REGULATIONS FOR THE DEGREE OF
BACHELOR OF SCIENCE IN BIOINFORMATICS
BSC(BIOINFORMATICS)

These regulations are applicable to candidates admitted under the 4-year BSc(Bioinformatics) curriculum in the academic year 2022-23 to 2023-2024.
(*See also General Regulations and Regulations for First Degree Curricula*)

Admission to the Bachelor of Science in Bioinformatics Degree

BIOF1 To be eligible for admission to the degree of BSc(Bioinformatics), candidates shall:
(a) comply with the General Regulations;
(b) comply with the Regulations for First Degree Curricula; and
(c) satisfy all the requirements of the curriculum in accordance with the regulations and the syllabuses of the degree.

Period of study

BIOF2 The curriculum for the degree of BSc(Bioinformatics) shall normally require eight semesters of full-time study, extending over not fewer than four academic years, and shall include any assessment to be held during and/or at the end of each semester. Candidates shall not in any case be permitted to extend their studies beyond the maximum period of registration of six academic years.

Selection of courses

BIOF3 (a) Candidates shall select their courses in accordance with these regulations and the guidelines specified in the syllabuses before the beginning of each semester. Changes to the selection of courses may be made only during the add/drop period of the semester in which the course begins, and such changes shall not be reflected in the transcript of the candidate. Requests for changes after the designated add/drop period of the semester shall not be considered, except under exceptional circumstances as approved by the Board of the Faculty of Medicine.
(b) Candidates withdrawing from any course without permission after the designated add/drop period of semester shall be given an F grade.

Curriculum requirements

BIOF4 To complete the curriculum, candidates shall normally:
(a) satisfy the requirements prescribed in UG5 of the Regulations for First Degree Curricula; including
(i) 12 credits in English language enhancement, including 6 credits in Core University English[1] and 6 credits in an English-in-the-Discipline course;
(ii) 6 credits in Chinese language enhancement[2];
(iii) 36 credits of courses in the Common Core Curriculum comprising at least

[1] Candidates who have achieved Level 5 or above in English Language in the Hong Kong Diploma of Secondary Education Examination, or equivalent, are exempted from this requirement, and Core University English is optional. Those who do not take this course should take an elective course in lieu, see Regulation UG6.
[2] Students are required to successfully complete the 6-credit Faculty-specific Chinese language enhancement course, except for:
(a) Putonghua-speaking students who should take CUND9002 (Practical Chinese and Hong Kong Society) or CUND9003 (Cantonese for Non-Cantonese Speaking Students); and
(b) students who have not studied Chinese language during their secondary education or who have not attained the requisite level of competence in the Chinese language to take CEMD9008 Practical Chinese for Biomedical Sciences Students should write to the Faculty Board to apply for exemption from the Chinese language requirement, and
(i) take a 6-credit Cantonese or Putonghua language course offered by the School of Chinese especially for international and exchange students; OR
(ii) take an elective course in lieu.

one and not more than two courses from each Area of Inquiry with not more than 24 credits of courses being selected within one academic year except where candidates are required to make up for failed credits; and

(iv) successful completion of any other non-credit bearing courses as required.

(b) complete satisfactorily not fewer than 240 credits, in the manner specified in these regulations and the syllabuses, including the Bioinformatics major of 96 credits with "BIOF4001 Final Year Project" to be taken in the final year of study as the capstone experience.

BIOF5

(a) Candidates shall normally take not fewer than 24 and not more than 30 credits of courses in each semester (except the summer semester), unless otherwise permitted or required by the Board of the Faculty of Medicine.

(b) Candidates shall have to satisfactorily complete the prerequisite courses in order to enroll in succeeding courses, unless with exemption granted by the Board of the Faculty of Medicine.

(c) Candidates may, of their own volition, take additional credits not exceeding 6 credits in each semester, accumulating up to a maximum of 72 credits in one academic year.

Advanced standing

BIOF6

(a) Advanced standing may be granted to candidates who have successfully completed a similar course at other universities or comparable institutions before admission to the University. The amount of credits to be granted for advanced standing shall be determined by the Board of the Faculty of Medicine, in accordance with UG2 of the Regulations for First Degree Curricula.

(b) Credits granted for advanced standing to a candidate shall not be included in the calculation of the GPA unless permitted by the Board of the Faculty of Medicine but will be recorded on the transcript of the candidate.

Assessment

BIOF7

(a) Candidates shall be assessed for each of the courses which they have registered for, and assessment may be conducted in any one or any combination of the following manners: written examinations or tests, continuous assessment, laboratory work, project reports, or in any other manner as specified in the syllabuses.

(b) Grades shall be awarded in accordance with UG8(a) of the Regulations for First Degree Curricula.

(c) Written examinations shall normally be held at the end of each semester unless otherwise specified in the syllabuses.

(d) Candidates who are unable, because of illness or other special circumstances, to be present at any examination of a course may apply for permission to present themselves at a supplementary examination of the same course to be held before the beginning of the First Semester of the following academic year. Any such application shall be made on the form prescribed within seven calendar days of the first day of the candidate's absence from any examination.

(e) Any supplementary examination shall be part of that academic year's examinations, and the provisions made in the regulations for failure at the first attempt shall apply accordingly.

(f) Examination results are determined by the respective Board of Examiners. There shall be no appeal against the results of examinations and all other forms of assessment.

(g) Candidates shall not be permitted to repeat a course for which they have received a D grade or above for the purpose of upgrading.

(h) Candidates are required to make up for failed courses in the following manner:

(i) undergoing re-assessment/re-examination in the failed course to be held no later than the end of the following semester (not including the summer semester); or
(ii) re-submitting failed coursework, without having to repeat the same course of instruction; or
(iii) repeating the failed course by undergoing instruction and satisfying the assessment requirements; or
(iv) for an elective course, taking another course in lieu and satisfying the assessment requirements.

Discontinuation

BIOF8 Candidates shall normally be recommended for discontinuation of their studies if they have

(a) failed to complete successfully 36 or more credits in two consecutive semesters (not including the summer semester), except where they are not required to take such a number of credits in the two given semesters; or
(b) failed to achieve an average Semester GPA of 1.0 or higher for two consecutive semesters (not including the summer semester); or
(c) exceeded the maximum period of registration specified in BIOF2 of the regulations of the degree; or
(d) failed for three times in any course under Prescribed courses (66 credits) in the syllabuses for BSc(Bioinformatics).

Honours classifications

BIOF9 (a) The degree of BSc(Bioinformatics) shall be awarded in five divisions: First Class Honours, Second Class Honours Division One, Second Class Honours Division Two, Third Class Honours and Pass. The classification of honours shall be determined by the Board of Examiners for the degree in accordance with the following Graduation GPA scores (GGPA), with all courses taken (including failed courses) carrying weightings which are proportionate to their credit values[3]:

Class of honours	*GGPA range*
First Class Honours	3.60 – 4.30
Second Class Honours	(2.40 – 3.59)
Division One	3.00 – 3.59
Division Two	2.40 – 2.99
Third Class Honours	1.70 – 2.39
Pass	1.00 – 1.69

(b) Honours classification may not be determined solely on the basis of a candidate's Graduation GPA and the Board of Examiners for the degree may, at its absolute discretion and with justification, award a higher class of honours to a candidate deemed to have demonstrated meritorious academic achievement but whose Graduation GPA falls below the range stipulated in BIOF9(a) of the higher classification by not more than 0.1 Grade Point.

(c) A list of candidates who have successfully completed all degree requirements shall be posted on the Faculty noticeboards.

[3] For students who have successfully completed six Common Core courses, the calculation of Graduation GPA is subject to the proviso that either five Common Core courses with the highest grades (covering all four Areas of Inquiry), or all six courses will be counted towards Graduation GPA, depending on which generates the higher Graduation GPA.

SYLLABUSES FOR THE DEGREE OF
BACHELOR OF SCIENCE IN BIOINFORMATICS
BSC(BIOINFORMATICS)

These syllabuses are applicable to candidates admitted under the 4-year BSc(Bioinformatics) curriculum in the academic year 2023-24.

Curriculum Structure

1. Courses for BSc(Bioinformatics) Major (96 credits)

   Students are required to complete a total of 96 credits of courses for the Bioinformatics major, of which the 3 anchoring courses, 6 foundation courses, 1 or 2 data science laboratory course(s) and the final year project course are prescribed.

