San Pablo Catholic University (UCSP)
Undergraduate Program in
Computer Science
SILABO

Universidad Católica San Pablo

CS231. Networking and Communication (Mandatory)

2023-II

1. General information		
1.1 School	:	Ciencia de la Computación
1.2 Course	:	CS231. Networking and Communication
1.3 Semester	:	7^{mo} Semestre.
1.4 Prerrequisites	:	CS2S1. Operating systems . (6^{th} Sem)
1.5 Type of course	:	Mandatory
1.6 Learning modality	:	Face to face
1.7 Horas	:	1 HT; 4 HP;
1.8 Credits	:	3
1.9 Plan	:	Plan Curricular 2016

2. Professors

Lecturer

- Julio Omar Santisteban Pablo <jsantisteban@ucsp.edu.pe>
  - PhD in Ciencias de la Computación, Universidad Nacional de San Agustin, Perú, 2021.
  - MSc in Internetworking, University of Technology, Australia, 2008.

3. Course foundation

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

4. Summary

1. Introduction 2. Networked Applications 3. Reliable Data Delivery 4. Routing and Forwarding 5. Local Area Networks 6. Resource Allocation 7. Mobility 8. Social Networking

5. Generales 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. Contribution to Outcomes

This discipline contributes to the achievement of the following outcomes:

1) Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions. (**Usage**)

2) Design, implement and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline. (**Usage**)

4) Recognize professional responsabilities and make informed judgments in computing practice based on legal and ethical principles. (**Familiarity**)

6) Apply computer science theory and software development fundamentals to produce computing-based solutions. (**Usage**)

7) Develop computational technology for the well-being of all, contributing with human formation, scientific, technological and professional skills to solve social problems of our community. (**Assessment**)

7. Content

UNIT 1: Introduction (5)

Competences:

Content	**Generales Goals**
• 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: Kurose and Ross (2013)

UNIT 2: Networked Applications (5)

Competences:

Content	**Generales Goals**
• 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: Kurose and Ross (2013)

UNIT 3: Reliable Data Delivery (10)	
Competences:	
Content	**Generales Goals**
• 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: Kurose and Ross (2013)	

UNIT 4: Routing and Forwarding (12)	
Competences:	
Content	**Generales Goals**
• 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: Kurose and Ross (2013)	

UNIT 5: Local Area Networks (10)	
Competences:	
Content	**Generales Goals**
• 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: Kurose and Ross (2013)	

UNIT 6: Resource Allocation (12)	
Competences:	
Content	**Generales Goals**
• 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: Kurose and Ross (2013)	

UNIT 7: Mobility (5)	
Competences:	
Content	**Generales Goals**
• 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: Kurose and Ross (2013), Chayapathi (2016)	

UNIT 8: Social Networking (5)	
Competences:	
Content	**Generales Goals**
• 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: Kurose and Ross (2013), Kadushin (2011)	

8. Methodology

1. El profesor del curso presentará clases teóricas de los temas señalados en el programa propiciando la intervención de los alumnos.
2. El profesor del curso presentará demostraciones para fundamentar clases teóricas.
3. El profesor y los alumnos realizarán prácticas

4. Los alumnos deberán asistir a clase habiendo leído lo que el profesor va a presentar. De esta manera se facilitará la comprensión y los estudiantes estarán en mejores condiciones de hacer consultas en clase.

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

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.

Evaluation System:
The final grade is obtained through of:

CONTINUOUS ASSESMENT	EVALUATIONS
Continuous assessment 1 : 15 % **Continuous assessment 2** : 15 %	**Midterm Exam** : 24 % **Final Exam** : 46 %
30%	70%

Where:

Continuous Assessment: It includes group work, active participation in class, exercise test.

- Continuos assessment 1 (weeks 1 - 9)
- Continuos assesment 2 (weeks 10 - 17)

To pass the course you must obtain 11.5 or more in the final grade .

References

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

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

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