University of Engineering and Technology
School of Computer Science
Syllabus of Course – Academic Period 2017-I

1. Code and Name: CS210. Algorithms and Data Structures
2. Credits: 4
3. Hours of theory and Lab: 2 HT; 4 HP;
4. Professor(s)
Meetings after coordination with the professor
5. Bibliography

[Cor+09] Thomas H. Cormen et al. *Introduction to Algorithms*. Third Edition. ISBN: 978-0-262-53305-8. MIT Press, 2009.

[Fag+14] José Fager et al. *Estructura de datos*. First Edition. Iniciativa Latinoamericana de Libros de Texto Abiertos (LATIN), 2014.

6. Information about the course

(a) **Brief description about the course** 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.

(b) **Prerrequisites:** CS113. Programación Orientada a Objetos II. (3^{er} Sem)

(c) **Type of Course:** Mandatory

7. Competences

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

8. Contribution to 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**)

9. Competences (IEEE)

C1. An intellectual understanding and the ability to apply mathematical foundations and computer science theory.⇒ **Outcome a**

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C2. Ability to have a critical and creative perspective in identifying and solving problems using computational thinking. ⇒ **Outcome b**

C5. Ability to implement algorithms and data structures in software.⇒ **Outcome c**

CS2. Identify and analyze criteria and specifications appropriate to specific problems, and plan strategies for their solution.⇒ **Outcome b**

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10. List of topics

1. Grafos
2. Matrices Esparzas
3. Arboles Equilibrados

11. Methodology and Evaluation
Methodology:

Theory Sessions:
The development of the theoretical sessions is focused on the student, through his active participation, solving problems related to the course with the individual contributions and discussing real cases of the industry. The students will develop throughout the course a project of application of the tools received in a company.

Lab Sessions:
Practical sessions are held in the laboratory. Laboratory practices are performed in teams to strengthen their communication. At the beginning of each laboratory the development of the practice is explained and at the end the main conclusions of the activity in group form are highlighted.

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

Reading:
Throughout the course different readings are provided, which are evaluated. The average of the notes in the readings is considered as the mark of a qualified practice. The use of the UTEC Online virtual campus allows each student to access the course information, and interact outside the classroom with the teacher and with the other students.
Evaluation System:

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12. Content

Unit 1: Grafos (12)	
Competences Expected: C1,C2,C5	
Learning Outcomes	**Topics**
• Acquire Dexterity to Perform Correct Implementation. [Usage] • Develop knowledge to decide when it is better to use one implementation technique than another. [Usage]	• 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.
Readings : [Cor+09], [Fag+14]	

Unit 2: Matrices Esparzas (8)	
Competences Expected: C1,C2,C5	
Learning Outcomes	**Topics**
• Understand the use and implementation of scatter matrices.[Assessment]	• Initial concepts. • Dense Matrices • Measurement of Efficiency in Time and Space • Static scatter vs. dynamic matrix creation. • Insert, search, and delete methods.
Readings : [Cor+09], [Fag+14]	

Unit 3: Arboles Equilibrados (16)	
Competences Expected: C2,C5,C6	
Learning Outcomes	**Topics**
• Understand the basic functions of these complex structures in order to acquire the capacity for their implementation. [Assessment]	• AVL Trees. • Measurement of Efficiency. • Simple and Composite Rotations • Insertion, deletion and search. • Trees B , B+ B* y Patricia.
Readings : [Cor+09], [Fag+14]	