



**MASENO UNIVERSITY**  
**COURSE OUTLINE**

**COURSE CODE:** CCS 407

**ACADEMIC YEAR:** 2024/2025

**COURSE TITLE:** Distributed Systems

**PROGRAMME:** BSc. Computer Science

**DEPARTMENT:** Computer Science

**FACULTY / SCHOOL:** Computing and Informatics

**Lecturer's Name:** Dr. James Obuhuma

**Lecturer's Contacts:**

**Telephone No.** +254710 463 258

**Email Address:** jobuhuma@maseno.ac.ke

**No. of Units / Contact Hours:** 48

Signed by Course Lecturer: .....

Confirmed by Head of Department: .....

<b>COURSE CODE:</b> CCS407		<b>COURSE TITLE:</b> Distributed Systems																
<b>Pre-requisite:</b> None		<b>Contact Hours:</b> 48																
<b>Year of Study:</b> IV		<b>Semester:</b> I																
<b>Purpose of the course:</b> The course introduces the basic ideas of distributed systems and distributed processing. Most of the big organizations worldwide carry out distributed processing through networking and producer/consumer systems. The students need to be exposed to the concepts of distributed processing as they prepare to join the job market.																		
<b>Expected Learning Outcomes:</b> By the end of the course, the student should be able to: <div><div>1. Explain distributed system architectures in comparison to parallel systems.</div><div>2. Describe processes and interprocess communication in distributed systems.</div><div>3. Discuss timing, coordination and distributed transaction management.</div><div>4. Describe naming services as applied in distributed systems.</div><div>5. Discuss fault tolerance and security controls as applied in distributed systems.</div></div>																		
<b>Course Content / Topics:</b> Introduction to distributed systems; distributed system architectures; processes in distributed systems; interprocess communication; timing and coordination; naming services; distributed transactions and concurrency control; fault tolerance; and security in distributed systems.																		
<b>Mode of Delivery:</b> Lectures, assignments and projects																		
<b>Instructional Materials and Equipment:</b> Books, Computers, Internet																		
<b>Course Assessment:</b> <table><tr><td>Continuous Assessment Tests</td><td></td><td>30%</td></tr><tr><td>CATs and Assignments</td><td>-</td><td>15%</td></tr><tr><td>Take Away or Group Project</td><td>-</td><td>15%</td></tr><tr><td>End of Semester Examination</td><td></td><td>70%</td></tr><tr><td></td><td></td><td>100%</td></tr></table>				Continuous Assessment Tests		30%	CATs and Assignments	-	15%	Take Away or Group Project	-	15%	End of Semester Examination		70%			100%
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		100%																
<b>Core References:</b> <div><div>1. Coulouris, G., Dollimore, J., Kindberg, T., Blair, G., Distributed Systems: Concepts and Design, 5th Edition, Addison Wesley, 2011.</div><div>2. Coulouris, G., Dollimore, J. and Kendberg, T., Distributed Systems, 2nd Edition, Addison Wesley, 1988.</div></div>																		

3. Pradeep K. Sinha, Distributed Operating Systems, Concepts and Design (IEEE Computer Society Press)

**Recommended Reference Materials:**

1. Lius, M. L., Distributed Computing: Principles and Applications, Pearson Education, January 2003.
2. Thurber, Kenneth J. et. al, Distributed Processor Communication Architecture Lexington Books, 1979.
3. Lam, Simon S. Principles of Communication and Networking Protocols 1984.
4. Digital Distributed Systems Handbook IEEE Computer Society Press.

## 2.0 LECTURE SCHEDULE (HRS)

### WEEK ONE TOPIC: Introduction to Distributed Systems

Sub Topic	Hrs	Course Text	Readings	Practicum / Lab Practical	Assignment(s)	Comments (By Lecturer)
Definition and Evolution; Distributed Vs Decentralized Systems; Overall Design Goals;	3	Core Reference: Text 1 (Coulouris et al, 2011)	Chapter 1: Characterization of Distributed Systems	• No lab work	Attempt the exercises at the end of Chapter 1 of the Course text: <ul style="list-style-type: none"> <li>• The first 2 questions will be submitted for marking</li> </ul>	

### WEEK TWO TOPIC: Distributed Systems Architectures

Sub Topic	Hrs	Course Text	Readings	Practicum / Lab Practical	Assignment(s)	Comments (By Lecturer)
Architectural Styles; Fundamental Models	3	Core Reference: Text 1 (Coulouris et al, 2011)	Chapter 2: System Models	No lab work	Attempt the exercises at the end of Chapter 2 of the Course text. <ul style="list-style-type: none"> <li>• The first 2 questions will be submitted for marking</li> </ul>	

**WEEK THREE TOPIC:** Processes in Distributed Systems

Sub Topic	Hrs	Course Text	Readings	Practicum / Lab Practical	Assignment(s)	Comments (By Lecturer)
Introduction to Processes and Threads	3	Core Reference: Text 1 (Coulouris et al, 2011)	Chapter 4: Interprocess Communication	No lab work	Attempt the exercises at the end of Chapter 4 of the Course text. <ul style="list-style-type: none"> <li>The first 2 questions will be submitted for marking</li> </ul>	

**WEEK FOUR TOPIC:** Interprocess Communication

Sub Topic	Hrs	Course Text	Readings	Practicum / Lab Practical	Assignment(s)	Comments (By Lecturer)
Interprocess Communication	3	Core Reference: Text 1 (Coulouris et al, 2011)	Chapter 4: Interprocess Communication	No lab work	Attempt the exercises at the end of Chapter 4 of the Course text. <ul style="list-style-type: none"> <li>Question 4.15 will be submitted for marking</li> </ul>	

