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

Universidad Católica San Pablo

CS210. Algorithms and Data Structures (Mandatory)

2021-I

1. General information

1.1 School	:	Ciencia de la Computación
1.2 Course	:	CS210. Algorithms and Data Structures
1.3 Semester	:	4^{to} Semestre.
1.4 Prerrequisites	:	• CS113. Computer Science II. (3^{rd} Sem) • CS100. Introduction to Computer Science. (2^{nd} Sem)
1.5 Type of course	:	Mandatory
1.6 Learning modality	:	Virtual
1.7 Horas	:	2 HT; 2 HP; 2 HL;
1.8 Credits	:	4

2. Professors

Lecturer

- Alex Jesús Cuadros Vargas <acuadros@ucsp.edu.pe>
  - ¡¡PosDocIn¿¿ Ciencia de la Computación, ICMC-USP, Brasil, 2009.
  - PhD in Ciencia de la Computación, ICMC-USP, Brasil, 2007.
  - MSc in Ciencia de la Computación, ICMC-USP, Brasil, 2001.

Practice

- Gustavo Delgado Ugarte <ggdelgado@ucsp.edu.pe>
  - MSc in Ingeniería del Software, Escuela Universitaria de Ingeniería Industrial, Informática y Sistemas - UTA, Chile, 2009.

3. Course foundation

The theoretical foundation of all branches of computing rests on algorithms and data structures, this course will provide participants with an introduction to these topics, thus forming a basis that will serve for the following courses in the career.

4. Summary

1. Graphs 2. Scatter Matrices 3. Balanced Trees

5. Generales Goals

- Make the student understand the importance of algorithms for solving problems.
- Introduce the student to the field of application of data structures.

6. Contribution to Outcomes

This discipline contributes to the achievement of the following outcomes:

a) An ability to apply knowledge of mathematics, science. (**Usage**)

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

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**)

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**)

k) Apply the principles of development and design in the construction of software systems of variable complexity. (**Usage**)

7. Content

UNIT 1: Graphs (12)

Competences: a,b,c

Content	**Generales Goals**
• Graph Concept • Directed Graphs and Non-directed Graphs. • Using Graphs. • Measurement of efficiency ,in time and space. • Adjacency matrices. • Tag adjacent matrices. • Adjacency Lists. • Implementation of graphs using adjacency matrices. • Graph Implementation using adjacency lists • Insertion, search and deletion of nodes and edges. • Graph search algorithms.	• Acquire Dexterity to Perform Correct Implementation. [Usage] • Develop knowledge to decide when it is better to use one implementation technique than another. [Usage]

Readings: Cormen et al. (2009), Fager et al. (2014), Knuth (1997), Knuth (1998)

UNIT 2: Scatter Matrices (8)

Competences: a,b,c

Content	**Generales Goals**
• Initial concepts. • Dense Matrices • Measurement of Efficiency in Time and Space • Static scatter vs. dynamic matrix creation. • Insert, search, and delete methods.	• Understand the use and implementation of scatter matrices.[Assessment]

Readings: Cormen et al. (2009), Fager et al. (2014), Knuth (1997), Knuth (1998)

UNIT 3: Balanced Trees (16)	
Competences: a,b,c	
Content	**Generales Goals**
• AVL Trees. • Measurement of Efficiency. • Simple and Composite Rotations • Insertion, deletion and search. • Trees B , B+ B* y Patricia.	• Understand the basic functions of these complex structures in order to acquire the capacity for their implementation. [Assessment]
Readings: Cormen et al. (2009), Fager et al. (2014), Knuth (1997), Knuth (1998)	

8. Methodology

El profesor del curso presentará clases teóricas de los temas señalados en el programa propiciando la intervención de los alumnos.

El profesor del curso presentará demostraciones para fundamentar clases teóricas.

El profesor y los alumnos realizarán prácticas

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

Continuous Assessment 1 : 20 %

Partial Exam : 30 %

Continuous Assessment 2 : 20 %

Final exam : 30 %

References

Cormen, Thomas H. et al. (2009). *Introduction to Algorithms*. Third Edition. ISBN: 978-0-262-53305-8. MIT Press.

Fager, José et al. (2014). *Estructura de datos*. First Edition. Iniciativa Latinoamericana de Libros de Texto Abiertos (LATIN).

Knuth, Donald E. (1997). *The Art of Computer Programming, Vol. 1: Fundamental Algorithms*. 3rd. Addison-Wesley Professional.

Knuth, Donald E. (1998). *The art of computer programming, volume 3:Sorting and searching*. 2nd. Addison-Wesley Professional.