   Prescribed courses (66 credits)

   - *Anchoring Courses (18 credits)*

		Year	Credits
BIOF1001	Introduction to Biomedical Data Science	1	6
BIOF2001	Artificial Intelligence in Medicine	2/3	6
BIOF3001	Big Data Biomedical Informatics	3/4	6

   - *Foundation Courses (36 credits)*

		Year	Credits
BBMS1003	Perspectives in Biochemistry	1	6
COMP1117	Computer Programming	1	6
MATH1013	University Mathematics II	1	6
MATH2014	Multivariable Calculus and Linear Algebra	2	6
STAT2601/ BIOF2013	Probability and Statistics I / Biomedical Statistics (Bioinformatics)	2	6
STAT2602/ BIOF2014	Probability and Statistics II / Statistical Modelling for Bioinformatics	2	6

   - *Project: Capstone Experience (12 credits)*

		Year	Credits
BIOF4001	Final Year Project	4	12

   Disciplinary Elective Courses (30 credits)

   List A (Data Science Laboratory Courses) Select 1-2 courses (6-12 credits) from the list below:

		Year	Credits
BIOF3002	Genome Sequencing and Analysis	3/4	6
BIOF3003	Digital Health	3/4	6

   List B (Disciplinary Electives) Select 3-4 courses (18-24 credits) from the list below:

		Year	Credits
BBMS1001	Introduction to Human Anatomy and Physiology	1	6
BBMS2003	Human Genetics	2	6
BBMS2007	Essential Molecular Biology	2	6
BBMS2009	Introduction to Clinical Research	2	6
BIOC2600	Basic Biochemistry	2	6

COMP2113	Programming Technologies	2	6
COMP2119	Introduction to Data Structures and Algorithms	2	6
BBMS2011	Research Methods in Medicine and Health Sciences	2/3	6
BBMS3008	Essential Proteomics	3/4	6
BBMS3009	Genome Science	3/4	6
BBMS4004	Public Health Genetics	3/4	6
BIOC3605	Sequence Bioinformatics	3/4	6
BIOF3004	Bioinformatics Internship	3/4	6
BIOF3005	Structural Bioinformatics	3/4	6
BIOF3006	Biomedical Software Systems	3/4	6
BIOF3007	Clinical Bioinformatics	3/4	6
BIOF4002	Global Health Informatics	3/4	6
BIOF4003	Biomedical Image Informatics	3/4	6
COMP3314	Machine Learning	3/4	6
COMP3317	Computer Vision	3/4	6
COMP3353	Bioinformatics	3/4	6
STAT3600	Linear Statistical Analysis	3/4	6
STAT3612	Statistical Machine Learning	3/4	6
STAT4602	Multivariate Data Analysis	3/4	6
STAT4609	Big Data Analytics	3/4	6

2. Common Core Courses (36 credits)

   Students are required to complete 6 Common Core courses (6-credit each) by the end of the second year, comprising at least one and not more than two courses from each Area of Inquiry with not more than 24 credits of courses being selected within one academic year except where candidates are required to make up for failed credits.

3. Language Enhancement Courses (18 credits)

   Students are required to complete 2 English Language courses (6-credit each), including 6 credits of Core University English[1] and 6 credits of English-in-the-Discipline course, and 1 Chinese Language course (6-credit)[2], within the first and second years of the curriculum in accordance with the Regulations for First Degree Curricula of the University.

[1] Candidates who have achieved Level 5 or above in English Language in the Hong Kong Diploma of Secondary Education Examination, or equivalent, are exempted from this requirement, and Core University English is optional. Those who do not take this course should take an elective course in lieu, see Regulation UG6.

[2] Students are required to successfully complete the 6-credit Faculty-specific Chinese language enhancement course, except for:

(a) Putonghua-speaking students who should take CUND9002 Practical Chinese and Hong Kong Society or CUND9003 Cantonese for Non-Cantonese Speaking Students; and

(b) students who have not studied Chinese language during their secondary education or who have not attained the requisite level of competence in the Chinese language to take CEMD9008 Practical Chinese for Biomedical Sciences Students should write to the Faculty Board to apply for exemption from the Chinese language requirement, and

   (i) take a 6-credit Cantonese or Putonghua language course offered by the School of Chinese especially for international and exchange students; OR

   (ii) take an elective course in lieu.

4. Minors and/or Electives (90 credits)

Apart from taking the 96 credits of courses for the Bioinformatics major as specified in paragraph 1, plus the Common Core courses (36 credits) and the Language Enhancement courses (18 credits), students can plan their study with the remaining credits (i.e. 90 credits) in various manners, subject to timetable constraints and approval of the host Faculties. Those interested in enriching and deepening their understanding on topics in the field of bioinformatics may opt to take a minor and/or electives offered within the BSc(Bioinformatics) curriculum, while those who would like to broaden their knowledge base outside the realm of bioinformatics can consider a minor and/or electives offered in other curricula.

Two minor options are offered in the BSc(Bioinformatics) curriculum:

Minor in Digital Health (36 credits) – any 6 courses from the following list

		Year	Credits
Select at least two courses from this list			
BIOF1001	Introduction to Biomedical Data Science	1	6
BIOF2001	Artificial Intelligence in Medicine	2/3	6
BIOF3001	Big Data Biomedical Informatics	3/4	6
BIOF3003	Digital Health	3/4	6
BIOF3006	Biomedical Software Systems	3/4	6
BIOF4002	Global Health Informatics	3/4	6
BIOF4003	Biomedical Image Informatics	3/4	6
Select at least two courses from this list			
BMED2500	Biomedical Signal and Linear Systems	2/3	6
BMED3501	Medical Imaging	3/4	6
COMP3314	Machine Learning	3/4	6
COMP3317	Computer Vision	3/4	6
COMP3340	Applied Deep Learning	3/4	6
STAT3612	Statistical Machine Learning	3/4	6
BMED4500	Biomedical Instrumentation and Systems	4	6
BMED4504	Biomedical Signals Processing and Modeling in Biomedical Applications	4	6

Minor in Biomedical Data Science (36 credits) – any 6 courses from the following list and of which at least 2 courses are of advanced level to be studied in year 3 or above[3]

		Year	Credits
Select at least two courses from this list			
BIOF1001	Introduction to Biomedical Data Science	1	6
BIOF2001	Artificial Intelligence in Medicine	2/3	6
BIOF3001	Big Data Biomedical Informatics	3/4	6
BIOF3002	Genome Sequencing and Analysis	3/4	6
BIOF3005	Structural Bioinformatics	3/4	6
BIOF3006	Biomedical Software Systems	3/4	6
BIOF3007	Clinical Bioinformatics	3/4	6
BIOF4002	Global Health Informatics	3/4	6
BIOF4003	Biomedical Image Informatics	3/4	6
Select at least one course from this list			
COMP1117	Computer Programming	1	6
STAT1016	Data Science 101	1	6

[3] The courses listed for year 2/3 shall not be counted towards the advanced level course requirements.

STAT1600	Statistics: Ideas and Concepts	1	6
BIOF2013	Biomedical Statistics (Bioinformatics)	2	6
BIOF2014	Statistical Modelling for Bioinformatics	2	6
COMP2113	Programming Technologies	2	6
COMP2119	Introduction to Data Structures and Algorithms	2	6
STAT2604	Introduction to R/Python Programming and Elementary Data Analysis	2/3	6

Select at least one course from this list

BBMS1003/ BIOC1600	Perspectives in Biochemistry	1	6
BBMS2003	Human Genetics	2	6
BBMS2007	Essential Molecular Biology	2	6
BBMS2009	Introduction to Clinical Research	2	6
BBMS3002	Molecular Biology of the Cell	3/4	6
BBMS3008	Essential Proteomics	3/4	6
BBMS3009	Genome Science	3/4	6
BBMS4003	Developmental Genetics	3/4	6
BBMS4004	Public Health Genetics	3/4	6
BIOC3605	Sequence Bioinformatics	3/4	6
BIOC4612	Molecular Biology of the Gene	3/4	6

Note:

(1) Students who have taken the course(s) for the major will not be allowed to claim credits awarded for the same courses to fulfill the requirements of the minor option.

(2) All elective courses may only be offered in alternate years; students should check on course availability and course prerequisites.

5. Non-credit bearing course

Students are required to complete and pass the non-credit bearing course "UG5E1001 Introduction to the Constitution, the Basic Law and the National Security Law" under Regulation UG5(e) of the Regulations for First Degree Curricula.

COURSE DESCRIPTIONS

Prescribed Courses: Anchoring Courses

BIOF1001 Introduction to Biomedical Data Science **Year 1 (6 credits)**

This course aims to introduce students to a variety of common biomedical data and practical skills to perform exploratory data analysis on these data. Data analysis skills such as data preprocessing, data quality assessment, data visualization and clustering will be introduced. The role of modern data analytics in the scientific process and medical applications will be examined. The ethical issues related to collection, sharing and integration of big data will also be discussed.
Assessment: 70% continuous assessment; 30% examination.

BIOF2001 Artificial Intelligence in Medicine **Year 2 or 3 (6 credits)**

This course aims to introduce students to key concepts in artificial intelligence (AI) and practical machine learning techniques that are applicable to biomedical research and healthcare applications. Using a problem-oriented approach, students will learn how to frame biomedical problems using a machine learning framework, collect relevant data, perform model training and evaluation, and deploy an AI system in the real-world. The course will also explore the social and ethical impact of digital health and AI technology in medicine and the scientific process.
Prerequisite: Eligible for students who have successfully completed one of the following courses: BIOF1001, STAT1005, STAT1016, COMP1117 or STAT2604, or are enrolled in STAT2604.
Assessment: 80% continuous assessment; 20% examination.

BIOF3001 Big Data Biomedical Informatics **Year 3 or 4 (6 credits)**

This course uses a problem-based approach to introduce analytical skills to tackle practical biomedical problems via integration of diverse biomedical big data. Students will be given structured scenarios in groups to solve a variety of biomedical problems using diverse data types. These may include data from genome sequencing and non-sequencing-based omics, electronic medical records, wearable/IoT technology, medical imaging, and social media. In the course, the students will learn the theory (algorithm, statistics), and hands-on skills (data collection, programming, data analysis, visualization) to support integrative data analysis tasks.
Prerequisite: Eligible for students who have successfully completed or are enrolled in BIOF2001.
Assessment: 100% continuous assessment including reports, presentation, and projects.