**WEEK FIVE TOPIC:** Timing in Distributed Systems

Sub Topic	Hrs	Course Text	Readings	Practicum / Lab Practicals	Assignment(s)	Comments (By Lecturer)
Clocks and Events; Clock Synchronisation Techniques	3	Core Reference: Text 1 (Coulouris et al, 2011)	Chapter 14: Time and Global States	No lab work	Attempt the exercises at the end of Chapter 14 of the Course text. <ul style="list-style-type: none"> <li>The first 2 questions will be submitted for marking</li> </ul>	

**WEEK SIX TOPIC:** Coordination and Agreement in Distributed Systems

Sub Topic	Hrs	Course Text	Readings	Practicum / Lab Practicals	Assignment(s)	Comments (By Lecturer)
Distributed Mutual Exclusion; Elections in Distributed Systems	3	Core Reference: Text 1 (Coulouris et al, 2011)	Chapter 15: Coordination and Agreement	No lab work	Attempt the exercises at the end of Chapter 15 of the Course text. <ul style="list-style-type: none"><li>The first 2 questions will be submitted for marking</li></ul>	

**WEEK SEVEN TOPIC:** Naming Services

Sub Topic	Hrs	Course Text	Readings	Practicum / Lab Practicals	Assignment(s)	Comments (By Lecturer)
Name Services; Domain Name Systems; Directory Services	3	Core Reference: Text 1 (Coulouris et al, 2011)	Chapter 13: Naming Services	No lab work	Attempt the exercises at the end of Chapter 13 of the Course text. <ul style="list-style-type: none"><li>The first 2 questions will be submitted for marking</li></ul>	

**WEEK EIGHT TOPIC:** Distributed Transactions and Concurrency Control

Sub Topic	Hrs	Course Text	Readings	Practicum / Lab Practicals	Assignment(s)	Comments (By Lecturer)
Distributed Transactions; ACID Properties; Concurrency Control Techniques	3	Core Reference: Text 1 (Coulouris et al, 2011)	Chapter 16 and 17: Transaction and Concurrency Control; Distributed Transactions	No lab work	Attempt the exercises at the end of Chapter 16 and 17 of the Course text. <ul style="list-style-type: none"><li>The first 2 questions of each Chapter will be submitted for marking</li></ul>	

**WEEK NINE TOPIC:** Fault Tolerance in Distributed Systems

Sub Topic	Hrs	Course Text	Readings	Practicum / Lab Practicals	Assignment(s)	Comments (By Lecturer)
Fault Tolerance; Fault Tolerance Techniques; Replication in Distributed Systems	3	Core Reference: Text 1 (Coulouris et al, 2011)	Chapter 18: Replication	No lab work	Attempt the exercises at the end of Chapter 18 of the Course text. <ul style="list-style-type: none"> <li>The first 2 questions will be submitted for marking</li> </ul>	

**WEEK TEN TOPIC:** Security in Distributed Systems

Sub Topic	Hrs	Course Text	Readings	Practicum / Lab Practicals	Assignment(s)	Comments (By Lecturer)
Security Threats and Vulnerabilities in Distributed Systems; Countermeasures to the Threats and Vulnerabilities	3	Core Reference: Text 1 (Coulouris et al, 2011)	Chapter 11: Security	No lab work	Discussion Activity in Class <ul style="list-style-type: none"> <li>Security Threats and Vulnerabilities in Distributed Systems</li> <li>Countermeasures to the Security Threats and Vulnerabilities.</li> </ul>	

**WEEK ELEVEN TOPIC:** Designing Distributed Systems

Sub Topic	Hrs	Course Text	Readings	Practicum / Lab Practicals	Assignment(s)	Comments (By Lecturer)
Google Case study	3	Core Reference: Text 1 (Coulouris et al, 2011)	Chapter 21: Designing Distributed Systems: Google Case Study	No lab work	Discussion Activity in Class: <ul style="list-style-type: none"> <li>Google Case Study on Designing of Distributed Systems</li> </ul>	

**WEEK TWELVE TOPIC:** Designing Distributed Systems (Continuation)

Sub Topic	Hrs	Course Text	Readings	Practicum / Lab Practicals	Assignment(s)	Comments (By Lecturer)
Google Case study	3	Core Reference: Text 1 (Coulouris et al, 2011)	Chapter 21: Designing Distributed Systems: Google Case Study	No lab work	Discussion Activity in Class: <ul style="list-style-type: none"> <li>Google Case Study on Designing of Distributed Systems</li> </ul>	

**WEEK THIRTEEN TOPIC:** Revision

Sub Topic	Hrs	Course Text	Readings	Practicum / Lab Practicals	Assignment(s)	Comments (By Lecturer)
Summary of the Course	3	Core Reference: Text 1 (Coulouris et al, 2011)	All Chapters covered throughout the course	No Lab Activity	None	

**WEEK FOURTEEN – SIXTEEN TOPIC:** Final Examination

Sub Topic	Hrs	Course Text	Readings	Practicum / Lab Practicals	Assignment(s)	Comments (By Lecturer)
Final Examination	3	N/A	All content covered in the course	N/A	N/A	

**End of Course Remarks / Signatures:**

Course Lecturer: .....

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Head of Department: .....

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