

Mathematical and Computational Biology FAQs

Why should I choose Mathematical and Computational Biology?

We are now able to generate very large and complex datasets – as well as mathematical models – to explore fundamental biological questions. To be able to analyse these datasets and models, biologists need to be equipped with the correct analytical tools. The core aim of Part IB Mathematical and Computational Biology is to provide an applied and rigorous course focused on practical use of statistics and computing in modern biology, underpinned by mathematics and mathematical modelling. This includes computer programming: practical classes in the first four weeks will concentrate on an introduction to the programming language Python, with no prior knowledge assumed. Python will then be used intensively throughout the course. Via our exciting lectures and practical classes – supplemented by example sheets to discuss in supervision, as well as longer mini-projects - students will develop a strong background in modelling, statistics, fitting models to data, algorithms, simulation, bioinformatics, “big data” and computer programming. The course is not tied to any one single application area, but instead furnishes students with a comprehensive suite of quantitative and computational skills that will be useful at Part II, Part III and beyond (in paid employment as well as in research).

What are lectures like?

Like all Part IB courses, there are three hours of timetabled lectures per week. Lectures will also be supplemented by a three-hour weekly practical class and supervisions from skilled staff and Postdocs from across the whole University. Like the mathematics course you studied in Part IA, example sheets of questions will be provided for discussion in supervisions (although in Part IB some of these questions may require computer programming to answer).

What are the practical classes like?

The practical classes revolve around the analysis of real datasets from across biology. The practical classes will be an opportunity to apply what they have been learning on different complex datasets. MCB also offers Drop-In Sessions for students run by our talented demonstrators for extra support with practical questions or Mini-Project queries.

What subjects do I need to have done in Part IA?

There are no constraints here; absolutely any combination of Part IA NST subjects is acceptable. You just need to be interested in learning more about how mathematics and computing can be used to analyse and better understand large datasets and models. Both Part IA NST Mathematics and Mathematical Biology are therefore suitable preparation for this course, and this is not only a course for mathematical geniuses. However, we recommend that you obtain a mark of 60% or higher in whichever mathematics option you did study. Since this course is a sequel to Part IA Mathematical Biology, knowledge of certain topics covered only in that course will be assumed. Full

details of recommended vacation work for those who studied Part IA NST Mathematics – which will consist of watching recorded lectures specifically made by a MCB lecturer summarising important topics from the Part IA Mathematical Biology course and attempting example questions – will be provided before the summer. This will be the equivalent of up to 12 lectures or so, and will be supported by a catch-up supervision in the first week of Michaelmas.

Do I need to already be able to program?

No! Many lecturers on this course are involved in first year teaching and realise – while programming is taught in both Part IA NST Mathematics and Mathematical Biology – that computing is not the major focus of either course. We also realise that programming in Mathematical Biology teaches R rather than Python. We will teach Python entirely from scratch. All that is required on your part is a willingness to learn, and a degree of enthusiasm about doing so (i.e. while you do not have to have mastered programming in Part IA, if you absolutely hated the computational work, this might not be the course for you!).

Which departments are involved in the course?

The course is led by the Genetics department, but lecturers also come from Pathology, Plant Sciences, PDN, Veterinary Medicine, Zoology and Psychology. This includes various lecturers who currently teach on the Part IA Mathematical Biology course, and so have a good understanding of the level of mathematics that many of you will start with.

How is the course assessed?

The course will be assessed through a combination of 2 x 3 hour end-of-year examinations and 3 x assessed practical coursework assignments (Mini-Projects).

What other Part IB subjects would work well with MCB?

The only hard constraint is that this course cannot be combined with either Earth Sciences B or Physics B, due to a timetable clash. In terms of other biology options, this course links well with all options, ranging from cellular to ecological. The only constraint is that combining this course Philosophy of Science and only a single experimental subject might constrain your options at Part II, and should be thought about very carefully.

What Part II (and Part III) options does MCB lead to?

The skills taught in this course will be useful for – and will enhance your understanding of at least some topics in – all Part II options, ranging from cell biology (e.g. Part II Genetics or Biochemistry) to ecology (e.g. the Ecology stream of Part II Plant Sciences or Zoology). The increased fluency in computational work and data analysis will be particularly useful if you intend to offer a research project at Part II. Part IB Mathematical and Computational Biology also provides a particularly good training for anyone intending to study Part III Systems Biology.