University of Macau
Faculty of Science and Technology
Department of Computer and Information Science
SFTW430 Systems and Networks II
Syllabus
2nd Semester 2010/2011
Part A – Course Outline

Compulsory course in Computer Science

Catalog description:
(3-2) 4 credits. This course introduces computer network architectures and high level network protocols, and covers internetworking techniques and protocols, transport layer protocols, the TCP/IP protocol suite, socket networking programming interface, application layer protocols, domain name system, electronic mail and world wide web.

Prerequisites:
- SFTW331

Textbook(s) and other required material:
- Andrew Tanenbaum, *Computer Networks*, 4th ed., 2003, Prentice Hall (Required)

References:
None

Major prerequisites by topic:
- Basic principles of data communication.
- Basic data link layer protocols.

Course objectives:
- Introduce to students routing and congestion control algorithms for computer networks. [a, e, k]
- Enable students to understand principles of the TCP/IP protocol suite. [a, e, k]
- Introduce to students application layer protocols. [a, e, k]

Topics covered:
- **Network layer design issues (2 hours):** store-and-forward packet switching, services provided to the transport layer, implementation of connectionless service, implementation of connection-oriented service, comparison of virtual-circuit and datagram subnets.
- **Routing algorithms (4 hours):** optimality principle, shortest-path routing, flooding, distance vector routing, link state routing, hierarchical routing, broadcast routing, multicast routing, routing for mobile hosts, routing in Ad Hoc networks, node lookup in peer-to-peer networks.
- **Congestion control algorithms (3 hours):** general principles of congestion control, congestion prevention policies, congestion control in virtual-circuit subnets, congestion control in datagram subnets, load shedding, jitter control.
- **Quality of service (3 hours):** requirements, techniques for achieving good quality of service, integrated services, differentiated services, label switching and MPLS.
- **Network layer in the Internet (4 hours):** the IP protocol, IP addresses, Internet control protocols, OSPF, BGP, Internet multicasting, mobile IP, IPv6.
- **Transport service (3 hours):** services provided to the upper layers, transport service primitives, Berkeley sockets, an example of socket programming: an Internet file server.
- **Elements of transport protocols (3 hours):** addressing, connection establishment, connection release, flow control and buffering, multiplexing, crash recovery.
- **A simple transport protocol (3 hours):** the example service primitives, the example transport entity.
- **The Internet Transport Protocols: UDP (2 hours):** introduction to UDP, remote procedure call, the real-time transport protocol.

- **TCP (4 hours):** the TCP service model, the TCP protocol, the TCP segment header, TCP connection establishment, TCP connection release, TCP connection management modeling, TCP transmission policy, TCP congestion control, TCP timer management.
- **Domain name system (3 hours):** the DNS name space, resource records, name servers.
- **Electronic mail (3 hours):** architecture and services, the user agent, message formats, message transfer, final delivery.
- **World wide web (3 hours):** architectural overview, HTTP – the hypertext transfer protocol, performance enhancements.

Class/laboratory schedule:

Timetabled work in hours per week			No of teaching weeks	Total hours	Total credits	No/Duration of exam papers
Lecture	**Tutorial**	**Practice**				
3	2	Nil	14	70	4	1 / 3 hours

Student study effort required:

Class contact:	
Lecture	42 hours
Tutorial	28 hours
Other study effort	
Self-study	35 hours
Homework assignment	15 hours
Total student study effort	120 hours

Student assessment:
Final assessment will be determined on the basis of:

Homework	10%
Mid-term	30%
Final exam	60%

Course assessment:
The assessment of course objectives will be determined on the basis of:
- Homework, mid-term test and final exams
- Course evaluation

Course outline:

Weeks	Topic	Course work
1-2	**Network layer design issues** store-and-forward packet switching, services provided to the transport layer, implementation of connectionless service, implementation of connection-oriented service, comparison of virtual-circuit and datagram **Routing algorithms** optimality principle, shortest-path routing, flooding, distance vector routing, link state routing, hierarchical routing, broadcast routing, multicast routing, routing for mobile hosts, routing in Ad Hoc networks, node lookup in peer-to-peer networks	Assignment 1
3	**Congestion control algorithms** general principles of congestion control, congestion prevention policies, congestion control in virtual-circuit subnets, congestion control in datagram subnets, load shedding, jitter control.	
4	**Quality of service** requirements, techniques for achieving good quality of service,	Assignment 2

