


Course Outline	
COMP6120 Network Programming (2/2)	
Effective Date 01 February 2016	Study Program Computer Science Revision 0

1. Course Description

This course consists in network programming concept and techniques that enable processes to communicate with each other across computer network. The students taking this course will have an experience and skill of writing simple client-server application program using C, C++ and Java programming language.

2. Graduate Competency

Each course in the study program contributes to the graduate competencies that are divided into employability and entrepreneurial skills and study program specific outcomes, in which students need to have demonstrated by the time they complete their course.

BINUS University employability and entrepreneurial skills consist of planning and organizing, problem solving and decision making, self management, team work, communication, and initiative and enterprise.

2.1. Employability and Entrepreneurial Skills

Aspect	Key Behaviour

2.2. Study Program Specific Outcomes

Study Program Specific Outcomes
Able to demonstrate knowledge and understanding of algorithm concepts, principles and theories relating to computer science knowledge.
Able to classify problems and to apply design and development principles for specific problems
Able to classify criteria and specifications appropriate to specific problems, plan strategies for their solution and construct software system development

3. Topics

- Network System Overview
- Socket Introduction
- Elementary TCP Sockets
- Multiprocessing Server
- Multithreading Server
- I/O Multiplexing Server
- UDP Sockets
- Java Socket Programming I
- Java Socket Programming II
- C++ Socket Programming
- Winsock Programming
- Unicast, Multicast and Broadcast
- Review

4. Learning Outcomes

On successful completion of this course, student will be able to:

- LO 1: Explain the concept of network programming techniques
- LO 2: Demonstrate some programs with common protocols used in computer network

- LO 3: Select network programming techniques and protocols for solving a problem

5. Teaching And Learning Strategies

In this course, the lecturers might deploy several teaching learning strategies, including Lecture, Demonstrate application of rules/laws/theories thr, Demonstrate problem-solving through case studies, Problem Solving, and Presentation.

6. Textbooks and Other Resources

6.1 Textbooks

1. Michael J. Donahoo. (2009). **TCP / IP Sockets in C Bundle: TCP/IP Sockets in C, Second Edition: Practical Guide for Programmers**. 02. Mokita Press. ISBN: 978-1-118-03469-9.
2. Kenneth L. Calvert; Michael J. Donahoo. (2008). **TCP/IP Sockets in Java, Second Edition: Practical Guide for Programmers (The Practical Guides)**. 02. Morgan Kaufmann Publishers. ISBN: 978-0123742551.

The book in the first list is a must to have for each student.

6.2 Other Resources

1. http://www.tutorialspoint.com/unix_sockets/what_is_socket.htm
2. <http://beej.us/guide/bgnet/output/html/multipage/syscalls.html#sendtorecv>
3. <http://beej.us/guide/bgnet/output/html/multipage/theory.html>
4. <http://stackoverflow.com/questions/6777946/sending-broadcast-in-linux-via-sockets>
5. <http://cs.tau.ac.il/~amir1/COURSE2005-2006/PPT2009-2010/Thread2.ppt>
6. <http://beej.us/guide/bgnet/output/html/multipage/ipstructsdata.html>
7. http://icapeople.epfl.ch/grossglauser/sc250_2007/lectures/sc250_07_05.pdf
8. <http://unlser1.unl.csi.cuny.edu/faqs/sock-faq/html/unix-socket-faq-4.html>
9. <http://http://www.codeproject.com/Articles/1891/Beginning-Winsock-Programming-Simple-TCP-server>
10. Multi process-Multi Threaded
11. I/O Multiplexing Enrichment
12. <http://http://beej.us/guide/bgnet/output/html/multipage/syscalls.html>
13. http://icapeople.epfl.ch/grossglauser/sc250_2007/lectures/sc250_07_05.pdf
14. <http://beej.us/guide/bgnet/output/html/multipage/man.html>
15. <http://beej.us/guide/bgnet/output/html/multipage/advanced.html>

