



## Course Specifications

<b>Course Title:</b>	Network Programming
<b>Course Code:</b>	441 CNET-3
<b>Program:</b>	Bachelor in Computer and Network Engineering
<b>Department:</b>	Computer and Network Engineering
<b>College:</b>	Computer Science and Information Technology
<b>Institution:</b>	Jazan University

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## A. Course Identification

<b>1. Credit hours:</b> 03
<b>2. Course type</b>
a. University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b. Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
<b>3. Level/year at which this course is offered:</b> Level 14 / Year 05
<b>4. Pre-requisites for this course (if any):</b> 331 CNET-3
<b>5. Co-requisites for this course (if any):</b> None

### 6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	52	100%
2	Blended	--	--
3	E-learning	--	--
4	Distance learning	--	--
5	Other	--	--

### 7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	22
2	Laboratory/Studio	22
3	Tutorial	--
4	Exams and Revision	8
	<b>Total</b>	<b>52</b>

## B. Course Objectives and Learning Outcomes

### 1. Course Description

This Course provides a complete introduction to developing Network Programs with Java. The focus is on creating Network Applications using TCP and UDP Protocols. You will learn how to use Java's Network Class Library to accomplish and understand various Networking Concepts. Topics include: I/O Streams, File Handling, InetAddress Class, Client Server Sockets using TCP and UDP Protocols, URL Class, URLConnection Class, Multithreading, Remote Method Invocation (RMI), Multicast using UDP, Secure Client Server Sockets.

### 2. Course Main Objective

- Identify and Apply various Network Programming Concepts and Mechanisms.
- Understand the Packages and Classes used in implementing Networking Applications.
- Implement Client-Server Applications using TCP and UDP Sockets.
- Demonstrate Multithreading and Multicasting Techniques.
- Implement a Distributed Application using Remote Method Invocation (RMI).

- Understand Secure Network Communications using Client Server Sockets.

### 3. Course Learning Outcomes

CLOs		Aligned PLOs
1	<b>Knowledge and Understanding:</b>	
1.1	<b>Describe</b> I/O Streams and File Handling in Java.	K2
1.2	<b>Explain</b> the various Classes and their Methods for Implementing Networking Applications.	K1
2	<b>Skills:</b>	
2.1	<b>Implement</b> Client Server Programs using TCP, UDP Sockets to perform Inter-Process Communications.	S1
2.2	<b>Apply</b> Network Based Applications using Multithreading, RMI and Multicast Concepts.	S2
2.3	<b>Analyze</b> Client and Server Sockets that handles the Encryption for Secure Communications.	S5
2.4	<b>Communicate</b> effectively in their presentations to demonstrate their work.	S4
3	<b>Values:</b>	
3.1	<b>Function</b> efficiently in a group to create various Network Based Client Server Applications.	V1

### C. Course Content

No	List of Topics	Contact Hours
1	<b>Chapter 1: Basic Concepts, I/O Streams, File Handling:</b> <ul style="list-style-type: none"> <li>• Ports and Socket</li> <li>• Output Stream</li> <li>• Input Stream</li> <li>• Filter Stream</li> <li>• Buffered Streams</li> <li>• Reader and Writer</li> <li>• File Handling</li> <li>• File Methods</li> <li>• Command Line Parameters</li> </ul>	5T + 4P
2	<b>Chapter 2: InetAddress Class, TCP Sockets, URL Class:</b> <ul style="list-style-type: none"> <li>• InetAddress Class Methods</li> <li>• Getter Methods</li> <li>• Basic Lifecycle of Server Program</li> <li>• ServerSocket Class</li> <li>• Server Socket Constructors</li> <li>• Steps to Create TCP Server Socket</li> <li>• Client Socket Constructors</li> <li>• Steps to Create TCP Client Socket</li> <li>• URL Syntax</li> <li>• URL Class Constructors</li> <li>• URLConnection Class</li> <li>• URL Methods</li> </ul>	4T + 4P
3	<b>Chapter 3: UDP Sockets:</b>	