Weeks	Topic	Course work
	integrated services, differentiated services, label switching and MPLS	
5-6	**Network layer in the Internet Communication networks** the IP protocol, IP addresses, Internet control protocols, OSPF, BGP, Internet multicasting, mobile IP, IPv6	
6-9	**Transport service** services provided to the upper layers, transport service primitives, Berkeley sockets, an example of socket programming: an Internet file server **Elements of transport protocols** addressing, connection establishment, connection release, flow control and buffering, multiplexing, crash recovery **A simple transport protocol** the example service primitives, the example transport entity **The Internet Transport Protocols: UDP** introduction to UDP, remote procedure call, the real-time transport protocol	Assignment 3 Assignment 4
10-11	**TCP** the TCP service model, the TCP protocol, the TCP segment header, TCP connection establishment, TCP connection release, TCP connection management modeling, TCP transmission policy, TCP congestion control, TCP timer management	Mid-term test Assignment 5
12	**Domain name system** the DNS name space, resource records, name servers	
13	**Electronic mail** architecture and services, the user agent, message formats, message transfer, final delivery	Assignment 6
14	**World wide web** architectural overview, HTTP – the hypertext transfer protocol, performance enhancements	

Contribution of course to meet the professional component:
This course prepares students to work professionally in the area of computer networks.

Relationship to CS program objectives and outcomes:
This course primarily contributes to the Computer Science program outcomes that develop student abilities to:
(a) an ability to apply knowledge of computing, mathematics, science, and engineering.
(e) an ability to analyze a problem, and identify, formulate and use the appropriate application requirements for obtaining its computing solution.
(k) an ability to use the techniques, skills, and modern computer tools necessary for engineering practice.

Relationship to CS program criteria:

Criterion	DS	PF	AL	AR	OS	NC	PL	HC	GV	IS	IM	SP	SE	CN
Scale: 1 (highest) to 4 (lowest)			3			1								

Discrete Structures (DS), Programming Fundamentals (PF), Algorithms and Complexity (AL), Architecture and Organization (AR), Operating Systems (OS), Net-Centric Computing (NC), Programming Languages (PL), Human-Computer Interaction (HC), Graphics and Visual Computing (GV), Intelligent Systems (IS), Information Management (IM), Social and Professional Issues (SP), Software Engineering (SE), Computational Science (CN).

Course content distribution:

Percentage content for			
Mathematics	Science and engineering subjects	Complementary electives	**Total**
0%	100%	0%	100%

Coordinator:
Prof. Yiu Kwok Tham

Persons who prepared this description:
Prof. Yiu Kwok Tham, Dr. Chi Man Vong

Part B – General Course Information and Policies

2nd Semester 2010/2011

Instructor:	Prof. Yiu Kwok Tham	Office:	N311
Office hour:	Wed & Thu p:oo am – 11:30 am, or by appointment	Phone:	8397 4357
Email:	yktham@umac.mo		

Time/Venue: Tue 1:30 pm – 3:30 pm, JG13 (lectures)
Thu 11:30 am – 12:30 pm, JG13 (lectures)
Fri 1:30 pm – 3:30 pm, JG13 (tutorial)

Grading distribution:

Percentage Grade	Final Grade	Percentage Grade	Final Grade
100 - 93	A	92 - 88	A–
87 - 83	B+	82 - 78	B
77 - 73	B–	72 - 68	C+
67 - 63	C	62 - 58	C–
57 - 53	D+	52 - 50	D
below 50	F		

Comment:
The objectives of the lectures are to explain and to supplement the text material. Students are responsible for the assigned material whether or not it is covered in the lecture. Students who wish to succeed in this course should read the textbook prior to the lecture and should work through all homework assignments.

Homework policy:
Working through homework assignments is an integral part of learning.
- There will be approximately 6 homework assignments.
- Homework is due one week after assignment unless otherwise noted; no late homework is accepted.
- The course grade will be partly based on the average of the homework grades.

Mid-term test:
One mid-term test will be held during the semester.

Note:
- Tutorial session is an important part of the course; attendance is strongly recommended.
- No make-up exam is given except for CLEAR medical proof.
- Cheating is prohibited.