

通訊所專業必修/必選修課程綱要表

課程名稱：(中文) 交換機結構		開課學程	通訊所	
(英文) Packet Switch Architectures		課程代碼	COM535300	
授課教師：張正尚或李端興				
學分數	3	必/選修	選修	開課年級
碩士班、博士班				
先修科目或先備能力：Probability, Linear Algebra				
課程概述與目標： In this course, we first give a detailed review of existing switch architectures, including both the output-buffered switches and input-buffered switches that are currently used in the Internet routers. We then move to the load-balanced Birkhoff-von Neumann switch, a switch architecture invented in Tsing Hua. We will show why the new architecture is much more scalable than the existing ones and thus can be built to meet the speed of fiber optics (in fact, it is funded by the PPAEU-II project to do so). In addition to all the electronic packet switches, we will also introduce our ground-breaking results in optical packet switches. We finally show how the classical switching theory can be used for constructing optical buffers. In short, this course will not only give you a comprehensive introduction of packet switches but also the research essence from the high speed switching team in Tsing Hua in last seven years. Here is a list of lecture topics.				
教科書 ¹	Cheng-Shang Chang and Duan-Shin Lee, Principles, Architectures and Mathematical Theory of High Performance Packet Switches, 清大出版社			
參考書目	<ol style="list-style-type: none"> 1. S.-Y. R. Li. Algebraic Switching Theory and Broadband Applications. Academic Press, 2001. 2. J. Y. Hui. Switching and Traffic Theory for Integrated Broadband Networks, Boston: Kluwer Academic Publishers, 1990. 3. Chao, Lam and Oki, Broadband Packet Switching Technologies, Wiley, 2001. 4. M. Schwartz, Broadband Integrated Networks, Prentice Hall, 1996. 5. F. K. Hwang. The Mathematical Theory of Nonblocking Switching Networks, Singapore: World Scientific Publishing Co., 1998 			
對應之學生核心能力		核心能力達成指標		比例
1. 發掘、分析、解決問題與獨立研究之能力		A.具備發掘問題之能力 B.具備分析問題之能力 C.具備解決問題之能力 D.具備獨立研究之能力		30%
2.通訊科技整合與創新之能力		A.具備整合通訊知識之能力 B.具備創新通訊科技知識之能力		20%
3.學習新知識與技術之能力		A.具備主動學習新知識之能力 B.具備學習新技術之能力		30%
4.良好溝通、表達與外語能力		A.具備與通訊專業人員溝通與表達專業知識之能力		10%

	B.具備外語專業能力用以溝通通訊專業知識	
5.具團隊精神及遵守專業倫理	A.具備團隊合作之能力與精神 B.能遵守專業倫理	10%
課程綱要	內容綱要	核心能力達成指標 (請勾選)
Introduction	1. The Internet 2. IP routers 3. Switch fabrics 4. Circuit switching, packet switching, and quasi-circuit switching 5. Optical packet switches	1- <input type="checkbox"/> A <input checked="" type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D 2- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B 3- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B 4- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B 5- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B
Basic Architectures and Principles of Packet Switches	1. Output-buffered switches 2. Input-buffered switches 3. Birkhoff-von Neumann switches 4. Three-stage constructions of switch fabrics 5. Two-stage constructions of switch fabrics 6. Exact emulation 7. Knockout switches	1- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B <input checked="" type="checkbox"/> C <input checked="" type="checkbox"/> D 2- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B 3- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B 4- <input type="checkbox"/> A <input checked="" type="checkbox"/> B 5- <input type="checkbox"/> A <input type="checkbox"/> B
Load Balanced Birkhoff-von Neumann switches	1. One-stage buffering 2. Switch fabrics 3. multi-stage buffering 4. Guaranteed rate services 5. Frame based schemes 6. Mailbox switches	1- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B <input checked="" type="checkbox"/> C <input checked="" type="checkbox"/> D 2- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B 3- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B 4- <input type="checkbox"/> A <input checked="" type="checkbox"/> B 5- <input type="checkbox"/> A <input type="checkbox"/> B
Optical packet switches	1. Direct implementation of optical RAM 2. Time slot interchange 3. 2-to-1 buffered multiplexers 4. N-to-1 buffered multiplexers 5. FIFO multiplexers with variable length bursts 6. FIFO queues 7. Building optical queues from classical switching theory 8. Priority optical queues	1- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B <input checked="" type="checkbox"/> C <input checked="" type="checkbox"/> D 2- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B 3- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B 4- <input type="checkbox"/> A <input checked="" type="checkbox"/> B 5- <input type="checkbox"/> A <input type="checkbox"/> B
<p>教學要點概述²：</p> <p>1. 教材編選：</p> <p>2. 教學方法：Lecturing with power points slides</p> <p>3. 評量方法：Homework 30%, midterm exam 30%, and final exam 40%</p> <p>4. 教學資源：Power point slides, homework problems and grading available on course web site</p>		

註：1. 教科書請註明書名、作者、出版社、出版年等資訊。

2. 教學要點概述請填寫教材編選、教學方法、評量方法、教學資源、教學相關配合事項等。
3. 研究所所有開設之課程皆須填寫此表格或提供原有格式之課程綱要表，並呈現於實地訪評現場。