Course description, learning outcomes, assessment scheme

GNBF 5010 - Introduction to Programming 電腦程式設計概論

Course description

This course introduces programming for students with no previous computer programming experience. Students learn how to apply computational tools to design, implement, test, debug, and document programs. They also learn the techniques of developing programs for problem solving through object-oriented programming methodology.

本課程講授電腦程式設計,學員不需要有任何程式設計經驗。學生們將學到電腦程式的設計、運行、檢測、排錯與貯存。此外,本課程亦講授目標定位的程式設計方法。

Learning outcomes

After finishing this course, students should be able to

1) acquire the basic concept of computer programming and software engineering;
2) design computer program to perform biological data using the main-stream programming language, including C, Perl, R and so on;
3) acquire the basic knowledge of famous biological software project, including BWA, GATK, Bioconductor and so on.

Assessment scheme (*percentage contributing to the final grade*)

1. attendance : 5%
2. assignments and small projects : 45%
3. final examination : 50%

GNBF 5020 - Introduction to Molecular Biology and Genetics 分子生物及遺傳學概論

Course Description

This course introduces students to the molecular mechanisms responsible for the transmission, expression and regulation of genetic information in prokaryotic and eukaryotic organisms. Students will also learn the basic concepts of genetics including population genetics, developmental genetics and evolutionary genetics.

本課程向學生介紹遺傳資訊在原核和真核生物中傳遞、表達與調控的分子機制。同時也講授群體遺傳學、 發育遺傳學和進化遺傳等遺傳學基本知識。

Learning outcomes

After finishing this course, students should be able to

1) understand basic concepts in biomolecules and cell biology
2) know how molecular biology can explain the transmission of genetic information
3) correlate molecular biology concepts with genetic and phenotypic traits

Assessment scheme (*percentage contributing to the final grade*)

1. attendance : 5%
2. mid-term examination : 47.5%
3. final examination : 47.5%

GNBF 5030 - Bio-computing 生物運算

Term 1

Course Description

This course introduces popular Biocomputing environments and software to answer problems using nucleotide sequences and other common data encountered in biological analyses.

本課程介紹受歡迎的程式設計和軟件。學生們將學習怎樣以程式來解決包括核苷酸序列 或其他常用數據的生物學問題。

Learning outcomes

After finishing this course, students should be able to

a. accustom themselves to Linux biocomputing environments

b. know the functionality of common bioinformatics tools

Assessment scheme (*percentage contributing to the final grade*)

1. attendance : 5%
2. assignments and small projects : 70%
3. final examination : 25%

Term 2

Course Description

This course introduces the bioinformatics tools in BioPerl. Students learn the Perl programming to answer problems using nucleotide sequences, protein sequences, structure and other data.

本課程介紹有關生物信息學的軟件。學生們將學習怎樣以 Perl 程式來解決包括核苷酸序列、 蛋白質序列和結構數據在內的生物學問題。

Learning outcomes

After finishing this course, students should be able to

1) know the functionality of tools deposited in the BioPerl;
2) combine modules in BioPerl to build bioinformatics applications;
3) develop bioinformatics-related modules using the Perl programming.

Assessment scheme (*percentage contributing to the final grade*)

1. attendance : 5%
2. assignments and small projects : 45%
3. final examination : 50%

GNBF 5040 - Genomics: Basic Concepts and Applications 基因組學:基本概念和應用

Course Description

This course introduces the basic concepts of genomics. It covers the structure and organization of human genome, and the strategies that are used to map, sequence and analyse the genomes. Students learn how to make connections between genomic data and the relevant biological questions. They also learn how genomic sequence information is utilized in biomedicine including pharmacogenomics, drug discovery, diagnostics and personalized medicine.

本課程介紹基因組學的基本知識。它不但涵蓋人類基因組的結構和組織,還介紹基因組制圖、測序和分析的策略。 學員將學習到如何使基因組數據與生物學問題關聯起來。此外, 他們將學習到基因組序列資訊在生物醫學的應用, 包括藥物基因組學、藥物的發現、診斷和個人化治療等等。

Learning outcomes

After finishing this course, students should be able to

1) acquire the basic concept of genomics;
2) learn the principle, strategies and limitations of genomic technology ;
3) apply genomics to solve biological and biomedical questions.