Prescribed Courses: Foundation Courses

BBMS1003 Perspectives in Biochemistry **Year 1 (6 credits)**

This course aims to teach students a biochemical perspective on each of the Basic Sciences focusing on concepts fundamental to the learning of Biochemistry and promote deep learning of course material through an integrated programme of practical and collaborative tasks. Students will be inspired with a view of the great discoveries and future challenges for Biochemistry and helped to make the transition from school to university by developing their teamwork, independent study skills and confidence to communicate within a Biochemistry learning environment.
Prerequisite: Eligible for students who have attained Level 3 or above in HKDSE Biology, Chemistry, or Combined Science with Biology or Chemistry component, or equivalent.
Assessment: 50% continuous assessment; 50% examination.
Remarks: Not eligible for students who have successfully completed or are enrolled in BIOL1110 or BIOC1600.

COMP1117 Computer Programming **Year 1 (6 credits)**

This is an introductory course in computer programming. Students will acquire basic Python programming skills, including syntax, identifiers, control statements, functions, recursions, strings, lists, dictionaries, tuples and files. Searching and sorting algorithms, such as sequential search, binary search, bubble sort, insertion sort and selection sort, will also be covered.
Mutually exclusive with: ENGG1111 or ENGG1112 or ENGG1330 or IIMT2602
Assessment: 50% continuous assessment; 50% examination.

MATH1013 University Mathematics II **Year 1 (6 credits)**

This course aims at students with Core Mathematics plus Module 1 or Core Mathematics plus Module 2 background and provides them with basic knowledge of calculus and some linear algebra that can be applied in various disciplines.
Prerequisite: Eligible for students who have attained Level 2 or above in Module 1, or Module 2 of HKDSE Mathematics or equivalent, or successfully completed MATH1009 or MATH1011.
Assessment: 50% continuous assessment; 50% examination.
Remark: Not eligible for students who have successfully completed MATH1821, or (MATH1851 and MATH1853), or are enrolled in one of the following courses: MATH1821, MATH1851 or MATH1853.

MATH2014 Multivariable Calculus and Linear Algebra **Year 2 (6 credits)**

This course aims to provide students with a solid foundation in calculus of several variables and linear algebra, which they will need in the study of mathematics related subjects.
Prerequisite: Eligible for students who have successfully completed MATH1013 or (MATH1851 and MATH1853).
Assessment: 50% continuous assessment; 50% examination.
Remark: Not eligible for students who have successfully completed MATH2822, or [(MATH2101 or MATH2102) and MATH2211], or have already enrolled in these courses.

STAT2601 Probability and Statistics I **Year 2 (6 credits)**

The discipline of statistics is concerned with situations in which uncertainty and variability play an essential role and forms an important descriptive and analytical tool in many practical problems. Against a background of motivating problems this course develops relevant probability models for the description of such uncertainty and variability.
Prerequisite: Eligible for students who have successfully completed or are enrolled in MATH2014 or (MATH2101 and MATH2211).
Assessment: 40% continuous assessment; 60% examination.
Remark: Not eligible for students who have successfully completed or are enrolled in ELEC2844, MATH3603, STAT1603 or STAT2901.

STAT2602 Probability and Statistics II **Year 2 (6 credits)**

This course builds on STAT2601, introducing further the concepts and methods of statistics. Emphasis is on the two major areas of statistical analysis: estimation and hypothesis testing. Through the disciplines of statistical modelling, inference and decision making, students will be equipped with both quantitative skills and qualitative perceptions essential for making rigorous statistical analysis of real-life data.
Prerequisite: Eligible for students who have successfully completed STAT2601.
Assessment: 40% continuous assessment; 60% examination.
Remark: Not eligible for students who have successfully completed or are enrolled in STAT3902.

BIOF2013 Biomedical Statistics (Bioinformatics) **Year 2 (6 credits)**

The ability to understand the fundamentals of biostatistics, and to employ appropriate quantitative methods to analyze data generated from diverse types of biomedical studies is a necessary requirement for biomedical and bioinformatics students. This course aims to introduce students to the central principles and concepts of statistical analysis, with special attention to analytical approaches typically encountered in biomedical sciences research. The first part of the course will cover some basic biostatistical knowledge (distributions, estimation, hypothesis testing), as well as some more advanced applications (regression and correlation analysis, multivariate statistics). The second part of the course will give students the practical skills and knowledge to apply the concepts learnt on real-life data analyses using R, a statistical programming language.
Pre-requisite: Eligible for students who have successfully completed BIOF1001 and BBMS1003/BIOC1600.
Assessment: 70% continuous assessment; 30% examination
Remark: Not eligible for students who have successfully completed or are enrolled in BBMS2013.

BIOF2014 Statistical Modelling for Bioinformatics **Year 2 (6 credits)**

This course is designed to help bioinformatic scientists to develop mathematical and computational expertise in modelling data in bioinformatics. Students will first acquire a mathematical foundation in probability theory and learn how different probability distributions are derived. Students will learn to recognize the modelling limitations of different probability distributions and to develop simple Bayesian models.
This course will emphasize both mathematical derivation and computer programming in data modelling. Students will learn to express biological questions in rigorous statistical notation, design statistical models with appropriate assumptions, derive estimators for model parameters mathematically, and implement Bayesian models using R and Stan programming.
This course will supplement the classical statistical inference techniques covered in BIOF2013 and cultivate the necessary foundation for building Bayesian statistical models to answer more complex inquiries.
Prerequisite: Students who have passed BIOF1001 and passed or enrolled in MATH2014 or (MATH2101 and MATH2211).
Assessment: 70% continuous assessment; 30% examination.

Prescribed Course: Project

BIOF4001 Final Year Project **Year 4 (12 credits)**

The course involves around 300 students' learning hours spreading over 2 semesters. Each student is required to carry out an in-depth study of a specialized field of bioinformatics under the guidance of a supervisor who will provide continuous assessment on the student's performance (15%). The project entails about 100 hours to write up a literature review (3,000 words) to be incorporated into a dissertation (10,000 words) and to give a professional presentation (20 minutes). The literature review, the dissertation and the oral presentation account for 15%, 45% and 25% of the final assessment, respectively. The research project also constitutes the capstone experience for the student.
Prerequisite: Eligible for students who have successfully completed or are enrolled in BIOF3001.
Assessment: 15% continuous assessment; 25% oral presentation; 15% literature review; 45% dissertation.

Language Courses

CAES1000 Core University English **Year 1 (6 credits)**

The Core University English (CUE) course aims to enhance first-year students' academic English language proficiency in the university context. CUE focuses on developing students' academic English language skills for the Common Core Curriculum. These include the language skills needed to understand and produce spoken and written academic texts, express academic ideas and concepts clearly and in a well-structured manner and search for and use academic sources of information in their writing and speaking. Four online-learning modules through the Moodle platform on academic speaking, academic grammar, academic vocabulary, citation and referencing skills and avoiding plagiarism will be offered to students to support their English learning. This course will help students to participate more effectively in their first-year university studies in English, thereby enriching their first-year experience.
Assessment: 100% continuous assessment.

CEMD9008 Practical Chinese for Biomedical Sciences Students **Year 1 (6 credits)**

This course is designed specifically to raise the students' level of proficiency in the use of the Chinese language in the field of biomedical sciences. It aims at sharpening the students' skills both of writing documents (such as letters, brochures, leaflets, reports and proposals) and of effectively interacting with professional practitioners and members of the public in Chinese. There are also drilling practices to familiarize the students with the simplified forms of some basic Chinese biomedical terms.
Assessment: 50% continuous assessment; 50% examination.

CAES9722 Academic English for Biomedical Sciences Students **Year 2 (6 credits)**

This six credit English-in-the-Discipline course is offered to second year students studying Biomedical Sciences. It helps students develop the necessary skills to use both written and spoken English within their studies and beyond. Students will learn to better communicate and discuss scientific concepts with other biomedical scientists as well as to a wider audience. In the writing component, students will learn how to disseminate recent scientific research in the form of a popular science article as well as a wiki article for a novice scientist audience. In the speaking component, students will present information from their research in an oral presentation format.
Assessment: 100% continuous assessment.

Disciplinary Elective Courses (List A: Data Science Laboratory Courses)

BIOF3002 Genome Sequencing and Analysis **Year 3 or 4 (6 credits)**

This comprehensive course is designed to provide biomedical scientists with an end-to-end understanding of high-throughput genome sequencing, encompassing all aspects from sample preparation and sequencing to data analysis using portable DNA sequencing technology. Participants will acquire hands-on expertise in the operation of portable DNA sequencers and their capacity to generate genomics data. Leveraging the acquired datasets and additional publicly available genome resources, students will employ advanced bioinformatics methodologies to address targeted biological inquiries. Additionally, participants will cultivate skills in managing genome sequencing data and effectively presenting genomic findings to a professional scientific audience. This course will supplement theoretical knowledge gained in BBMS3009 Genome Sciences and help equip students with the necessary proficiency for academic research or to work in industries that use genomic technologies.
Prerequisite: Eligible for students who have successfully completed BIOF1001 plus completed or are enrolled in BBMS3009.
Assessment: 100% continuous assessment including project reports and presentation.

