Course Specification

(Postgraduate)

Course Title:	**Distributed Systems Security**
Course Code:	**CYBS60304**
Program:	**M.Sc. in Cybersecurity**
Department:	**Department of Computers Science**
College:	**Faculty of Computing and Information**
Institution:	Al-baha University
Version:	**1**
Last Revision Date:	*Pick Revision Date.*

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A. General information about the course:

1. Course Identification:

1. Credit hours: (3)				
3				
2. Course type				
A.	☐University	☐College	☐Department	☐Track
B.	☐ Required		☒ Elective	
3. Level/year at which this course is offered: (2/3 or 2/4)				
4. Course general Description:				
This course provides a background for the basic topics in distributed systems, followed by a holistic insight into current security issues, processes, and solutions. It maps out future directions in today's distributed systems. This insight is elucidated by modelling modern distributed systems using a four-tier (layer) logical model: a host layer, an infrastructure layer, an application layer, and a service layer (bottom to top). This course provides a general introduction to distributed systems concepts with examples. It explains the different terms used in distributed systems, such as Protocols and Layering, High-Performance Computing, Hypervisors, and Cloud Computing Implementation. The different threats and vulnerabilities in distributed systems are explained. These threats and vulnerabilities include host-level threats and vulnerabilities, infrastructure-level threats and vulnerabilities, application-level threats and vulnerabilities, and service-level threats and vulnerabilities. Moreover, the applied solutions for these threats and vulnerabilities are explained in this course . For instance, host-level solutions, infrastructure-level solutions, application-level solutions, and service-level solutions are given in this course.				
5. Pre-requirements for this course (if any)**:**				
None				
6. Pre-requirements for this course (if any)**:**				
None				
7. Course Main Objective(s):				
☐ Explain the basics components of distributed system with real working examples. ☐ Explain the role of operating system processes in distributed systems. ☐ Describe security threats and issues across four-tier logical model –host layer, infrastructure layer, application layer, and service layer.				

- Describe the approaches required for efficient security engineering, alongside exploring how existing solutions can be leveraged or enhanced to proactively meet the dynamic needs of security for the next-generation distributed systems.
- Report and Solve security issues in distributed systems.
- Communicate effectively through oral presentations, computer presentations and written reports.
- Work as teamwork.

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	26	80%
2	E-learning	7	20%
3	Hybrid - Traditional classroom - E-learning		
4	Distance learning		

3. Contact Hours: (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	33
2.	**Laboratory/Studio**	-
3.	**Field**	-
4.	**Tutorial**	-
5.	**Others (specify).....**	-
	Total	33

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods:

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.1	Explain the components and interfaces of a networking standard provided.	**K1**	☐ Lectures ☐ Assignments ☐ Group Discussions	☐ Homework ☐ Presentations ☐ Midterm exam ☐ Quiz ☐ Final Exam
1.2	Describe a process in an operating system and introduce various architectures for running processes and enabling their communication.	**K2**	☐ Lectures ☐ Assignments ☐ Group Discussions	☐ Homework ☐ Presentations ☐ Midterm exam ☐ Quiz Final Exam
1.3	Explain High performance computing (HPC) and use cases that differentiate HPC from the standard Internet servers.	**K3**	☐ Lectures ☐ Assignments Group Discussions	☐ Homework ☐ Presentations ☐ Midterm exam ☐ Quiz Final Exam
1.4	Explain the types and sources of risks that affect the four-tier logical model –host layer, infrastructure layer, application layer, and service layer.	**K4**	☐ Lectures ☐ Assignments Group Discussions	☐ Homework ☐ Presentations ☐ Midterm exam ☐ Quiz Final Exam
1.5	Describe the approaches required for efficient security engineering, alongside exploring how existing solutions can be leveraged or enhanced to proactively meet the dynamic needs of security for the next-generation distributed systems.	**K5**	☐ Lectures ☐ Assignments Group Discussions	☐ Homework ☐ Presentations ☐ Midterm exam ☐ Quiz Final Exam

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
2.0	**Skills**			
2.1	Examine the attack surfaces of the different distributed computing models, emphasizing that every interface introduces potential vulnerabilities.	**S1**	☐ Case Studies	☐Presentations ☐Final Exam
2.2	Analyze and Solve security issues in distributed systems.	**S2**	☐ Case Studies	
3.0	**Values, autonomy, and responsibility**			
3.1	Communicate effectively through oral presentations, computer presentations and written reports.	**V.1**	Project assignment in Small groups Oral presentation	Course project presentation and report
3.2	Work in groups	**V2**	• Lab assignment Small groups Oral presentation	Course project presentation and report

C. Course Content:

No	List of Topics	Contact Hours
1.	1.1 Distributed Systems General Concepts 1.2 High Performance Computing	**3**
2.	2.1 Protocols and Layering in distributed systems 2.2 Hypervisors and Cloud Computing Implementation	**3**
3.	Vulnerabilities and Exploit Examples (Common security issues and technologies)	**3**
4.	Host-level threats and vulnerabilities	**3**
5.	Infrastructure-level threats and vulnerabilities	**3**
6.	Application-level threats and vulnerabilities	**3**
7.	Service-level threats and vulnerabilities	**3**
8.	Infrastructure-level and Host-level solutions	**3**

9.	Application-level and Service-level solutions	3
10.	Case Study: Compliance and Financial services	3
11.	Case Study: Grid/Cloud Computing	3
Total		33

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Home work	Weekly	10%
2.	Mid-term exam	6	20%
3.	Quiz	10	10%
4.	Course project/Case Studies presentation and report	11	10%
5.	Final Exam	12	50%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities:

1. References and Learning Resources:

Essential References	Abhijit Belapurkar, Distributed Systems Security: Issues, Processes and Solutions, Anirban Chakrabarti, Wiley 2009. Maarten van Steen and Andrew Tanenbaum ,Distributed Systems: Principles and Paradigms, 3rd (3.01) edition.
Supportive References	• Communications of ACM (Association for Computer Machinery) - http://cacm.acm.org/ Journal of the ACM - http://jacm.acm.org/
Electronic Materials	• Access to the Saudi Digital Library (SDL). • Using the learning management system of the university – Rafid System (https://lms.bu.edu.sa/). • IEEE/ACM Transactions on Networking https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=90
Other Learning Materials	

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities	• A classroom or lecture hall with whiteboard for 25 students. A laboratory with 25 computers.

Items	Resources
(Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	
Technology equipment (Projector, smart board, software)	All students shall have • A laptop or access to a desktop computer with access to a programming development tool • High speed Internet connection • Power outlets for student's laptop plug-in Relevant programming software for use of students.
Other equipment (Depending on the nature of the specialty)	• The laboratory should have computers with programming development tools.

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students - Program Leaders	Indirect
Effectiveness of students assessment	Program Leaders	Indirect
Quality of learning resources	**Students**	**Indirect**
The extent to which CLOs have been achieved	Peer reviewers	Direct
Reviewing course effectiveness and planning for improvement.	Program Leaders - Faculty	Direct

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	