7. Schedule

Theory

Session/ Mode	Related LO	Topics	References
1 F2F	LO 1	Network System Overview - Network system elements - Network software - Communications protocol - Protocol layer - OSI Model - TCP/IP Reference Model - Network Programming Tools - Client Server Application	- Network System Overview - TCP / IP Sockets in C Bundle: TCP/IP Sockets in C, Second Edition: Practical Guide for Programmers, TCP/IP Sockets in C, chapter 1 - What is a Socket?, http://www.tutorialspoint.com/unix_sockets/what_is_socket.htm - , http://beej.us/guide/bgnet/output/html/multipage/theory.html
2 F2F	LO 1 LO 2	Socket Introduction - Network API - Port - Creating Sockets - Socket address structure - Byte Ordering - Network Byte Order	- Socket Introduction - TCP / IP Sockets in C Bundle: TCP/IP Sockets in C, Second Edition: Practical Guide for Programmers, TCP/IP Sockets in C, chapter 1 & 2

		<ul style="list-style-type: none"> - Byte manipulation function - IPv4 Address Conversion - Programming Example 	<ul style="list-style-type: none"> - Socket Introduction, http://beej.us/guide/bgnet/output/html/multipage/ipstructsd ata.html
3 F2F	LO 2	Elementary TCP Sockets <ul style="list-style-type: none"> - socket function - connect function - bind function - listen function - accept function - read function - write function - Case Study 	<ul style="list-style-type: none"> - Elementary TCP Sockets - TCP / IP Sockets in C Bundle: TCP/IP Sockets in C, Second Edition: Practical Guide for Programmers, TCP/IP Sockets in C, chapter 2 & 3 - System Calls or Bust, http://http://beej.us/guide/bgn et/output/html/multipage/syscalls.html - Man Pages, http://beej.us/guide/bgnet/output/html/multipage/man.html
4 GSLC	LO 1 LO 2	Multiprocessing Server <ul style="list-style-type: none"> - Process understanding - Process Hierarchy - System calls that related to the process - Case Study 	<ul style="list-style-type: none"> - Multiprocessing Server - TCP / IP Sockets in C Bundle: TCP/IP Sockets in C, Second Edition: Practical Guide for Programmers, TCP/IP Sockets in C, chapter 6.4 - Multi process-Multi Threaded, http://cs.tau.ac.il/~amir1/COURSE2005-2006/PPT2009-2010/Thread2.ppt
5 F2F	LO 1 LO 2	Multithreading Server <ul style="list-style-type: none"> - Thread Understanding - Differences between multi-process and multi-thread - Case Study 	<ul style="list-style-type: none"> - Multithreading Server - TCP / IP Sockets in C Bundle: TCP/IP Sockets in C, Second Edition: Practical Guide for Programmers, TCP/IP Sockets in C, chapter 6.4 - Multi process-Multi Threaded
6 F2F	LO 1 LO 2	I/O Multiplexing Server <ul style="list-style-type: none"> - I/O model - Blocking I/O model - Non-Blocking I/O model - I/O multiplexing model - Signal driven I/O Model - Asynchronous I/O Model - Select function 	<ul style="list-style-type: none"> - I/O Multiplexing Server - TCP / IP Sockets in C Bundle: TCP/IP Sockets in C, Second Edition: Practical Guide for Programmers, TCP/IP Sockets in C, chapter 6.3, 6.5. - I/O Multiplexing Enrichment - Slightly Advanced Techniques, http://beej.us/guide/bgnet/output/html/multipage/advanced .html - Writing Server Applications (TCP/SOCK_STREAM), http://unlser1.unl.csi.cuny.edu/faqs/sock-faq/html/unix-socket-faq-4.html
7 F2F	LO 1 LO 2 LO 3	UDP Sockets <ul style="list-style-type: none"> - Differences between TCP and UDP - Recvfrom and sendto functions - Blocking and Unblocking 	<ul style="list-style-type: none"> - UDP Sockets - TCP / IP Sockets in C Bundle: TCP/IP Sockets in C, Second Edition: Practical Guide for Programmers,