BIOF3003 Digital Health **Year 3 or 4 (6 credits)**

This course aims to give students practical experience in collecting, analysing, and evaluating data generated from modern digital health technology, such as wearable devices, mobile smartphones, images, text, as well as structured data from electronic medical record. In this project-oriented course, student experiences how to develop a data collection strategy, process sensor data, images, and text, as well as performing evaluation. Students will learn how to develop a mobile application to solve specific biomedical problems.
Prerequisite: Eligible for students who have successfully completed one of the following courses: BIOF2001, STAT2602 or COMP2119, or are enrolled in BIOF2001.
Assessment: 100% continuous assessment including project reports and presentation.

Disciplinary Elective Courses: List B

BBMS1001 Introduction to Human Anatomy and Physiology **Year 1 (6 credits)**

This course examines the concepts related to the structure and function of the human body, including the organization of the body from single cell to the coordinated whole. Throughout the course, focus will be placed on the inter-relationship between structure and function in cells, tissues and body systems (cardiovascular, respiratory, digestive, renal, musculoskeletal, neural, immune, and endocrine systems). The course serves as a basis for understanding the normal processes of life.
Prerequisite: HKDSE Biology or Chemistry or Combined Science with Biology or Chemistry component, or equivalent
Assessment: 50% continuous assessment; 50% examination.

BBMS2003 Human Genetics **Year 2 (6 credits)**

To present an extensive introduction to the principles of genetics, illustrate how they operate in humans with examples, and discuss the applications of these in medical and clinical genetics. Topics covered include Mendel's laws of genetics, basic patterns of Mendelian inheritance in humans, the construction and analysis of pedigrees, single gene and polygenic inheritance, multifactorial traits and heritability, cytogenetics, karyotypes, structural changes in chromosomes, and non-Mendelian inheritance. Concepts of genetic variations in human populations and Hardy-Weinberg equilibrium will also be presented.
Prerequisite: Eligible for students who have successfully completed BBMS1001, BBMS1003/BIOC1600 or BIOL1110.
Assessment: 50% continuous assessment; 50% examination.

BBMS2007 Essential Molecular Biology **Year 2 (6 credits)**

This course aims to enable the students to understand the basics in molecular biology including the process and machineries involving in the storage, utilization and maintenance of the genetic information and the corresponding genomes.
Prerequisite: Eligible for students who have successfully completed BBMS1003/BIOC1600, BMED1207 or BIOL1110.
Assessment: 60% continuous assessment; 40% examination.
Remark: Not for students who have successfully completed or enrolled in BIOL3401.

BBMS2009 Introduction to Clinical Research **Year 2 (6 credits)**

The purpose of clinical research is to determine the safety and efficacy of treatments intended for human use. It helps researchers to learn how to prevent, diagnose and treat human illness. Clinical Trial is a key type of clinical research. The aim of this course is to equip students with necessary knowledge and skills for planning, designing and conducting clinical trials. The overall course learning outcome is to build a strong understanding of the scientific, practical, and ethical aspects of clinical trials.
Prerequisite: Pass in any one of the following courses: BIOF1001, BBMS2013, BIOL2102, MATH1013, MATH1853, STAT1601, STAT1603 or concurrently enrolled in BBMS2013
Assessment: 100% continuous assessment.

BIOC2600 Basic Biochemistry **Year 2 (6 credits)**

This course is designed to present an overview of biochemistry of fundamental importance to the life process. We aim to develop appreciation of the basics in biochemistry as a common ground for science and non-science students to progress into their areas of specialization. Students intending to pursue further studies in Biochemistry and Molecular Biology will find this course particularly helpful.
Prerequisite: Eligible for students who have successfully completed BBMS1003/BIOC1600, BIOL1110, ENGG1207 or BMED1207.
Assessment: 50% coursework; 50% examination.
Remark: Not eligible for students who have successfully completed or are enrolled in one of the following courses: BIOL2220, MEDE2301 or BMED2301.

COMP2113 Programming Technologies **Year 2 (6 credits)**

This course covers intermediate to advanced computer programming topics on various technologies and tools that are useful for software development. Topics include Linux shell commands, shell scripts, C/C++ programming, and separate compilation techniques and version control. This is a self-learning course; there will be no lecture and students will be provided with self-study materials. Students are required to complete milestone-based self-assessment tasks during the course.
This course is designed for students who are interested in Computer Science / Computer Engineering.
Prerequisite: Eligible for students who have successfully completed COMP1117 or ENGG1330.
Assessment: 30% written examination; 70% continuous assessment.
Remark: Not eligible for students who have successfully completed or are enrolled in ENGG1340 or COMP2123.

COMP2119 Introduction to Data Structures and Algorithms **Year 2 (6 credits)**

Arrays, linked lists, trees and graphs; stacks and queues; symbol tables; priority queues, balanced trees; sorting algorithms; complexity analysis.
Prerequisite: Eligible for students who have successfully completed ENGG1340, COMP2113 or COMP2123.
Assessment: 40% continuous assessment; 60% examination.

BBMS2011 Research Methods in Medicine and Health Sciences **Year 2/3 (6 credits)**

This course introduces students to a comprehensive set of knowledge and practical skills necessary for understanding, appraising, and conducting clinical research. Students will start by examining the epistemological basis of scientific inquiry and its evolution, and begin formulating relevant research questions within a causal framework. Students will then be introduced to different approaches to answer research questions, including major epidemiologic study designs and qualitative research methods, and will learn about important considerations when conducting research, including research ethics, survey design, and data management & analysis. Finally, students will apply and transfer the knowledge of conducting research and interpreting and communicating results from research studies.
Assessment: 50% continuous assessment; 50% examination

BBMS3008 Essential Proteomics **Year 3 or 4 (6 credits)**

This course will introduce protein structure and contemporary proteomics relevant to biomedical sciences. Protein structure will include protein structure classification and identification, protein modelling, and structure determination by X-ray crystallography and cryo-EM. Proteomics will include protein mass spectrometry, isotope labelling, and protein-protein interaction techniques.
Prerequisite: Eligible for students who have successfully completed one of the following courses: BBMS2007, BIOC2600, BIOL2220 or BIOL3401.
Assessment: 50% continuous assessment; 50% examination.

BBMS3009 Genome Science **Year 3 or 4 (6 credits)**

This course will present topics applicable to human genetics and genomic biology in the "post-genome" era. Main topics include The Human Genome Project; technologies for genomic analysis such as microarrays and high-throughput sequencing; and bioinformatics for handling, analysing and interpreting genomic data, making use of standard analysis programs and public genomic resources such as the HapMap, 1000 Genome, ENCODE and Epigenetic Roadmap. We also show how the application of genome science to human diseases has led to improved understanding of disease aetiology and mechanisms. Students will gain knowledge and understanding in genomics that will be useful in their future career, be it in science or industry.
Prerequisite: Eligible for students who have successfully completed BBMS2013, BIOL2102 or BIOF1001; and one of the following courses: BBMS2003, BBMS2007, BIOL3401 or BIOL3408.
Assessment: 50% coursework; 50% examination.

BBMS4004 Public Health Genetics **Year 3 or 4 (6 credits)**

Public health genetics is the study of variation in the genome, its inheritance, and its contribution to health and disease. The main features of public health genetics research will be highlighted including how genetic and environmental factors play a role in disease susceptibility; emergence of biobanks; cancer genomics; precision medicine; and Mendelian randomisation. This course will also discuss the use of genetic epidemiology in the study of human diseases, the use of genetic testing in the diagnosis and screening of diseases as well as the use of genetic information in the treatment of diseases. It will also explore the ethical, legal and policy questions raised when applying genomics to health care.
Prerequisite: Eligible for students who have successfully completed BBMS2013 or BIOL2102; and BBMS2003.
Assessment: 100% continuous assessment.

BIOC3605 Sequence Bioinformatics **Year 3 or 4 (6 credits)**

This course will examine existing bioinformatics tools for DNA and protein sequence analysis. The underlying principles of these analysis programs and services will be presented. Students will learn how to retrieve, analyze, and compare protein and DNA sequences using bioinformatics tools available on the internet. A basic introduction to the principles and tools for the analysis of next generation sequencing data will also be presented.
Prerequisite: Eligible for students who have successfully completed one of the following courses: BIOC2600, BIOL2220, BBMS2003, BBMS2007, BMED2301 or MEDE2301.
Assessment: 50% coursework; 50% examination.

BIOF3004 Bioinformatics Internship **Year 3 or 4 (6 credits)**

This course will offer students the opportunity to gain work experience in the industry relating to bioinformatics and health data science. The workplace learning experience will enable students to apply knowledge gained during their studies in real work environments. Students have to take on approximately 160 hours of internship work outside the University with the approval of the course coordinator.
Prerequisite: Eligible for students who have successfully completed BIOF2001.
Assessment: 100% continuous assessment including written report and oral presentation.

BIOF3005 Structural Bioinformatics **Year 3 or 4 (6 credits)**

This undergraduate-level course offers a comprehensive exploration of the methods and tools commonly used in structural bioinformatics. It focuses on the analysis and interpretation of experimentally determined and predicted macromolecular structure data. Students will learn to effectively utilize bioinformatics data resources and tools for investigating, analyzing, and interpreting both experimentally determined and predicted biomacromolecular structures.

The course encompasses a wide range of techniques in biomolecular simulation, including protein molecular visualization of macromolecules, protein structure prediction and validation, molecular docking, mass spectrometry-guide drug discovery, and de novo protein design, among others. Through a combination of lectures and hands-on tutorials, students will have the opportunity to gain practical experience in the application of computational and structural methods.

