Universitat de Lleida

DEGREE CURRICULUM

DATA STRUCTURES

Coordination: SAYAGO BARRANTES, SERGIO

Academic year 2021-22

DATA STRUCTURES 2021-22

Subject's general information

Subject name	DATA STRUCTURES
Code	102375
Semester	1st Q(SEMESTER) CONTINUED EVALUATION
Typology	

Degree	Course	Character	Modality
Bachelor's degree in Digital Interaction and Computing Techniques	2	COMPULSORY	Attendance-based

Course number of credits (ECTS)	6
Type of activity, credits, and groups	

Activity type	PRALAB	TEORIA
Number of credits	3	3
Number of groups	1	1

Coordination	SAYAGO BARRANTES, SERGIO
Department	COMPUTER SCIENCE AND INDUSTRIAL ENGINEERING
Teaching load distribution between lectures and independent student work	According to the academic framework of bachelor's degrees of the EPS: - 1 ECTS = 25 hours; 6 ECTS = 150 hours - 40% (60h) of in-class work and 60% (90h) of autonomous work This distribution in this course is as follows: - Lectures: theory (28h) + laboratories (28h) = 56 + 4 hours of exams = 60h - Independent student's work = first theory exam (20h) + second theory exam (20h) + first lab exam (20h) + second lab exam (30h) = 90h
Important information on data processing	Consult this link for more information.
Language	English, Spanish and Catalan
Distribution of credits	See type of activity, credits, and groups

DATA STRUCTURES 2021-22

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
SAYAGO BARRANTES, SERGIO	sergio.sayago@udl.cat	6	Make an appointment via e-mail. Office 12 Campus Igualada (Pla de la Massa) / Online via videconference

Subject's extra information

Data Structures is a compulsory course of 6 ECTS. Data Structures is held in the first semester of the second year of the bachelor's degree in Digital Interaction and Computing Techniques (GTIDIC).

GTIDIC aims to train qualified professionals in the computing field with a very practical side, giving special emphasis to the design and implementation of interactive applications. The graduates will acquire solid programming knowledge, focusing on mobile and web applications, Internet technologies, administration tools and security systems, and interface design and development.

Data Structures focuses on data structures for programming. Data Structures is designed to provide students with a hands-on and thorough introduction to data structures. To this end, the students will carry out 6 laboratories.

Data Structures follows up on Object Oriented Programming, as it focuses on key concepts of OOP related to data structures in Java. Data Structures also aims to complement Mathematics for Computing and Computing Techniques by discussing algorithm analysis and complexity.

Learning objectives

1. To be conversant with the main types of data structures: sequential access, trees, and tables
2. To delve into object oriented programming; design and develop interfaces, abstract classes and generics in data structures by using the Java Collections Framework
3. To analyse operations and algorithms by using Big Oh notation, and develop more efficient algorithms
4. To delve into recursion; design and develop recursive methods to traverse tree and turn these methods into iterative ones
5. To design and develop classes which make use of several data structures and aspects related to object oriented programming in order to solve problems

Competences

According to the table of competences of the GTIDIC (https://ja.cat/zvyK4):

Basic competences

CB03 That students have the ability to gather and interpret relevant data (usually within their area of study) to makejudgments that include a reflection on relevant social, scientific or ethical issue.

Transversal competences

CT3 Acquire training in the use of new technologies and information and communication technologies.

General competences

CG10. Capacity to apply proper algorithmic techniques to solve computational problems.

Specific competences

CE2. Capacity to understand and master the basic concepts of discrete mathematics, logics, algorithmic and

computational complexity, and its application to solve computational problems

CE8. Knowledge and application of the basic algorithmic procedures of computer technologies to design solutions to computational problems, analyzing the suitability and complexity of the proposed algorithms.

CE9. Knowledge, design and efficient use of the types and data structure more suitable for solving a problem

CE10. Capacity to analyse, design, build and maintain safe and efficient applications, choosing the most suitable paradigm and programming languages.

Subject contents

- Introduction to algorithms complexity for data structures
- Aspects related to object oriented programming related to the course and guided introduction to the Java Collections Framework
- Main data structures of sequential access: introduction, design, implementation and analysis
- Trees: introduction, design, implementation and analysis
- Hash tables

Methodology

Methdology	Theory	Laboratories	Indepdent student's work
Interactive lectures	X		
Exercises in laboratories (in groups, 2 students per group)		X	
Exercises at home			X
Study (preparation for exams)			X

Both plenary and laboratory sessions will be face-to-face activities during the academic year 21/22 unless the academic authorities of the UdL indicate that they must be virtual.