	<ul style="list-style-type: none"> <li>• Introduction of DatagramPacket and DatagramSocket Class</li> <li>• DatagramPacket Class Constructors to receive and send datagrams</li> <li>• get methods</li> <li>• set methods</li> <li>• DatagramSocket Class Constructors</li> <li>• DatagramSocket Class Methods to send and receive datagrams</li> <li>• Steps to Create UDP Server</li> <li>• Steps to Create UDP Client</li> </ul>	4T + 4P
4	<p><b>Chapter 4: Multithreading, RMI and Multicasting:</b></p> <ul style="list-style-type: none"> <li>• Using Threads in Java</li> <li>• Extending the Thread Class</li> <li>• Implementing the Runnable Interface</li> <li>• Multithreading</li> <li>• Advantages of Multithreaded Servers</li> <li>• Multithreaded Server Process</li> <li>• Thread States</li> <li>• RMI (Remote Method Invocation) Introduction</li> <li>• The Basic RMI Process</li> <li>• RMI Implementation Details</li> <li>• RMI Security</li> <li>• Multicast Introduction</li> <li>• How Multicast Works</li> <li>• Multicast Addresses</li> <li>• Multicast Groups</li> <li>• Routers and Routing</li> <li>• Multicast Socket Constructors</li> <li>• Communicating with a Multicast Group</li> </ul>	5T + 6P
5	<p><b>Chapter 5: Secure Sockets:</b></p> <ul style="list-style-type: none"> <li>• Secure Communications</li> <li>• Java Secure Socket Extension (JSSE)</li> <li>• Creating Secure Client Sockets using createSocket( ) Methods</li> <li>• Choosing the Cipher Suites</li> <li>• Cipher Suite Example</li> <li>• Session Management</li> <li>• Client Mode</li> <li>• Creating Secure Server Sockets using createServerSocket( ) Methods</li> <li>• Configuring SSLServerSockets</li> </ul>	4T + 4P
	<b>Exams</b>	4T + 4P
<b>Total</b>		52

**Online Study Topics:**

- Client Server Model
- Predefined Streams
- FileInputStream
- FileOutputStream
- Getting Information about Client and Server Sockets
- Thread Basics
- Thread Class Methods
- Multicast Applications

**D. Teaching and Assessment****1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods**

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
<b>1.0</b>	<b>Knowledge and Understanding</b>		
1.1	<b>Describe</b> I/O Streams and File Handling in Java.	<ul style="list-style-type: none"> <li>➤ Lectures</li> <li>➤ Classroom Discussion</li> <li>➤ Lab Exercises</li> </ul>	<ul style="list-style-type: none"> <li>➤ Assignment</li> <li>➤ Mid-Term Exam</li> <li>➤ Final Exam</li> </ul>
1.2	<b>Explain</b> the various Classes and their Methods for Implementing Networking Applications.	<ul style="list-style-type: none"> <li>➤ Lectures</li> <li>➤ Classroom Discussion</li> <li>➤ Lab Exercises</li> </ul>	<ul style="list-style-type: none"> <li>➤ Assignment</li> <li>➤ Mid-Term Exam</li> <li>➤ Final Exam</li> </ul>
<b>2.0</b>	<b>Skills</b>		
2.1	<b>Implement</b> Client Server Programs using TCP, UDP Sockets to perform Inter-Process Communications.	<ul style="list-style-type: none"> <li>➤ Lectures</li> <li>➤ Classroom Discussion</li> <li>➤ Lab Exercises</li> </ul>	<ul style="list-style-type: none"> <li>➤ Assignment</li> <li>➤ Mid-Term Exam</li> <li>➤ Final Exam</li> <li>➤ Lab Exam</li> </ul>
2.2	<b>Apply</b> Network Based Applications using Multithreading, RMI and Multicast Concepts.	<ul style="list-style-type: none"> <li>➤ Lectures</li> <li>➤ Classroom Discussion</li> <li>➤ Lab Exercises</li> </ul>	<ul style="list-style-type: none"> <li>➤ Assignment</li> <li>➤ Final Exam</li> <li>➤ Lab Exam</li> </ul>
2.3	<b>Analyze</b> Client and Server Sockets that handles the Encryption for Secure Communications.	<ul style="list-style-type: none"> <li>➤ Lectures</li> <li>➤ Classroom Discussion</li> <li>➤ Lab Exercises</li> </ul>	<ul style="list-style-type: none"> <li>➤ Final Exam</li> <li>➤ Lab Exam</li> </ul>
2.4	<b>Communicate</b> effectively in their presentations to demonstrate their work.	<ul style="list-style-type: none"> <li>➤ Demonstration / Presentation</li> </ul>	<ul style="list-style-type: none"> <li>➤ Mini Project</li> <li>➤ Assignment</li> </ul>
<b>3.0</b>	<b>Values</b>		
3.1	<b>Function</b> efficiently in a group to create various Network Based Client Server Applications.	<ul style="list-style-type: none"> <li>➤ Demonstration / Presentation</li> </ul>	<ul style="list-style-type: none"> <li>➤ Mini Project</li> <li>➤ Assignment</li> </ul>