By the end of the course, students will have acquired understanding of structural bioinformatics and the tools and techniques necessary to analyze and interpret biomacromolecular structures. They will also have developed the practical skills required to apply computational methods and statistical data analysis in their own research.
Prerequisite: Eligible for students who have successfully completed BIOF2001 and BBMS1003/BIOC1600. BBMS3008 is recommended (not mandatory).
Assessment: 50% continuous assessment; 50% examination.

BIOF3006 Biomedical Software Systems **Year 3 or 4 (6 credits)**

There are many software systems in modern biomedical data sciences – from standalone bioinformatics software, molecular sequence databases, web services, electronic health record system, telehealth system, mobile app, cloud-based systems, and embedded software in wearable devices. This course introduces design principles and practical hands-on experience in designing and evaluating various biomedical software systems. It will also discuss the impact of biomedical software in the healthcare system and scientific process.
Prerequisite: Eligible for students who have successfully completed COMP2119.
Assessment: 100% continuous assessment and project.

BIOF3007 Clinical Bioinformatics **Year 3 or 4 (6 credits)**

This course will highlight the increasingly integral role of bioinformatics in clinical settings with a particular emphasis on genomic medicine. Students will learn to design bioinformatic frameworks for clinical genomic laboratories and navigate data management, quality assurance, ethical issues and reporting. Practical experience will be gained through case studies covering diverse clinical scenarios and quality issues. Other emerging applications of bioinformatics including radiology, digital pathology, and health informatics will also be introduced in this course.
Prerequisite: Eligible for students who have successfully completed BBMS2013/BIOF2013 and BIOF3002.
Assessment: 60% continuous assessment; 40% examination.

BIOF4002 Global Health Informatics **Year 3 or 4 (6 credits)**

This course aims to present key biostatistical, computational, and epidemiology concepts and techniques that are useful for monitoring, modelling, predicting, and managing infectious and non-communicable diseases. This course will introduce practical techniques for data collection, data analysis, and predictive modelling for global health applications. This course will also discuss issues related to communication of public health information, and formulation of public health policy.
Prerequisite: Eligible for students who have successfully completed BIOF3001.
Assessment: 70% continuous assessment; 30% examination.

BIOF4003 Biomedical Image Informatics **Year 3 or 4 (6 credits)**

This course aims to introduce common medically relevant images data, and computational techniques to process them. Image processing and computer vision techniques will be introduced.
Prerequisite: Eligible for students who have successfully completed BIOF2001.
Assessment: 70% continuous assessment; 30% examination.

COMP3314 Machine Learning **Year 3 or 4 (6 credits)**

This course introduces algorithms, tools, practices, and applications of machine learning. Topics include core methods such as supervised learning (classification and regression), unsupervised learning (clustering, principal component analysis), Bayesian estimation, neural networks; common practices in data pre-processing, hyper-parameter tuning, and model evaluation; tools/libraries/APIs such as scikit-learn, Theano/Keras, and multi/many-core CPU/GPU programming.
Prerequisite: Eligible for students who have successfully completed MATH1853 or MATH2014, and COMP2119 or ELEC2543 or FITE2000.
Assessment: 50% continuous assessment; 50% examination.

COMP3317 Computer Vision **Year 3 or 4 (6 credits)**

This course introduces the principles, mathematical models and applications of computer vision. Topics include: image processing techniques, feature extraction techniques, imaging models and camera calibration techniques, stereo vision, and motion analysis.
Prerequisite: Eligible for students who have successfully completed COMP2119, and MATH1853, MATH2014 or MATH2101.
Assessment: 50% continuous assessment; 50% examination.

COMP3353 Bioinformatics **Year 3 or 4 (6 credits)**

The goal of the course is for students to be grounded in basic bioinformatics, concepts, algorithms, tools, and databases. Students will be leaving the course with hands-on bioinformatics analysis experience and empowered to conduct independent bioinformatics analyses. We will study: 1) algorithms, especially those for sequence alignment and assembly, which comprise the foundation of the rapid development of bioinformatics and DNA sequencing; 2) the leading bioinformatics tools for comparing and analyzing genomes starting from raw sequencing data; 3) the functions and organization of a few essential bioinformatics databases and learn how they support various types of bioinformatics analysis.
Prerequisite: Eligible for students who have successfully completed COMP1117 or ENGG1330.
Assessment: 70% continuous assessment; 30% examination.

STAT3600 Linear Statistical Analysis **Year 3 or 4 (6 credits)**

The analysis of variability is mainly concerned with locating the sources of the variability. Many statistical techniques investigate these sources through the use of 'linear' models. This course presents the theory and practice of these models.
Prerequisite: Eligible for students who have successfully completed STAT2602.
Assessment: 40% coursework; 60% examination
Remark: Not eligible for students who have successfully completed or are enrolled in STAT3907.

STAT3612 Statistical Machine Learning **Year 3 or 4 (6 credits)**

Machine learning is the study of computer algorithms that build models of observed data in order to make predictions or decisions. Statistical machine learning emphasizes the importance of statistical methodology in the algorithmic development. This course provides a comprehensive and practical coverage of essential machine learning concepts and a variety of learning algorithms under supervised and unsupervised settings.
Prerequisite: Eligible for students who have successfully completed or are enrolled in STAT3600 or STAT3907; and successfully completed COMP1117, ENGG1330 or STAT2604.
Assessment: 100% coursework.
Remark: Not eligible for students who have successfully completed or are enrolled in STAT4904. High proficiency in Python is required.

STAT4602 Multivariate Data Analysis **Year 3 or 4 (6 credits)**

In many designed experiments or observational studies, the researchers are dealing with multivariate data, where each observation is a set of measurements taken on the same individual. These measurements are often correlated. The correlation prevents the use of univariate statistics to draw inferences. This course develops the statistical methods for analysing multivariate data through examples in various fields of application and hands-on experience with the statistical software SAS.
Prerequisite: Eligible for students who have successfully completed STAT3600 or STAT3907.
Assessment: 50% coursework; 50% examination.

STAT4609 Big Data Analytics **Year 3 or 4 (6 credits)**

In the past decade, huge volume of data with highly complicated structure has appeared in every aspect, such as social web logs, e-mails, video, speech recordings, photographs, tweets and others. The efficient extraction of valuable information from these data sources becomes a challenging task. This course focuses on the practical knowledge and skills of some advanced analytics and statistical modeling for solving big data problems.
Prerequisite: Eligible for students who have successfully completed STAT3612 or STAT4904.
Assessment: 100% coursework.

Courses for Minor in Digital Health

BIOF1001 Introduction to Biomedical Data Science **Year 1 (6 credits)**

This course aims to introduce students to a variety of common biomedical data and practical skills to perform exploratory data analysis on these data. Data analysis skills such as data preprocessing, data quality assessment, data visualisation and clustering will be introduced. The role of modern data analytics in the scientific process and medical applications will be examined. The ethical issues related to collection, sharing and integration of big data will also be discussed.
Assessment: 70% continuous assessment; 30% examination.

BIOF2001 Artificial Intelligence in Medicine **Year 2 or 3 (6 credits)**

This course aims to introduce students to key concepts in artificial intelligence (AI) and practical machine learning techniques that are applicable to biomedical research and healthcare applications. Using a problem-oriented approach, students will learn how to frame biomedical problems using a machine learning framework, collect relevant data, perform model training and evaluation, and deploy an AI system in the real-world. The course will also explore the social and ethical impact of digital health and AI technology in medicine and the scientific process.
Prerequisite: Eligible for students who have successfully completed one of the following courses: BIOF1001, STAT1005, STAT1016, COMP1117 or STAT2604, or are enrolled in STAT2604.
Assessment: 80% continuous assessment; 20% examination.

BMED2500 Biomedical Signals and Linear Systems **Year 2 or 3 (6 credits)**

The theory of signals and linear systems is fundamental to all engineering disciplines. This is the first course in signals and linear systems for biomedical engineering students without any pre-requisite knowledge in signal theory or signal processing other than some knowledge in fundamental calculus and the use of complex numbers. The course uses simple real-life examples of signals and systems to illustrate how signal theory can be used in biomedical applications. An introduction to MATLAB is included as a tool for basic signal modelling, computational realization of basic signal theory, and analysis of real biomedical signals acquired by students themselves in a lab session.

This course aims to help students gain a firm understanding of fundamental signal and linear system concepts and theory using adequate mathematical and computing techniques to tackle simple signal processing problems. It serves as a pre-requisite course for many other courses, including Integrated Projects, Medical Imaging, Biomedical Engineering Laboratory, Statistics and Mathematical Analysis for Biomedical Engineering, Biomedical Instrumentation and Systems, Digital Signal Processing, Control and Instrumentation, Communication Systems, Digital Image Processing, and some elective courses, etc.

Specifically, the course covers the following topics: time-domain signal representation, periodic and aperiodic signals; spectral representation of signals, Fourier series and Fourier transform; system responses and linear system modelling; sampling, aliasing and analog-to-digital conversion; convolution and correlation; FIR filters and digital filtering; IIR filters and frequency response of digital filters; continuous-time systems and Fourier transform properties; application examples of biomedical signal analysis and processing.

At the end of the course, students should have a clear understanding of the fundamentals of signals and system theory to enable them to perform simple biomedical signal analysis and processing using both analytical methods and computing tools, link the mathematical representation of signals to some very simple real-life signals, and vice versa, and appreciate the applications of linear systems theory in solving some simple real-life problems. In addition, students should be aware of the complexity of real-life problems and the need to continue investigation in practice after graduation.