Development plan

Week	Dates	Theory	Labs	Notes
1	14 Sept - 16 Sept	Presentation + T1	P1	
2	21 Sept - 23 Sept	T2	P2	Submission P1
3	28 Sept - 30 Sept	No session	P2 (cont.)	No plenary session
4	5 Oct - 7 Oct	T2 (cont.)	P2 (cont.)	
5	12 Oct - 14 Oct	No session	P3	No plenary session Submission P2
6	19 Oct - 21 Oct	T3	P3 (cont.)	
7	26 Oct - 28 Oct	T3 (cont.)	P4	Submission P3
8	02 Nov - 04 Nov	Mock-up exam_1	P4 (cont.)	
9	09 Nov - 11 Nov	First exams		Theory exam (T1, T2, T3) Lab exam (P1, P2, P3)
10	16 Nov - 18 Nov	T4	P5	Submission P4
11	23 Nov - 25 Nov	T4 (cont.)	P5 (cont.)	

12	30 Nov - 2 Dec	T4 (cont.)	P6 (cont.)	Submission P5
13	7 Dec - 9 Dec	No session	P6 (cont.)	No plenary session
14	14 Dec - 9 Dec	T5	P6 (cont.)	
15	21 Dec - 23 Dec	Mock-up exam_2	No session	No lab session Submission P6
16	11 Jan - 13 Jan	Second exams		Theory exam (T4, T5) Lab exam (P5, P6)
17	18 Jan - 20 Jan	Second exams		
18	25 Jan - 27 Jan	Office hours		
19	1 Feb - 3 Feb	Retakes		

Evaluation

The assessment instruments and their relationship with the learning objectives and specific competences are listed below:

Instrument	Learning objectives	Specific competences
Labs	All	All
Exams	All	All

The overall assessment framework is defined by the GTIDIC, the academic framework of the EPS (https://ja.cat/IeppB), and the regulation of assessment in degrees at UdL (https://ja.cat/ZWcLF). The evaluation, within this context, in this course is as follows:

Continuous assessment

Final Grade (FG) = **Theory * 0.5 + Laboratories * 0.5, FG >= 5**

- **Theory** (50% of the FG) **>= 5**
  - (20% of the FG) First exam. 2 h max. WIthout notes. In paper.
    - First exam = MAX (MockUP_Exam_1, First_exam)
  - (20% de la FG) Second exam. 2 h max. WIthout notes. In paper.
    - Second exam = MAX (MockUP_Exam_2, Second_exam)
  - (10% de la FG) Participation in sessions
- **NP** (50% of the FG) **>= 5**
  - (20% of the FG) Labs
    - Labs submitted beyond the deadline = 0.
    - Labs (over 10) = [P1(10%), P2(10%), P3 (15%), P4 (15%), P5 (20%), P6 (30%)]
  - (15% of the FG) First exam of labs (P1. P2, P3).
    - It will be carried out together with the first theory exam. It will be a written exam without course materials
    - First exam of labs (over 10) = [P1(20%) + P2 (40%) + P3(40%)].
  - (15% of the FG) Second exam of labs (P5, P6).
    - It will be carried out together with the second theory exam. It will be a written exam without course materials
    - Second exam of labs (over 10) = [P5 (50%), P6 (50%)]

Retakes - mininum grade = 5, maximum grade = 7.5

- Retakes are not for getting a higher grade
- If **Theory < 5** : final exam. 2 hours.
- If **Laboratories < 5**: final (written) exam of laboratories. 2 hours.

Assessment activities will be carried out face-to-face unless the academic authorities of the UdL indicate that these activities must be virtual.

Bibliography

Apropament a les estructures de dades des del programari lliure/ Josep Maria Ribó Balust

Curs pràctic d'àlgebra per a informàtics / Joan Gimbert Quintilla ... [et al.]

Data structures and algorithms in Java / Adam Drozdek

Data structures and problem solving using Java / Mark A. Weiss

Data structures and the Java collections framework / William Collins

Curs Pràctic d'álgebra per a informàtics. Col·lecció Eines. Edicions de la Universitat de Lleida. Joan Gimbert, Ramiro Moreno, Josep Maria Ribo, i Magda Valls