Assessment scheme (*percentage contributing to the final grade*)

Workshop I	:	5%
Workshop II	:	5%
Mid-term examination		35%
Final examination	:	50%
Attendance	:	5%

GNBF 5050 - Theories and Algorithms in Bioinformatics 生物信息學的理論和演算法

Course Description

This course introduces common bioinformatics problems and the theories and algorithms behind the methods and tools tackling the problems. The topics include gene expression and network analysis, ordination for exploring interactions among genes, organisms and environment, sequence alignment, phylogeny, hidden markov models for biological signal identification and functional annotations. Lecture attendance and hands-on experience are equally important for effective learning in this course.

Learning outcomes

After finishing this course, students should be able to understand the complexity of common bioinformatics problems and to choose relevant methods/tools/parameters for problem solving.

Assessment scheme (*percentage contributing to the final grade*)

1.	attendance	:	5%
2.	assignments	:	50%
3.	final examination	:	45%

GNBF 5060 - Systems Biology 系統生物學

Course Description

This course introduces how systems biology combines molecular biology and genomics with physical chemistry and mathematical modeling to make biosystems work. Students will learn basic concepts of the non-linear dynamics and genetic networks. They also learn mathematical modeling techniques needed to study biological questions and experiments that can be used to validate mathematical models.

本課程介紹系統生物學如何將分子生物學、基因組學與物理化學以及數學模擬相結合從而進行生物系統的運作。學生們將學習到控制理論和遺傳網絡等基本知識。此外, 他們將學習到數學模擬技術, 以研究生物學的問題和進行有關驗證數學模型的實驗。

Learning outcomes

After finishing this course, students should be able to

1) know the basic principle of systems biology;
2) learn how to apply control theory and genetic networks on genomics and bioinformatics;
3) use systems biology to solve biological and biomedical questions.

Assessment scheme (*percentage contributing to the final grade*)

1.	attendance	:	5%
2.	assignments and small projects	:	25%
3.	final examination	:	70%

GNBF 5070 - Genome Informatics 基因組資訊學

Course Description

This course introduces the knowledge of genomics and bioinformatics. Students will learn the concepts and methods for different categories of genomic studies, including reference genome studies, population genomic studies, and genomic applications. In each of these categories of studies, basic knowledge as well as most recent progress will be presented. In addition to theoretical lectures, students will also have hand-on practice of the mentioned tools, thus they will have better idea about genomics and bioinformatics.

Learning outcomes

After finishing this course, students should be able to:

a. know the basic principle of and pipeline for genomic studies;
b. know the current progress of genomic studies;
c. learn how to analyze the second generation sequencing data;
d. learn how to use/apply different bioinformatics tools;
e. learn how to conduct a genomic study

Assessment scheme (*percentage contributing to the final grade*)

1.	attendance	:	5%
2.	assignments	:	50%
3.	final examination	:	50%

GNBF 6010 - Research Project 研究項目

Course Description

Genome Informatics-related research topics will be provided by principal investigators in the Chinese University of Hong Kong and the Beijing Genome Institute Shenzhen in the first semester (full-time study mode) or first semester of the second year of study (part-time study mode). After selecting the topics, students conduct the research in the second semester. Finally, they report their results in an oral presentation and submit a written report to the programme committee.

在第一個學期(全日制)或第二個學年的第一個學期(兼讀制), 香港中文大學和華大基因(深圳)將分別提供一些有關基因信息學的研究項目讓學生們能夠參與其中。學生們選定論文題目後便可在項目負責人的指導下進行研究工作。最後, 同學們需要以口頭報告形式匯報他們的研究結果,並向課程委員會提交一份書面研究報告。

Learning outcomes

After finishing this course, students should be able to

1) design the strategy and methodology to solve a research question ;
2) conduct experiments by implementing the research plan;
3) interpret and integrate experimental results to answer the research question;
4) present the research finding in the format of a written report and an oral presentation.

Assessment scheme (*percentage contributing to the final grade*)

1.	proposal	:	20%
2.	oral presentation	:	20%
3.	marks given by supervisor	:	20%
4.	final report	:	40%