Assessment: 60% coursework; 40% examination.

BIOF3001 Big Data Biomedical Informatics **Year 3 or 4 (6 credits)**

This course uses a problem-based approach to introduce analytical skills to tackle practical biomedical problems via integration of diverse biomedical big data. Students will be given structured scenarios in groups to solve a variety of biomedical problems using diverse data types. These may include data from genome sequencing and non-sequencing-based omics, electronic medical records, wearable/IoT technology, medical imaging, and social media. In the course, the students will learn the theory (algorithm, statistics), and hands-on skills (data collection, programming, data analysis, visusalization) to support integrative data analysis tasks.
Prerequisite: Eligible for students who have successfully completed or are enrolled in BIOF2001.
Assessment: 100% continuous assessment including reports, presentation, and projects.

BIOF3003 Digital Health **Year 3 or 4 (6 credits)**

This course aims to give students practical experience in collecting, analysing, and evaluating data generated from modern digital health technology, such as wearable devices, mobile smartphones, images, text, as well as structured data from electronic medical record. In this project-oriented course, student experiences how to develop a data collection strategy, process sensor data, images, and text, as well as performing evaluation. Students will learn how to develop a mobile application to solve specific biomedical problems.
Prerequisite: Eligible for students who have successfully completed one of the following courses: BIOF2001, STAT2602 or COMP2119, or are enrolled in BIOF2001.
Assessment: 100% continuous assessment including project reports and presentation.

BIOF3006 Biomedical Software Systems **Year 3 or 4 (6 credits)**

There are many software systems in modern biomedical data sciences – from standalone bioinformatics software, molecular sequence databases, web services, electronic health record system, telehealth system, mobile app, cloud-based systems, and embedded software in wearable devices. This course introduces design principles and practical hands-on experience in designing and evaluating various biomedical software systems. It will also discuss the impact of biomedical software in the healthcare system and scientific process.
Prerequisite: Eligible for students who have successfully completed COMP2119.
Assessment: 100% continuous assessment and project.

BIOF4002 Global Health Informatics **Year 3 or 4 (6 credits)**

This course aims to present key biostatistical, computational, and epidemiology concepts and techniques that are useful for monitoring, modelling, predicting, and managing infectious and non-communicable diseases. This course will introduce practical techniques for data collection, data analysis, and predictive modelling for global health applications. This course will also discuss issues related to communication of public health information, and formulation of public health policy.
Prerequisite: Eligible for students who have successfully completed BIOF3001.
Assessment: 70% continuous assessment; 30% examination.

BIOF4003 Biomedical Image Informatics **Year 3 or 4 (6 credits)**

This course aims to introduces common medically relevant images data, and computational techniques to process them. Image processing and computer vision techniques will be introduced.
Prerequisite: Eligible for students who have successfully completed BIOF2001.
Assessment: 70% continuous assessment; 30% examination.

BMED3501 Medical Imaging **Year 3 or 4 (6 credits)**

Medical imaging is an indispensible technology in modern healthcare and biomedical research. It provides in vivo anatomical, physiological and functional information of the human body in normal, developing and pathological states. The rapid development in this field not only leads to better disease diagnosis and more accurate treatment efficacy assessment, but also paves the way for better understanding of living biological systems. This course will focus mainly on the principles of conventional (X-ray and Ultrasound) and modern (Computerized Tomography – CT; Magnetic Resonance Imaging – MRI; Nuclear Imaging and Optical Imaging) imaging techniques applied to biological systems and in medical diagnoses and the interpretations of these images. At the end of the course, students should gain a clear understanding in the physics, working principles and mathematics involved in the various imaging modalities covered. They should also be able to appreciate the interdisciplinary nature of the subject and learn the latest development or advancement in the field of medical imaging.
Prerequisite: Eligible for students who have successfully completed in BMED2500 or ELEC3241
Assessment: 20% practical work, 10% continuous assessment, 70% examination.

COMP3314 Machine Learning **Year 3 or 4 (6 credits)**

This course introduces algorithms, tools, practices, and applications of machine learning. Topics include core methods such as supervised learning (classification and regression), unsupervised learning (clustering, principal component analysis), Bayesian estimation, neural networks; common practices in data pre-processing, hyper-parameter tuning, and model evaluation; tools/libraries/APIs such as scikit-learn, Theano/Keras, and multi/many-core CPU/GPU programming.
Prerequisite: Eligible for students who have successfully completed MATH1853 or MATH2014, and COMP2119 or ELEC2543 or FITE2000.
Assessment: 50% continuous assessment; 50% examination.

COMP3317 Computer Vision **Year 3 or 4 (6 credits)**

This course introduces the principles, mathematical models and applications of computer vision. Topics include: image processing techniques, feature extraction techniques, imaging models and camera calibration techniques, stereo vision, and motion analysis.
Prerequisite: Eligible for students who have successfully completed COMP2119, and MATH1853, MATH2014 or MATH2101.
Assessment: 50% continuous assessment; 50% examination.

COMP3340 Applied Deep Learning **Year 3 or 4 (6 credits)**

An introduction to algorithms and applications of deep learning. The course helps students get hands-on experience of building deep learning models to solve practical tasks including image recognition, image generation, reinforcement learning, and language translation. Topics include: machine learning theory; optimization in deep learning; convolutional neural networks; recurrent neural networks; generative adversarial networks; reinforcement learning; self-driving vehicle.
Prerequisite: Eligible for students who have successfully completed COMP2119, ELEC2543 or FITE2000; and MATH1853 or MATH2014.
Assessment: 50% continuous assessment, 50% examination
Remark: Mutually exclusive with ELEC4544

STAT3612 Statistical Machine Learning **Year 3 or 4 (6 credits)**

Machine learning is the study of computer algorithms that build models of observed data in order to make predictions or decisions. Statistical machine learning emphasizes the importance of statistical methodology in the algorithmic development. This course provides a comprehensive and practical coverage of essential machine learning concepts and a variety of learning algorithms under supervised and unsupervised settings.
Prerequisite: Eligible for students who have successfully completed or are enrolled in STAT3600 or STAT3907; and successfully completed COMP1117, ENGG1330 or STAT2604.
Assessment: 100% coursework.
Remark: Not eligible for students who have successfully completed or are enrolled in STAT4904. High proficiency in Python is required.

BMED4500 Biomedical Instrumentation and Systems **Year 4 (6 credits)**

This course introduces the essential principles of biomedical instrumentation and systems used for both diagnostic and therapeutic purposes from the level of human body, organs, cells, down to the molecular level. Their applications encompass a wide range of areas, ranging from healthcare, clinical applications to basic life science research. Examples include ECG, EEG; blood pressure sensors; DNA microarray; flow cytometry, cardiac pacemakers, defibrillators and laser surgery. Prerequisite: Eligible for students who have successfully completed BMED2500.
Assessment: 20% practical work, 40% continuous assessment, 40% examination.

BMED4504 Biomedical Signals Processing and Modeling in Biomedical Applications **Year 4 (6 credits)**

This course aims to provide students with fundamentals of the common and important biomedical signals (mainly, neural signals); to furnish students with essential signal processing and modelling techniques for practical and clinical biomedical applications; to offer students with practical guidance on how to choose appropriate processing methods for solving specific problems of biomedical research; to let students gain first-hand experience in operating biomedical signal (EEG and EMG) acquisition systems and analysing biomedical signals; to introduce students to the most recent developments and the state-of-the-art of biomedical signals and systems, such as brain-computer interface and brain connectome.
Prerequisite: Eligible for students who have successfully completed BMED2500.
Assessment: 40% coursework; 60% examination.
Remark: Not eligible for students who have successfully completed or are enrolled in ELEC6081.

Courses for Minor in Biomedical Data Science

BBMS1003 Perspectives in Biochemistry **Year 1 (6 credits)**

This course aims to teach students a biochemical perspective on each of the Basic Sciences focusing on concepts fundamental to the learning of Biochemistry and promote deep learning of course material through an integrated programme of practical and collaborative tasks. Students will be inspired with a view of the great discoveries and future challenges for Biochemistry and helped to make the transition from school to university by developing their teamwork, independent study skills and confidence to communicate within a Biochemistry learning environment.
Prerequisite: Eligible for students who have attained Level 3 or above in HKDSE Biology, Chemistry, or Combined Science with Biology or Chemistry component, or equivalent.
Assessment: 50% continuous assessment; 50% examination.
Remarks: Not for students who have passed or are enrolled in BIOL1110 or BIOC1600.

BIOC1600 Perspectives in Biochemistry **Year 1 (6 credits)**

This course aims to teach students a biochemical perspective on each of the Basic Sciences focusing on concepts fundamental to the learning of Biochemistry and promote deep learning of course material through an integrated programme of practical and collaborative tasks. Students will be inspired with a view of the great discoveries and future challenges for Biochemistry and helped to make the transition from school to university by developing their teamwork, independent study skills and confidence to communicate within a Biochemistry learning environment.
Prerequisite: Eligible for students who have attained Level 3 or above in HKDSE Biology, Chemistry, or Combined Science with Biology or Chemistry component, or equivalent.
Assessment: 50% continuous assessment; 50% examination.
Remarks: Not for students who have passed or are enrolled in BIOL1110 or BBMS1003.

