edinburgh, School of Engineering screencasts provide a good introduction to Matlab for numerical algebra.

If you have time to spare before the first teaching week (week two of term) then you might also like to download some free software that you will need throughout the degree programme. A document called Software for Bioengineers (including Matlab) describing how to do this, and can be found on the departmental webpage.

If you have any questions about the above then please do contact me.

Best wishes,

Liam Madden (l.madden@imperial.ac.uk)