		- Case Study	TCP/IP Sockets in C, chapter 4 - Sendto() and recvfrom()—Talk to me, DGRAM-style, http://beej.us/guide/bgnet/output/html/multipage/syscalls.html#sendtorecv
8 F2F	LO 2	Java Socket Programming I - Basic Socket - Sending and Receiving messages	- Java Socket Programming I - TCP/IP Sockets in Java, Second Edition: Practical Guide for Programmers (The Practical Guides), TCP/IP Sockets in Java, chapter 3 and 4 - Socket Programming, http://icapeople.epfl.ch/grossglauser/sc250_2007/lectures/sc250_07_05.pdf
9 GSLC	LO 2 LO 3	Java Socket Programming II - Case Study	- Java Socket Programming II - TCP/IP Sockets in Java, Second Edition: Practical Guide for Programmers (The Practical Guides), TCP/IP Sockets in Java, chapter 3 and 4 - Computer Network I, http://icapeople.epfl.ch/grossglauser/sc250_2007/lectures/sc250_07_05.pdf
10 F2F	LO 2	C++ Socket Programming - C++ Socket Programming	- C++ Socket Programming - TCP / IP Sockets in C Bundle: TCP/IP Sockets in C, Second Edition: Practical Guide for Programmers, TCP/IP Sockets in C, chapter 8
11 F2F	LO 1 LO 2	Winsock Programming - What is Winsock? - Elements of Winsock Programming - Supported Programming models	- Winsock Programming - TCP / IP Sockets in C Bundle: TCP/IP Sockets in C, Second Edition: Practical Guide for Programmers, TCP/IP Sockets in C, chapter 2 & 3 - Beginning Winsock Programming - Simple TCP server, http://http://www.codeproject.com/Articles/1891/Beginning-Winsock-Programming-Simple-TCP-server
12 GSLC	LO 1 LO 2	Unicast, Multicast and Broadcast - Unicast - Multicast - Broadcast	- Unicast, Multicast and Broadcast - TCP / IP Sockets in C Bundle: TCP/IP Sockets in C, Second Edition: Practical Guide for Programmers, TCP/IP Sockets in C, chapter 6.6 - Sending broadcast in Linux via Sockets, http://stackoverflow.com/que

			stions/6777946/sending-broadcast-in-linux-via-sockets
13 F2F	LO 1 LO 2 LO 3	Review - Review	- Review - TCP / IP Sockets in C Bundle: TCP/IP Sockets in C, Second Edition: Practical Guide for Programmers,

Practicum

Session/ Mode	Related LO	Topics	References
1 F2F	LO 1 LO 2	Socket Introduction - Introduction to Socket API	- Socket Introduction - TCP / IP Sockets in C Bundle: TCP/IP Sockets in C, Second Edition: Practical Guide for Programmers,
2 F2F	LO 2	Elementary TCP Sockets - Creating C Client-Server program using TCP/IP Protocol	- Elementary TCP Sockets - TCP / IP Sockets in C Bundle: TCP/IP Sockets in C, Second Edition: Practical Guide for Programmers,
3 F2F	LO 1 LO 2	Multiprocessing Server - Creating C Client-Server program using Multi-process and I/O Multiplexing	- Multiprocessing Server - TCP / IP Sockets in C Bundle: TCP/IP Sockets in C, Second Edition: Practical Guide for Programmers,
4 F2F	LO 1 LO 2	Multithreading Server - Creating C Client-Server program program using Multi-process and Multi-Threading	- Multithreading Server - TCP / IP Sockets in C Bundle: TCP/IP Sockets in C, Second Edition: Practical Guide for Programmers,
5 F2F	LO 1 LO 2	Unicast, Multicast and Broadcast - Material review: Introduction to Socket API, Creating C Client-Server program using TCP/IP Protocol, Creating C Client-Server program using Multi-process and I/O Multiplexing, and Creating C Client-Server program program using Multi-process and Multi-Threading	- Unicast, Multicast and Broadcast - TCP / IP Sockets in C Bundle: TCP/IP Sockets in C, Second Edition: Practical Guide for Programmers,
6 F2F	LO 1 LO 2	Quiz 1 - Quiz 1	- Quiz 1 - TCP / IP Sockets in C Bundle: TCP/IP Sockets in C, Second Edition: Practical Guide for Programmers,
7 F2F	LO 1 LO 2	Introduction to Java Programming - Input, Output, Looping , Selection - Threading	- Introduction to Java Programming - TCP / IP Sockets in C Bundle: TCP/IP Sockets in C, Second Edition: Practical Guide for Programmers,
8 F2F	LO 2 LO 3	TCP Sockets in Java - Implementing Java TCP Socket in Client - Implementing Java TCP Socket in Server	- TCP Sockets in Java - TCP / IP Sockets in C Bundle: TCP/IP Sockets in C, Second Edition: Practical Guide for Programmers,
9 F2F	LO 2 LO 3	UDP Sockets Client-Server in Java - Implementing Java UDP Socket in Client - Implementing Java UDP Socket in Server	- UDP Sockets Client-Server in Java - TCP / IP Sockets in C Bundle: TCP/IP Sockets in C, Second Edition: Practical