BIOF1001 Introduction to Biomedical Data Science **Year 1 (6 credits)**

This course aims to introduce students to a variety of common biomedical data and practical skills to perform exploratory data analysis on these data. Data analysis skills such as data preprocessing, data quality assessment, data visualization and clustering will be introduced. The role of modern data analytics in the scientific process and medical applications will be examined. The ethical issues related to collection, sharing and integration of big data will also be discussed.
Assessment: 70% continuous assessment; 30% examination.

COMP1117 Computer Programming **Year 1 (6 credits)**

This is an introductory course in computer programming. Students will acquire basic Python programming skills, including syntax, identifiers, control statements, functions, recursions, strings, lists, dictionaries, tuples and files. Searching and sorting algorithms, such as sequential search, binary search, bubble sort, insertion sort and selection sort, will also be covered.
Mutually exclusive with: ENGG1111 or ENGG1112 or ENGG1330 or IIMT2602
Assessment: 50% continuous assessment; 50% examination.

STAT1016 Data Science 101 **Year 1 (6 credits)**

The course introduces basic concepts and methodology of data science to junior undergraduate students. The teaching is designed at a level appropriate for all undergraduate students with various backgrounds and without pre-requisites. Students will engage in a full data work-flow including collaborative data science projects. They will study a full spectrum of data science topics, from initial investigation and data acquisition to the communication of final results. Specifically, the course provides exposure to different data types and sources, and the process of data curation for the purpose of transforming them to a format suitable for analysis. It introduces elementary notions in estimation, prediction and inference. Case studies involving less-manicured data are discussed to enhance the computational and analytical abilities of the students.
Assessment: 100% coursework.
Remark: Not eligible for the following: students who have successfully completed or are enrolled in STAT1005, STAT1015, STAT1018.

STAT1600 Statistics: Ideas and Concepts **Year 1 (6 credits)**

The course aims at providing a broad overview of statistics for students who aspire to major in Statistics or Risk Management. It focuses on the roles of statistics as a scientific tool with applications to a wide spectrum of disciplines, and as a science of reasoning which has revolutionized modern intellectual endeavours. It lays a panoramic foundation for a formal study of statistics at the university level.
Assessment: 60% continuous assessment; 40% examination.
Remark: Not eligible for students who have successfully completed one of the following courses: MATH1853, STAT1602, STAT1603, STAT2602, or STAT3902.

BBMS2003 Human Genetics **Year 2 (6 credits)**

To present an extensive introduction to the principles of genetics, illustrate how they operate in humans with examples, and discuss the applications of these in medical and clinical genetics. Topics covered include Mendel's laws of genetics, basic patterns of Mendelian inheritance in humans, the construction and analysis of pedigrees, single gene and polygenic inheritance, multifactorial traits and heritability, cytogenetics, karyotypes, structural changes in chromosomes, and non-Mendelian inheritance. Concepts of genetic variations in human populations and Hardy-Weinberg equilibrium will also be presented.
Prerequisite: Eligible for students who have successfully completed BBMS1001, BBMS1003/BIOC1600 or BIOL1110.
Assessment: 50% continuous assessment; 50% examination.

BBMS2007 Essential Molecular Biology **Year 2 (6 credits)**

This course aims to enable the students to understand the basics in molecular biology including the process and machineries involving in the storage, utilization and maintenance of the genetic information and the corresponding genomes.
Prerequisite: Eligible for students who have successfully completed BBMS1003/BIOC1600, BMED1207 or BIOL1110.
Assessment: 60% continuous assessment; 40% examination.
Remark: Not for students who have successfully completed or enrolled in BIOL3401.

BBMS2009 Introduction to Clinical Research **Year 2 (6 credits)**

The purpose of clinical research is to determine the safety and efficacy of treatments intended for human use. It helps researchers to learn how to prevent, diagnose and treat human illness. Clinical Trial is a key type of clinical research. The aim of this course is to equip students with necessary knowledge and skills for planning, designing and conducting clinical trials. The overall course learning outcome is to build a strong understanding of the scientific, practical, and ethical aspects of clinical trials.
Prerequisite: Pass in any one of the following courses: BIOF1001, BBMS2013, BIOL2102, MATH1013, MATH1853, STAT1601, STAT1603 or concurrently enrolled in BBMS2013
Assessment: 100% continuous assessment.

BIOF2013 Biomedical Statistics (Bioinformatics) **Year 2 (6 credits)**

The ability to understand the fundamentals of biostatistics, and to employ appropriate quantitative methods to analyze data generated from diverse types of biomedical studies is a necessary requirement for biomedical and bioinformatics students. This course aims to introduce students to the central principles and concepts of statistical analysis, with special attention to analytical approaches typically encountered in biomedical sciences research. The first part of the course will cover some basic biostatistical knowledge (distributions, estimation, hypothesis testing), as well as some more advanced applications (regression and correlation analysis, multivariate statistics). The second part of the course will give students the practical skills and knowledge to apply the concepts learnt on real-life data analyses using R, a statistical programming language.
Pre-requisite: Eligible for students who have successfully completed BIOF1001 and BBMS1003/BIOC1600.
Assessment: 70% continuous assessment; 30% examination
Remark: Not eligible for students who have successfully completed or are enrolled in BBMS2013.

BIOF2014 Statistical Modelling for Bioinformatics **Year 2 (6 credits)**

This course is designed to help bioinformatic scientists to develop mathematical and computational expertise in modelling data in bioinformatics. Students will first acquire a mathematical foundation in probability theory and learn how different probability distributions are derived. Students will learn to recognize the modelling limitations of different probability distributions and to develop simple Bayesian models.
This course will emphasize both mathematical derivation and computer programming in data modelling. Students will learn to express biological questions in rigorous statistical notation, design statistical models with appropriate assumptions, derive estimators for model parameters mathematically, and implement Bayesian models using R and Stan programming.
This course will supplement the classical statistical inference techniques covered in BIOF2013 and cultivate the necessary foundation for building Bayesian statistical models to answer more complex inquiries.
Prerequisite: Students who have passed BIOF1001 and passed or enrolled in MATH2014 or (MATH2101 and MATH2211).
Assessment: 70% continuous assessment; 30% examination.

COMP2113 Programming Technologies **Year 2 (6 credits)**

This course covers intermediate to advanced computer programming topics on various technologies and tools that are useful for software development. Topics include Linux shell commands, shell scripts, C/C++ programming, and separate compilation techniques and version control. This is a self-learning course; there will be no lecture and students will be provided with self-study materials. Students are required to complete milestone-based self-assessment tasks during the course.
This course is designed for students who are interested in Computer Science / Computer Engineering.
Prerequisite: Eligible for students who have successfully completed COMP1117 or ENGG1330.
Assessment: 30% written examination; 70% continuous assessment.
Remark: Not eligible for students who have successfully completed or are enrolled in ENGG1340 or COMP2123.

COMP2119 Introduction to Data Structures and Algorithms **Year 2 (6 credits)**

Arrays, linked lists, trees and graphs; stacks and queues; symbol tables; priority queues, balanced trees; sorting algorithms; complexity analysis.
Prerequisite: Eligible for students who have successfully completed ENGG1340, COMP2113 or COMP2123.
Assessment: 40% continuous assessment; 60% examination.

BIOF2001 Artificial Intelligence in Medicine **Year 2 or 3 (6 credits)**

This course aims to introduce students to key concepts in artificial intelligence (AI) and practical machine learning techniques that are applicable to biomedical research and healthcare applications. Using a problem-oriented approach, students will learn how to frame biomedical problems using a machine learning framework, collect relevant data, perform model training and evaluation, and deploy an AI system in the real-world. The course will also explore the social and ethical impact of digital health and AI technology in medicine and the scientific process.
Prerequisite: Eligible for students who have successfully completed one of the following courses: BIOF1001, STAT1005, STAT1016, COMP1117 or STAT2604, or are enrolled in STAT2604.
Assessment: 80% continuous assessment; 20% examination.

STAT2604 Introduction to R/Python Programming and Elementary Data Analysis **Year 2 or 3 (6 credits)**

This course is designed to provide a first-level introduction to Python programming for statistics. This course focuses on learning the basic programming skills in Python with examples and applications in elementary statistical analysis. The programming skills involved can be applied to input and output of data sets, work with different data types, manipulation and transformation of data, random sampling, descriptive data analysis, and production of professional summary reports with high-quality graphs.
Prerequisite: Eligible for students who have successfully completed or are enrolled in STAT1600 or MATH1821 or (MATH1851 and MATH1853).
Assessment: 100% coursework.

BBMS3002 Molecular Biology of the Cell **Year 3 or 4 (6 credits)**

The course will cover current topics of cell biology and will provide an overview of the fundamentals of biological processes that contribute to cell growth and survival. Four major areas will be covered: Nucleus and Epigenetics; Signal Transduction; Cytoskeleton and Cell Adhesion; and Cell Proliferation and Differentiation. Students will also be introduced to current methodologies for molecular and cell biology research, and will be exposed to emerging systems and synthetic biology approaches in the study of cellular processes. The course also aims to provoke appreciation of how knowledge in basic science aids in the detection, rationalisation and treatment of genetic diseases, including cancer and other metabolic disorders. Students are expected to research into how good understanding of the basic principles of molecular and cell biology has facilitated development of current strategies for disease intervention.
Prerequisites: Eligible for students who have successfully completed BBMS1001 and BBMS1011/BBMS2001.
Assessment: 50% continuous assessment; 50% examination

BBMS3008 Essential Proteomics **Year 3 or 4 (6 credits)**

This course will introduce protein structure and contemporary proteomics relevant to biomedical sciences. Protein structure will include protein structure classification and identification, protein modelling, and structure determination by X-ray crystallography and cryo-EM. Proteomics will include protein mass spectrometry, isotope labelling, and protein-protein interaction techniques.
Prerequisite: Eligible for students who have successfully completed one of the following courses: BBMS2007, BIOC2600, BIOL2220 or BIOL3401.
Assessment: 50% continuous assessment; 50% examination.

