科目ナンバリング	U-LAS14 20061 SE68						
授業科目名<英訳>	Introduction to Computational Molecular Biology-E2 Introduction to Computational Molecular Biology-E2			担当者所属職名・氏名	薬学研究科　准教授　Martin Robert		
群	自然科学科目群			分野(分類)	生物学(各論)	使用言語	英語
旧群	B群	単位数	2単位	週コマ数	1コマ	授業形態	演習（対面授業科目）
開講年度・開講期	2026・後期	曜時限	木4	配当学年	全回生	対象学生	理系向

[授業の概要・目的]

The last two decades have seen the rapid expansion of quantitative data in biology. Large-scale experimental approaches now provide quantitative information about biomolecules at an unprecedented pace and scale. Along with these advances, computational tools have become essential to deal with the huge amount of data and to better understand complex and dynamical living systems.

The main objective of the course is to learn some of the basic principles of computational biology and bioinformatics, from the molecular perspective.

[到達目標]

At the end of this course students should:
- Appreciate and be able to describe different types of biomolecular components
- Understand and solve sequence matching problems and perform sequence analysis and its interpretation
- Use and understand computational tools that are widely used by research scientists
- Solve problems of molecular analysis using computational tools
- Understand the basic principles of molecular networks, their structure, properties, and analysis
- Appreciate and utilize the power of computational modeling to study and better understand complex biological systems

[授業計画と内容]

The following topics will be covered over the course of 14 classes, not necessarily in that order:

Week 1 Guidance
Week 2 Basic concepts in computational molecular biology
Week 3 Review of biomolecule structure and properties
Week 4 Introduction to biological databases
Week 5-6 DNA and protein sequence analysis
Week 7-8 Protein analysis (structure and biochemical properties)
Week 9 Sequence alignment
Week 10 Patterns in data
Week 11 Molecular networks: principles and analysis
Week 12 Reaction-diffusion systems and spatiotemporal patterns
Week 13 Computational and metabolic models of cells or organisms
Week 14 Project presentations
Week 15 Final examination
Week 16 Feedback

Introduction to Computational Molecular Biology-E2(2)へ続く↓↓↓

Introduction to Computational Molecular Biology-E2(2)

[履修要件]

Students will need a computer to complete in-class exercises and homework assignments.

The course is meant for beginners, but students are expected to have a basic familiarity with biomolecules, cell biology, and the use of computers.

[成績評価の方法・観点]

20% Class attendance/participation
40% In-class exercises and homework assignments
20% Project and presentation
20% Final examination

[教科書]

Kelley, Scott T. and Didulo, Dennis 『Computational biology: a hypertextbook』 （ASM Press, Wiley 2018）

The textbook listed above will be the main resource for the course but students are not required to buy it. Kyoto University Library has some digital license available.

[参考書等]

（参考書）
Additional material and articles will be provided in class.

[授業外学修（予習・復習）等]

Out of class activities will mainly be for assigned readings and homework assignments and for working on a project. Students should expect to spend about 1-2 hours per week preparing for the class and completing assignments.

[その他（オフィスアワー等）]

Announced in class.

[主要授業科目（学部・学科名）]

薬学部薬科学科、薬学部薬学科