10 F2F	LO 2 LO 3	UDP Sockets Broadcast in Java - Broadcasting to Multiple Recipient	Guide for Programmers, - UDP Sockets Broadcast in Java - TCP / IP Sockets in C Bundle: TCP/IP Sockets in C, Second Edition: Practical Guide for Programmers,
11 F2F	LO 1 LO 2 LO 3	Review - Review	- Review - TCP / IP Sockets in C Bundle: TCP/IP Sockets in C, Second Edition: Practical Guide for Programmers,
12 F2F	LO 1 LO 2 LO 3	Quiz 2 - Quiz 2	- Quiz 2 - TCP / IP Sockets in C Bundle: TCP/IP Sockets in C, Second Edition: Practical Guide for Programmers,

8. Evaluation

Theory

Assessment Activity	Weight	Learning Outcomes		
		1	2	3
Assignment	20%	√	√	√
Mid Exam	30%	√	√	√
Final Exam	50%	√	√	√

Practicum

Assessment Activity	Weight	Learning Outcomes		
		1	2	3
Assignment	100%	√	√	√

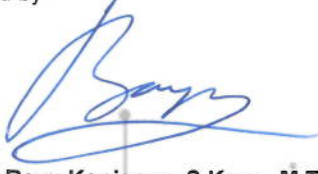


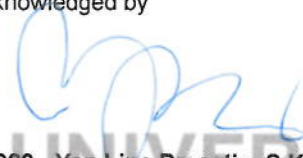
Final Evaluation Score

Aspects	Weight
Theory	70%
Practicum	30%

9. A. Assessment Rubric (Study Program Specific Outcomes)

LO	Indicators	Proficiency Level			
		Excellent (85 – 100)	Good (75 – 84)	Average (65 – 74)	Poor (<= 64)
LO 1	1.1. Ability to explain Client-Server Concept.	The explanations are complete and clearly stated	The explanations are complete but not clearly stated	The explanations are incomplete but clearly stated	The explanations are incomplete and not clearly stated
	1.2. Ability to explain Socket API and its functions.	The explanations are complete and clearly stated	The explanations are complete but not clearly stated	The explanations are incomplete but clearly stated	The explanations are incomplete and not clearly stated
	1.3. Ability to explain Unicast, Multicast and Broadcast Concept.	The explanations are complete and clearly stated	The explanations are complete but not clearly stated	The explanations are incomplete but clearly stated	The explanations are incomplete and not clearly stated
LO 2	2.1. Demonstrate some C programs with common protocol used in computer network.	The program using common protocol is cleanly compiled and executed properly without warning	The program using common protocol is compiled and executed properly with some warning	The program using common protocol is compiled properly but is executed wrongly	The program using common protocol is compiled and executed wrongly
	2.2. Demonstrate some C++ programs with common protocol used in computer network.	The program using common protocol is cleanly compiled and executed properly without warning	The program using common protocol is compiled and executed properly with some warning	The program using common protocol is compiled properly but is executed wrongly	The program using common protocol is compiled and executed wrongly
	2.3. Demonstrate some Java programs with common protocol used in computer network.	The program using common protocol is cleanly compiled and executed properly without warning	The program using common protocol is compiled and executed properly with some warning	The program using common protocol is compiled properly but is executed wrongly	The program using common protocol is compiled and executed wrongly

LO 3	3.1. Select network programming techniques and protocols for solving a problem.	The selection of a technique and protocol solve the problem and clearly explained	The selection of a technique and protocol nearly solve the problem	The selection of a technique and protocol less solve the problem	The selection of a technique and protocol not solve the problem
	3.2. Apply network programming techniques and protocols for solving a problem.	The selection and application of a technique solve the problem and clearly explained	The application of a technique and protocol nearly solve the problem	The application of a technique and protocol less solve the problem	The application of a technique and protocol not solve the problem

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