

NMK30703-Programming for Networking

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Synopsis

The aims of this course are to introduce the students of programming in network and students get familiar with the mechanism of protocols that consists in the network. This course provides the skills to programme the network protocols to work properly to transfer data from sender to the receiver are exposed. The students are able to analyse, test, develop and design the protocols that are setting up a network.

Course Outcomes (COs)

- **CO1: Ability to EXPLAIN and APPLY the concepts of network programming and the related network protocols involved.**
- **CO2: Ability to APPLY network programming in computer networking environments.**
- **CO3: Ability to DESIGN the architecture of network application/web.**
- **CO4: Ability to DEVELOP an application and IMPROVE its Java language as an application by using network programming techniques learned.**

Time Table

Tuesday	13:00 – 16:00 Y3G2 (Lab G1 – MKM2)	
Thursday	8:30 – 11:30 (Lab G2 – Makmal Komputer)	
Friday	17:00 – 19:00 (Lec – FKTEN 1-Bilik Tutorial)	

Topics 1

1- BASIC NETWORK CONCEPTS

- A. DEFINE and EXPLAIN** in details the networks and the Internet work.
- Overview of networks
 - Review of the OSI Model and TCP/IP Model
 - Data Encapsulation in a Layered Networking Model
 - Review of IP, TCP and UDP Protocols
 - Overview of firewalls and proxy servers
 - Internet standardization process

2- STREAMS AND THREADS

- A. DESCRIBE and IDENTIFY** basic concepts of I/O in Java:
- Input streams read data
 - Output streams write data
 - Filter Streams
 - Readers and writers streams
- B. DESCRIBE and APPLY** the threads
- Running Threads
 - Returning Information from a Thread
 - Synchronization
 - Deadlock
 - Thread Scheduling
 - Thread Pools and Executors

3- INTERNET ADDRESSES

- A. (DISCUSS and SHOW** Java programs interact with the Domain Name System through the InetAddress class)
- The InetAddress Class
 - Inet4Address and Inet6Address
 - The Network Interface Class
 - Spam Check
- B. ANALYZE and SHOW** powerful abstraction for downloading information and files from network servers and the URL class enables to connect and download files and documents from a network server.
- URLs and URIs class
 - Proxies
 - Communicating with Server
 - Accessing Password
 - URL Connections

Topics 2

4- HYPERTEXT TRANSFER PROTOCOL (HTTP)

- A.** **DESIGN** and **DISPLAY** how a web clients talks to a server and how data transfer from the server back to the client
- The Protocol
 - HTTP Methods
 - Cookies
- B.** **CREATE** and **SHOW** how to write networks clients that interact with TCP servers, how to use the socket server and to protect client server communications using the Secure Socket Layers (SSL)
- Socket for Clients
 - Socket for Servers
 - Secure Sockets

5- NONBLOCKING I/O

- A.** **DISCUSS** the new I/O APIs specifically designed for network servers. Enable program to figure out whether a connection is ready before it tries to read from or write to the socket.
- Creating Buffers
 - Data Conversion
 - Compacting Buffers
 - Duplicating Buffers
 - Channels

6- USER DATAGRAM PROTOCOL (UDP)

- A.** **REVISE** and **IMPROVE** the User Datagram Protocol (UDP) and the associated Datagram Packet and Datagram Socket classes that provide fast, unreliable communication.
- The UDP Protocol
 - UDP Clients
 - UDP Servers
 - The Datagram Packet Class
 - The Datagram Socket Class
 - Datagram Channel
- B.** **DESIGN** the UDP to communicate with multiple hosts at the same time.
- Multicast Addresses and Groups
 - Clients and Servers
 - Routers and Routing
 - Multicast Sockets

Labs

Lab 1 : Introduction to the ISO Model and the Transport Layer

Lab 2 : TCP Client/server

Lab 3 : I/O Multiplexing

Lab 4 : UDP Echo Server/Client

Lab 5 : SCTP Protocol

Lab 6 : Non-Blocking Input/output

Lab 7 : Threads

Lab 8 : Raw Sockets

Assessment

Course Outcomes (CO)		Level of Complexity	Programme Outcomes	Assessment Components & Contribution							
				Components	Group (G) Individual (I)	Engineering Problems (WP, SP, DP)	Engineering Activities (EA, TA, NA)	Final Examination (FE)	Continuous Assessment (CA)	Total	
								%	%	%	
CO1	Ability to EXPLAIN and APPLY the concepts of network programming and the related network protocols involved.	C3	P02	TEST - Q1	I	SP1	-		10	25	
			P02	FINAL EXAM Q1&Q2	I	SP1	-	16			
CO2	Ability to APPLY network programming in computer networking environments.	C3	P02	TEST - Q2	I	SP1	-		10	20	
			P02	FINAL EXAM Q3	I	SP1	-	8			
			P02	QUIZ	I		-		5		
CO3	Ability to DESIGN the architecture of network applications/web.	C6	P03	FINAL EXAM Q4 and Q5/6	I	SP1		16		25	
			P03	QUIZ	I				5		
CO4	Ability to DEVELOP and IMPROVE Java language as an application by using network programming techniques learned.	C6 P4	P05	LAB WORK	I	SP1	-		15	30	
			P09	MINI PROJECT	G	SP1			15		
Total				Individual (I) %		85			40	60	100
				Group (G) %		15					

Text books:

Text books:

- **Harold Elliot Reilly.**, "Java Network Programming", 4th Edition, O'Reilly's & Associated, 2014.

References:

- **Marty Hall and Larry Brown.**, "Core Web Programming", 6th Edition, Prentice Hall, 2012.
- **David Reilly and Michael Reilly.**, "Java Network Programming and Distributed Computing", Addison Wesley, 2011.
- **Jonathan Knudsen.**, "Wireless Java-Developing with J2ME", Apress, 2011.
- **Tomasi, W.**, "Introduction to Network Programming", Prentice Hall, 2011.
- **Forouzan, B.**, "Network Programming". McGraw Hill, 2010.

Q & A