Ucayali State University (UNU)
School of Computer Science
Sillabus 2023-I

1. COURSE

CS231. Networking and Communication (Mandatory)

2. GENERAL INFORMATION

2.1 Credits	:	3
2.2 Theory Hours	:	1 (Weekly)
2.3 Practice Hours	:	2 (Weekly)
2.4 Duration of the period	:	16 weeks
2.5 Type of course	:	Mandatory
2.6 Modality	:	Blended
2.7 Prerrequisites	:	CS2S1. Operating systems . (4^{th} Sem)

3. PROFESSORS

Meetings after coordination with the professor

4. INTRODUCTION TO THE COURSE

The ever-growing development of communication and information technologies means that there is a marked tendency to establish more computer networks that allow better information management..

In this second course, participants will be introduced to the problems of communication between computers, through the study and implementation of communication protocols such as TCP / IP and the implementation of software on these protocols

5. GOALS

- That the student implements and / or modifies a data communication protocols.
- That the student master the data transmission techniques used by the existing network protocols.
- That the student knows the latest trends in networks that are being applied on the Internet.

6. COMPETENCES

b) An ability to design and conduct experiments, as well as to analyze and interpret data. (**Familiarity**)

c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. (**Usage**)

e) Understand correctly the professional, ethical, legal, security and social implications of the profession. (**Familiarity**)

g) The broad education necessary to understand the impact of computing solutions in a global, economic, environmental, and societal context. (**Assessment**)

i) An ability to use the techniques, skills, and modern computing tools necessary for computing practice. (**Usage**)

j) Apply the mathematical basis, principles of algorithms and the theory of Computer Science in the modeling and design of computational systems in such a way as to demonstrate understanding of the equilibrium points involved in the chosen option. (**Usage**)

7. TOPICS

Unit 1: Introduction (5)	
Competences Expected: b,c	
Topics	**Learning Outcomes**
• Organization of the Internet (Internet Service Providers, Content Providers, etc.) • Switching techniques (e.g., circuit, packet) • Physical pieces of a network, including hosts, routers, switches, ISPs, wireless, LAN, access point, and firewalls • Layering principles (encapsulation, multiplexing) • Roles of the different layers (application, transport, network, datalink, physical)	• Articulate the organization of the Internet [Familiarity] • List and define the appropriate network terminology [Familiarity] • Describe the layered structure of a typical networked architecture [Familiarity] • Identify the different types of complexity in a network (edges, core, etc) [Familiarity]
Readings : [KR13]	

Unit 2: Networked Applications (5)	
Competences Expected: b,c,i	
Topics	**Learning Outcomes**
• Naming and address schemes (DNS, IP addresses, Uniform Resource Identifiers, etc.) • Distributed applications (client/server, peer-to-peer, cloud, etc.) • HTTP as an application layer protocol • Multiplexing with TCP and UDP • Socket APIs	• List the differences and the relations between names and addresses in a network [Familiarity] • Define the principles behind naming schemes and resource location [Familiarity] • Implement a simple client-server socket-based application [Usage]
Readings : [KR13]	

Unit 3: Reliable Data Delivery (10)	
Competences Expected: b,c,i	
Topics	**Learning Outcomes**
• Error control (retransmission techniques, timers) • Flow control (acknowledgements, sliding window) • Performance issues (pipelining) • TCP	• Describe the operation of reliable delivery protocols [Familiarity] • List the factors that affect the performance of reliable delivery protocols [Familiarity] • Design and implement a simple reliable protocol [Usage]
Readings : [KR13]	

Unit 4: Routing and Forwarding (12)	
Competences Expected: b,c,i	
Topics	**Learning Outcomes**
• Routing versus forwarding • Static routing • Internet Protocol (IP) • Scalability issues (hierarchical addressing)	• Describe the organization of the network layer [Familiarity] • Describe how packets are forwarded in an IP network [Familiarity] • List the scalability benefits of hierarchical addressing [Familiarity]
Readings : [KR13]	

Unit 5: Local Area Networks (10)	
Competences Expected: b,c	
Topics	**Learning Outcomes**
• Multiple Access Problem • Common approaches to multiple access (exponential-backoff, time division multiplexing, etc) • Local Area Networks • Ethernet • Switching	• Describe how frames are forwarded in an Ethernet network [Familiarity] • Describe the interrelations between IP and Ethernet [Familiarity] • Describe the steps used in one common approach to the multiple access problem [Familiarity]
Readings : [KR13]	

Unit 6: Resource Allocation (12)	
Competences Expected: b,c,i	
Topics	**Learning Outcomes**
• Need for resource allocation • Fixed allocation (TDM, FDM, WDM) versus dynamic allocation • End-to-end versus network assisted approaches • Fairness • Principles of congestion control • Approaches to Congestion (e.g., Content Distribution Networks)	• Describe how resources can be allocated in a network [Familiarity] • Describe the congestion problem in a large network [Familiarity] • Compare and contrast fixed and dynamic allocation techniques [Familiarity] • Compare and contrast current approaches to congestion [Familiarity]
Readings : [KR13]	

Unit 7: Mobility (5)	
Competences Expected: b,c	
Topics	**Learning Outcomes**
• Principles of cellular networks • 802.11 networks • Issues in supporting mobile nodes (home agents)	• Describe the organization of a wireless network [Familiarity] • Describe how wireless networks support mobile users [Familiarity]
Readings : [KR13], [Cha16]	

Unit 8: Social Networking (5)	
Competences Expected: b,c,i	
Topics	**Learning Outcomes**
• Social networks overview • Example social network platforms • Structure of social network graphs • Social network analysis	• Discuss the key principles (such as membership, trust) of social networking [Familiarity] • Describe how existing social networks operate [Familiarity] • Construct a social network graph from network data [Usage] • Analyze a social network to determine who the key people are [Usage] • Evaluate a given interpretation of a social network question with associated data [Familiarity]
Readings : [KR13], [Kad11]	

8. WORKPLAN

8.1 Methodology

Individual and team participation is encouraged to present their ideas, motivating them with additional points in the different stages of the course evaluation.

8.2 Theory Sessions

The theory sessions are held in master classes with activities including active learning and roleplay to allow students to internalize the concepts.

8.3 Practical Sessions

The practical sessions are held in class where a series of exercises and/or practical concepts are developed through problem solving, problem solving, specific exercises and/or in application contexts.

9. EVALUATION SYSTEM

********* EVALUATION MISSING ********

10. BASIC BIBLIOGRAPHY

[Cha16] Paresh Chayapathi Rajendra; Syed F. Hassan; Shah. *Network Functions Virtualization (NFV) with a Touch of SDN*. Addison-Wesley Professional; 1 edition, 2016. ISBN: 978-0134463056.

[Kad11] Charles Kadushin. *Understanding Social Networks: Theories, Concepts, And Findings*. Oxford University Press, Usa; 1 edition, 2011. ISBN: 978-0195379471.

[KR13] J.F. Kurose and K.W. Ross. *Computer Networking: A Top-down Approach*. 7th. Always learning. Pearson, 2013. ISBN: 978-0133594140.