## 2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Assignments / Mini Project	4 <sup>th</sup> Week	20%
2	Midterm Exam	6 <sup>th</sup> Week	20%
3	Lab Exam	11 <sup>th</sup> Week	20%
4	Final Theory Exam	12 <sup>th</sup> Week	40%

\*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

## E. Student Academic Counseling and Support

### Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Department have an arrangement for “Academic Counseling and Support” for each student by the department. The Department Coordinator nominates faculty members for “Student Academic Advisory Committee” every semester. These “Academic Advisors” are responsible for student counseling and advising to a group of fix number of students (around 10-15 students) and maintaining students’ files. At the beginning of semester and at time of course registration all students take counseling from Academic Advisor according to his previous grades and coverage of pre-requisite course and follow-up.

Also, students with GPA below than 2.00 are remained under deep observation and continuous meetings with respective course teachers about their performance are arranged to help and support the students. The course teacher is to be associated with this course provide a proper guidance for students who are looking to focus on their future career based on their intellectual interests, identify better opportunities related to this course and connections in their academic fields.

The course teacher will commit to a minimum scheduled time for student consultation equivalent to 3 Hours Per Week and will have prescribed times set aside for individual appointments with students. The students will be informed at the commencement of every semester for teacher consultation hours for seeking advice and support.

## F. Learning Resources and Facilities

### 1. Learning Resources

<b>Required Textbooks</b>	<ol style="list-style-type: none"> <li>1. Jan Graba, “An Introduction to Network Programming with Java”, 3rd Edition, 2013, ISBN 978-1-4471-5254-5, Springer.</li> <li>2. Elliotte Rusty Harold, “Java Network Programming”, 4th Edition, 2014, ISBN 13: 978-93-5110-744-6, O’Reilly.</li> </ol>
<b>Essential References Materials</b>	<ol style="list-style-type: none"> <li>1. Bogdan Ciubotaru and Gabriel-Miro Muntean , “Advanced Network Programming-Principles and Techniques ” , 2013, ISBN 978-1-4471-5291-0, Springer.</li> <li>2. Herbert Schildt, “Java The Complete Reference”, 12th edition, 2021, ISBN 978-1260463415, McGraw-Hill.</li> </ol>

<b>Electronic Materials</b>	1. Electronic Course Material available on Blackboard. 2. <a href="https://docs.oracle.com/javase/tutorial/essential/io/index.html">https://docs.oracle.com/javase/tutorial/essential/io/index.html</a> .
<b>Other Learning Materials</b>	1. Java. 2. An IDE such as NetBeans.

## 2. Facilities Required

Item	Resources
<b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)	1. One lecture room equipped with projector. (maximum 30 students at a time) 2. One specialized computer lab fully equipped with Java Language and an IDE like NetBeans.
<b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)	1. A Client-Server setup is required in the Lab, which will enable the students to test programs. 2. Java Software. 3. IDE like NetBeans.
<b>Other Resources</b> (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	--

## G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Sufficiency of resources and facilities for students	Students	Course evaluation survey form
Effectiveness of teaching / learning process	Students	Course evaluation survey form
Effectiveness of teaching / learning process	CRC / QAU / HoD	Course reports / result analysis
Quality of learning Resources	Track leaders / CRC	Review meetings and star rating with suggestions for further modification and improvements
Verifying standards of student achievement / evaluation	HoD / committee nominated by HoD	Random re-checking of evaluated answer sheets
Achievement of course learning outcomes	Course Teachers / QAU	CLO assessment template that is further verified at course coordinator, Track leader and QAU level.

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

**Assessment Methods** (Direct, Indirect)

## H. Specification Approval Data

<b>Council / Committee</b>	DEPARTMENT COUNCIL
<b>Reference No.</b>	
<b>Date</b>	



