

Major in Computational Biology

This is a four-year, multi-disciplinary undergraduate programme that leads to a B.Sc.(Hons.) in Computational Biology. It involves the participation from 11 Departments spanning across three Faculties/School, including the Departments of Biological Sciences, Chemistry, Mathematics, Physics and Statistics and Applied Probability from the Faculty of Science, the Department of Computer Science from the School of Computing and the Departments of Biochemistry, Microbiology, Physiology and Pharmacology from the Yong Loo Ling School of Medicine.

The field of Computational Biology is a well-recognized and fast emerging discipline in scientific research, with the potential of producing breakthroughs likely to impact the whole spectrum of the life sciences. Its distinguishing feature is the explosive growth of data generated by the post-genomic era and proteomics research, requiring novel and state-of-the-art computational approaches and instrumentations for their most effective analysis. Since the unraveling of the three-dimensional structure of DNA half a century ago, molecular and structural biology has experienced extraordinary progress, resulting in enhanced understanding of biological systems. This deeper understanding is obtained through the interdisciplinary interaction of Biology with the Computational and Mathematical Sciences, which has led to the emergence and recognition of Computational Biology as a discipline at the interface of these sciences. This discipline has today a well-connected peer community, with a host of well-established conferences and publication venues. Research has also been concomitant with the emergence of a vigorous professional market, spearheaded by pharmaceutical and biomedical industries.

This programme aims to provide a multidisciplinary education that would produce graduates who would be equally at ease with algorithm design, mathematical and statistical analysis as they would be with biochemistry, biology/genetics, and wet-lab know-how. Graduates from the programme will be equipped for a career in the fast-paced pharmaceutical, biomedical or biotechnology industries. They could also pursue graduate studies in bioinformatics.

Programme Structure

Computational Biology students will read a basket of core multi-disciplinary modules (lower division) in their first two years of study and proceed to an upper division specialized track in the next two years.

The lower division modules embrace a fundamental body of knowledge in which a computational biologist should be proficient. This body of knowledge consists of the following:

- Discrete mathematics and combinatorics, i.e. logic, sets, graphs, counting techniques, etc;
- Probability and statistics, i.e., sample spaces, random variables, conditioning, distributions, design of experiments, significance tests, statistical inference, etc;
- Algorithm design and proficiency in some current programming language, i.e., combinatorial algorithms, algorithmic paradigms, analysis and design, working knowledge of current languages (for example, C, C++, Java) and experience in writing actual nontrivial code;
- Organic chemistry and biochemistry;
- Biology and genetics, including a moderate amount of wet-lab experience

The upper division specialized track will strengthen the student's knowledge in the theoretical foundations of DNA/protein sequence analysis, mathematical models of genetic interactions and metabolic and cell signaling pathways, as well as modeling and computational prediction of protein structures and its applications in drug design. Students taking this track will need to have strong foundations in numerical analysis, stochastic process, and advanced calculus.

Students may refer to the Computational Biology page on [myPortal@NUS](#) for details of the requirements for their respective cohort.

Admission Requirements

Only applicants who are offered and have accepted a place in the Faculty of Science, NUS are eligible to apply for the programme.

This highly challenging programme is suited for candidates who have a keen interest as well as the aptitude in the Mathematical Sciences and the Life Sciences.

Applicants should have good A-level H2 passes or the equivalent in Mathematics or Further Mathematics, and either Biology or Chemistry.

Students without A-level H2 passes or the equivalent in either Biology or Chemistry should have at least an O-level or equivalent pass in it.

Please complete the [application form](#) below and submit it together with all supporting documents to: compbio@nus.edu.sg.

When submitting your application, please indicate "COMPUTATIONAL BIOLOGY PROGRAMME" on the top left-hand corner of the envelope.

If you have enquiries regarding application or need more information on the programme, please send us an email at compbio@nus.edu.sg.

Application Schedule for AY2020/2021

Application deadline: 30 June 2020

Interview: 8-10 July 2020

Result of application: 15 July 2020