

104 學年第 2 學期 同步輻射與雷射在生醫研究之應用 Introduction of Synchrotron & Laser Techniques in Biomedical Research 課程綱要

課程名稱：（中文）同步輻射與雷射在生醫研究之應用		開課單位	物理碩			
（英文）Introduction of Synchrotron & Laser Techniques in Biomedical Research		永久課號	IEP5636			
授課教師：梁耕三 杉山輝樹						
學分數	3	必/選修	選修	開課年級	*	
先修科目或先備能力：						
<p>The course is designed for senior and graduate students who have knowledge of introductory level of physics or chemistry. It is helpful but not required for students to have previous courses on biology or synchrotron radiation.</p>						
課程概述與目標：						
<p>Laser and synchrotron facilities have become indispensable tools for the advanced bio and biomedical researches. The completion of human genome sequence in early 2000 has further accelerated the needs of understanding the structures of proteins and functions of cells of medical importance. Recently, new interests for advanced measurements have been created as the low-emittance synchrotrons and lastly the X-ray free electron lasers become operational. The course is designed to introduce these new world-wide experimental facilities and discuss the emerging scientific opportunities not possible before. The course is also planned to include such newly emerged scientific topics as X-ray nano-imaging for cell biology and cancer research, laser-controlled crystallization for proteins, laser-fabricated nanomedicine, advancement of optical microscopy of bio imaging, and so on to study the dynamics of protein systems. The course is intended to be highly interactive and free of discussions.</p>						
教科書（請註明書名、作者、出版社、出版年等資訊）		“Molecular Biology of the Cell, by Bruce Alberts, et al. (Garland Science, 2008)				
課程大綱		分配時數				備註
單元主題	內容綱要	講授	示範	習作	其他	
教學要點概述：						
1.學期作業、考試、評量 Attendance (30%), Question (40%), Mid-term Exam (15%), Term-end exam (15%)						
2.教學方法及教學相關配合事項(如助教、網站或圖書及資料庫等)						

	排定時間	地點	連絡方式
師生 晤談	Every Wednesday 1:30 - 4:30 pm	SC 159	Prof. Teruki Sugiyama: TKP Building 612; E-mail : sugiyama@nctu.edu.tw; Office: 03-571-2121 Ext. 56594 Prof. K. S. Liang: Science Building III, Rm. 309; E- mail: ksliang@nsrrc.org.tw

每週進度表

週次	上課日期	課程進度、內容、主題
1	2/17	Photon Science in biomedical research: Advanced laser and synchrotron facilities
2	2/24	Cells, DNA, and proteins
3	3/2	Protein expression, purification, and characterizations Q&A-I (modern life science)
4	3/9	Synchrotron machines: Absorption & diffraction
5	3/16	X-ray Free Electron Laser: Nano crystallography, molecular imaging, and dynamics
6	3/23	Protein X-ray crystallography
7	3/30	Structure and function of proteins and protein complexes
8	4/6	Protein crystallography and drug design
9	4/13	Mid-term Exam Q&A-II (crystallization & crystallography)
10	4/20	X-ray nano tomography on cancer and brain
11	4/27	Femtosecond laser-based X-ray pulse generation toward future bio- applications
12	5/4	Laser-controlled protein crystallization
13	5/11	Laser fabrication of nanomedicine
14	5/18	Advancements of optical microscopy in cell imaging
15	5/25	Light sheet microscopy
16	6/1	Overview of optical microscopy of bioimaging
17	6/8	Single-molecule spectroscopy and microscopy
18	6/15	End-term Exam

※ 請同學遵守智慧財產權觀念及勿使用不法影印教科書。

備註：

1. 其他欄包含參訪、專題演講等活動。
2. 請同學遵守智慧財產權觀念及勿使用不法影印教科書。

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