課程資訊 (Course Information)					
科號 Course Number	11120LSBS565100	學分 Credit	3	人數限制 Class Size	20
中文名稱 Course Title	電腦生物學				
英文名稱 Course English Title	Computational Biology				
任課教師 Instructor	楊立威(YANG, LEE-WEI) *more information*				
上課時間 Time	F2F3F4	上課教室 Room	LS II生二220		

提醒您：請遵守智慧財產權，勿使用非法影印教科書
Please respect the intellectual property rights, do not use illegal copies of textbooks.

此科目對應之系所課程規畫所欲培養之核心能力 Core capability to be cultivated by this course	■ 生物資訊與結構生物學的專業知識 (30%) Specialized knowledge in bioinformatics and structural biology (30%) ■ 生物資訊與結構生物學的實驗技術 (25%) Experimental techniques in bioinformatics and structural biology (25%) ■ 國際觀與外語能力 (10%) Global perspective and foreign language proficiency (10%) ■ 團隊合作的精神 (5%) Team work spirit (5%) ■ 獨立思考、分析與解決研究問題的能力 (30%) Ability in reflecting, analyzing and resolving research problems independently (30%)

課程簡述 (Brief course description)

The course confers the basic knowledge of Computational Biology at the molecular level. Algorithms and theories taught are applied to analyze DNA/RNA/Protein sequences, bimolecular structures and protein dynamics. Through the course, students learn how basic knowledges in math, physics, chemistry and computation can pave the way to solve mysteries in life at its smallest scale.

課程大綱 (Syllabus)

Course keywords:
Sequence Alignment, Structural Comparison, Protein Dynamics, Machine Learning, Programming

WORKSHOP on Programming --> TIME & Location: (TBD) @ R220, LSII
The workshop teaches you basics about Matlab (or python), Linux and Visualization software (VMD, Pymol, Swiss-PDB-Viewer etc)]

I. Course Description
Conferring the basic knowledge of how math and physics have been helping solve biological problems

II. Text Books
Molecular Modeling - Principles and Applications, by Andrew R Leach

III. References
"Biochemistry, 5th edition", by Garrett & Grisham. Publisher: Thomson/Brooks/Cole
“Molecular Biophysics”, by Daune
"Biological Sequence Analysis: Probabilistic Models of Proteins and Nucleic Acids" Richard Durbin, Sean R. Eddy, Anders Krogh, Graeme Mitchison (E-book at NTHU library) or
http://eisc.univalle.edu.co/cursos/web/material/750068/1/6368030-Durbin-Et-Al-Biological-Sequence-Analysis-CUP-2002-No-OCR.pdf
“Structural Bioinformatics” by Jenny Gu, Philip E. Bourne
“Normal Mode Analysis”by Qiang Cui & Ivet Bahar
“Coarse-Graining of Condensed Phase and Biomolecular Systems”by Gregory A Voth
Math Chapters (Appendix) in "Quantum Chemistry" by Donald McQuarrie

IV. Teaching Method

Lectures plus after-class hands-on practice in programming and using computer software

V. Syllabus
Biological sequences - Nucleic acids and dynamic programming I [Linear Algebra I & Matlab intro I]
Biological sequences - Amino acids and sequence alignment [Linear Algebra II & Matlab intro II]
Probability & Statistics I [Matlab drill]
Probability & Statistics II; Secondary Structure Prediction [Matlab drill]
Protein Structure Comparison and Prediction I [VMD intro]
Protein Structure Comparison and Prediction II [VMD / tcl script]
Protein Dynamics I - Monte Carlo simulations and small ligand docking [Matlab/Autodock drill]
Molecular Dynamics Simulations I
Molecular Dynamics Simulations II
Normal Mode Analysis I [Matlab drill]
Normal Mode Analysis II - Elastic Network Model [Matlab drill]

VI. Evaluation
Quizzes (20%)
Homework (80%) (highest scored 5 out of >=8 homework)