BBMS3009 Genome Science **Year 3 or 4 (6 credits)**

This course will present topics applicable to human genetics and genomic biology in the "post-genome" era. Main topics include The Human Genome Project; technologies for genomic analysis such as microarrays and high-throughput sequencing; and bioinformatics for handling, analysing and interpreting genomic data, making use of standard analysis programs and public genomic resources such as the HapMap, 1000 Genome, ENCODE and Epigenetic Roadmap. We also show how the application of genome science to human diseases has led to improved understanding of disease aetiology and mechanisms. Students will gain knowledge and understanding in genomics that will be useful in their future career, be it in science or industry.
Prerequisite: Eligible for students who have successfully completed BBMS2013, BIOL2102 or BIOF1001; and one of the following courses: BBMS2003, BBMS2007, BIOL3401 or BIOL3408.
Assessment: 50% coursework; 50% examination.

BBMS4003 Developmental Genetics **Year 3 or 4 (6 credits)**

This course covers the genetic bases as well as cellular and molecular processes of embryo development. Topics include: genetic control of body plans and pattern formation, morphogenesis, cell fate determination, formation of organ systems such as lung, kidney, vascular, skeletal and nervous systems, germ cells and sex determination, stem cells, regeneration, common congenital malformations, and key signaling molecules involved. Methods and technologies for studying developmental genetics, studies of model organisms, and examples relevant to human diseases and modern medicine are discussed.
Prerequisite: Eligible for students who have successfully completed one of the following courses: BBMS2003, BBMS2007, BIOL3401, BIOL3408, BBMS3002 or equivalent courses.
Assessment: 50% continuous assessment; 50% examination.

BBMS4004 Public Health Genetics **Year 3 or 4 (6 credits)**

Public health genetics is the study of variation in the genome, its inheritance, and its contribution to health and disease. The main features of public health genetics research will be highlighted including how genetic and environmental factors play a role in disease susceptibility; emergence of biobanks; cancer genomics; precision medicine; and Mendelian randomisation. This course will also discuss the use of genetic epidemiology in the study of human diseases, the use of genetic testing in the diagnosis and screening of diseases as well as the use of genetic information in the treatment of diseases. It will also explore the ethical, legal and policy questions raised when applying genomics to health care.
Prerequisite: Eligible for students who have successfully completed BBMS2013 or BIOL2102; and BBMS2003.
Assessment: 100% continuous assessment.

BIOC3605 Sequence Bioinformatics **Year 3 or 4 (6 credits)**

This course will examine existing bioinformatics tools for DNA and protein sequence analysis. The underlying principles of these analysis programs and services will be presented. Students will learn how to retrieve, analyze, and compare protein and DNA sequences using bioinformatics tools available on the internet. A basic introduction to the principles and tools for the analysis of next generation sequencing data will also be presented.
Prerequisite: Eligible for students who have successfully completed one of the following courses: BIOC2600, BIOL2220, BBMS2003, BBMS2007, BMED2301 or MEDE2301.
Assessment: 50% coursework; 50% examination.

BIOC4612 Molecular Biology of the Gene **Year 3 or 4 (6 credits)**

To provide an up-to-date knowledge of molecular biology, especially with respect to the regulation of eukaryotic gene expression.
Prerequisite: Eligible for students who have successfully completed one of the following courses: BIOC3601, BIOL3401, BIOL3402, BIOL3404 or BBMS2007.
Assessment: 50% assignment; 50% examination.

BIOF3001 Big Data Biomedical Informatics **Year 3 or 4 (6 credits)**

This course uses a problem-based approach to introduce analytical skills to tackle practical biomedical problems via integration of diverse biomedical big data. Students will be given structured scenarios in groups to solve a variety of biomedical problems using diverse data types. These may include data from genome sequencing and non-sequencing-based omics, electronic medical records, wearable/IoT technology, medical imaging, and social media. In the course, the students will learn the theory (algorithm, statistics), and hands-on skills (data collection, programming, data analysis, visualization) to support integrative data analysis tasks.
Prerequisite: Eligible for students who have successfully completed or are enrolled in BIOF2001.
Assessment: 100% continuous assessment including reports, presentation, and projects.

BIOF3002 Genome Sequencing and Analysis **Year 3 or 4 (6 credits)**

This comprehensive course is designed to provide biomedical scientists with an end-to-end understanding of high-throughput genome sequencing, encompassing all aspects from sample preparation and sequencing to data analysis using portable DNA sequencing technology. Participants will acquire hands-on expertise in the operation of portable DNA sequencers and their capacity to generate genomics data. Leveraging the acquired datasets and additional publicly available genome resources, students will employ advanced bioinformatics methodologies to address targeted biological inquiries. Additionally, participants will cultivate skills in managing genome sequencing data and effectively presenting genomic findings to a professional scientific audience. This course will supplement theoretical knowledge gained in BBMS3009 Genome Sciences and help equip students with the necessary proficiency for academic research or to work in industries that use genomic technologies.
Prerequisite: Eligible for students who have successfully completed BIOF1001 plus completed or are enrolled in BBMS3009.
Assessment: 100% continuous assessment including project reports and presentation.

BIOF3005 Structural Bioinformatics **Year 3 or 4 (6 credits)**

This undergraduate-level course offers a comprehensive exploration of the methods and tools commonly used in structural bioinformatics. It focuses on the analysis and interpretation of

experimentally determined and predicted macromolecular structure data. Students will learn to effectively utilize bioinformatics data resources and tools for investigating, analyzing, and interpreting both experimentally determined and predicted biomacromolecular structures.

The course encompasses a wide range of techniques in biomolecular simulation, including protein molecular visualization of macromolecules, protein structure prediction and validation, molecular docking, mass spectrometry-guide drug discovery, and de novo protein design, among others. Through a combination of lectures and hands-on tutorials, students will have the opportunity to gain practical experience in the application of computational and structural methods.

By the end of the course, students will have acquired understanding of structural bioinformatics and the tools and techniques necessary to analyze and interpret biomacromolecular structures. They will also have developed the practical skills required to apply computational methods and statistical data analysis in their own research.
Prerequisite: Eligible for students who have successfully completed BIOF2001 and BBMS1003/BIOC1600. BBMS3008 is recommended (not mandatory).
Assessment: 50% continuous assessment; 50% examination.

BIOF3006 Biomedical Software Systems **Year 3 or 4 (6 credits)**

There are many software systems in modern biomedical data sciences – from standalone bioinformatics software, molecular sequence databases, web services, electronic health record system, telehealth system, mobile app, cloud-based systems, and embedded software in wearable devices. This course introduces design principles and practical hands-on experience in designing and evaluating various biomedical software systems. It will also discuss the impact of biomedical software in the healthcare system and scientific process.
Prerequisite: Eligible for students who have successfully completed COMP2119.
Assessment: 100% continuous assessment and project.

BIOF3007 Clinical Bioinformatics **Year 3 or 4 (6 credits)**

This course will highlight the increasingly integral role of bioinformatics in clinical settings with a particular emphasis on genomic medicine. Students will learn to design bioinformatic frameworks for clinical genomic laboratories and navigate data management, quality assurance, ethical issues and reporting. Practical experience will be gained through case studies covering diverse clinical scenarios and quality issues. Other emerging applications of bioinformatics including radiology, digital pathology, and health informatics will also be introduced in this course.
Prerequisite: Eligible for students who have successfully completed BBMS2013/BIOF2013 and BIOF3002.
Assessment: 60% continuous assessment; 40% examination.

BIOF4002 Global Health Informatics **Year 3 or 4 (6 credits)**

This course aims to present key biostatistical, computational, and epidemiology concepts and techniques that are useful for monitoring, modelling, predicting, and managing infectious and non-communicable diseases. This course will introduce practical techniques for data collection, data analysis, and predictive modelling for global health applications. This course will also discuss issues related to communication of public health information, and formulation of public health policy.
Prerequisite: Eligible for students who have successfully completed BIOF3001.
Assessment: 70% continuous assessment; 30% examination.

BIOF4003 Biomedical Image Informatics **Year 3 or 4 (6 credits)**

This course aims to introduce common medically relevant images data, and computational techniques to process them. Image processing and computer vision techniques will be introduced.
Prerequisite: Eligible for students who have successfully completed BIOF2001.
Assessment: 70% continuous assessment; 30% examination.

Non-credit bearing course

UG5E1001 Introduction to the Constitution, the Basic Law and the National Security Law **Year 1, 2, 3 or 4**

This online course is based on pre-recorded lectures (PRLs) and study materials which are prepared by the Faculty of Law. Students will adopt a self-directed learning approach.
This course aims to provide a basic introduction of the Constitution, the Basic Law and the National Security Law. The supplementary materials provide students with an opportunity to examine the international perspective on the topics under study.