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

CS370. Big Data (Mandatory)

2023-II

1. General information

1.1 School	:	Ciencia de la Computación
1.2 Course	:	CS370. Big Data
1.3 Semester	:	9^{no} Semestre.
1.4 Prerrequisites	:	

- CS272. Databases II. (5th Sem)

- CS3P1. Parallel and Distributed Computing . (8th 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

- Alvaro Henry Mamani-Aliaga <ahmamani@ucsp.edu.pe>
  - PhD in Ciencia de la Computación, UNSA, Perú, 2019.
  - MSc in Ciencia de la Computación, IME-USP, Brasil, 2011.

3. Course foundation

Nowadays, knowing scalable approaches to processing and storing large volumes of information (terabytes, petabytes and even exabytes) is fundamental in computer science courses. Every day, every hour, every minute generates a large amount of information which needs to be processed, stored, analyzed.

4. Summary

1. Introducción a Big Data 2. Hadoop 3. Procesamiento de Grafos en larga escala

5. Generales Goals

- That the student is able to create parallel applications to process large volumes of information

- That the student is able to compare the alternatives for the processing of big data

- That the student is able to propose architectures for a scalable application

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**)

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

7. Content

UNIT 1: Introducción a Big Data (15)
Competences:

Content	**Generales Goals**
• Overview on Cloud Computing • Distributed File System Overview • Overview of the MapReduce programming model	• Explain the concept of Cloud Computing from the point of view of Big Data[Familiarity] • Explain the concept of Distributed File System [Familiarity] • Explain the concept of the MapReduce programming model[Familiarity]

Readings: Coulouris et al. (2011)

UNIT 2: Hadoop (15)
Competences:

Content	**Generales Goals**
• Hadoop overview. • History. • Hadoop Structure. • HDFS, Hadoop Distributed File System. • Programming Model MapReduce	• Understand and explain the Hadoop suite [Familiarity] • Implement solutions using the MapReduce programming model. [Usage] • Understand how data is saved in the HDFS. [Familiarity]

Readings: Hwang, Dongarra, and Fox (2011), Buyya, Vecchiola, and Selvi (2013)

UNIT 3: Procesamiento de Grafos en larga escala (10)
Competences:

Content	**Generales Goals**
• Pregel: A System for Large-scale Graph Processing. • Distributed GraphLab: A Framework for Machine Learning and Data Mining in the Cloud. • Apache Giraph is an iterative graph processing system built for high scalability.	• Understand and explain the architecture of the Pregel project. [Familiarity] • Understand the GraphLab project architecture. [Familiarity] • Understand the architecture of the Giraph project. [Familiarity] • Implement solutions using Pregel, GraphLab or Giraph. [Usage]

Readings: Low et al. (2012), Malewicz et al. (2010), Baluja et al. (2008)

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 : 24 %	**Midterm Exam** : 20 %
Continuous assessment 2 : 36 %	**Final Exam** : 20 %
60%	40%

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

Baluja, Shumeet et al. (2008). "Video Suggestion and Discovery for Youtube: Taking Random Walks Through the View Graph". In: *Proceedings of the 17th International Conference on World Wide Web*. WWW '08. ACM: Beijing, China, pp. 895–904. ISBN: 978-1-60558-085-2. DOI: 10.1145/1367497.1367618.

Buyya, Rajkumar, Christian Vecchiola, and S. Thamarai Selvi (2013). *Mastering Cloud Computing: Foundations and Applications Programming*. 1st. Morgan Kaufmann Publishers Inc.: San Francisco, CA, USA. ISBN: 9780124095397, 9780124114548.

Coulouris, George et al. (2011). *Distributed Systems: Concepts and Design*. 5th. Addison-Wesley Publishing Company: USA. ISBN: 0132143011, 9780132143011.

Hwang, Kai, Jack Dongarra, and Geoffrey C. Fox (2011). *Distributed and Cloud Computing: From Parallel Processing to the Internet of Things*. 1st. Morgan Kaufmann Publishers Inc.: San Francisco, CA, USA. ISBN: 0123858801, 9780123858801.

Low, Yucheng et al. (Apr. 2012). "Distributed GraphLab: A Framework for Machine Learning and Data Mining in the Cloud". In: *Proc. VLDB Endow.* 5(8), pp. 716–727. ISSN: 2150-8097. DOI: 10.14778/2212351.2212354.

Malewicz, Grzegorz et al. (2010). "Pregel: A System for Large-scale Graph Processing". In: *ACM SIGMOD Record*. SIGMOD '10, pp. 135–146. DOI: 10.1145/1807167.1807184.