Universitat de Lleida

DEGREE CURRICULUM

DATA STRUCTURES

Coordination: SAYAGO BARRANTES, SERGIO

Academic year 2020-21

DATA STRUCTURES 2020-21

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 2020-21

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
SAYAGO BARRANTES, SERGIO	sergio.sayago@udl.cat	6	

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 make judgments that include a reflection on relevant social, scientific or ethical issues.

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 the computer technologies to design problem solving, analysing the suitability and complexity of the algorithms proposed.

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

Academic year 20/21: theory is going virtual, and laboratories are face-to-face. Theory sessions will be conducted via the videoconference system of the virtual campus.

Development plan

Week	Theory (virtual)	Laboratories (in-class)
1	Presentations T1: Introduction to analysis of algorithms	P1. Analysis of algorithms
2	T2: Aspects of OOP	Submission of P1 P2. POO exercises
3	T2 (cont.)	P2 (cont.)
4	T2 (cont.)	P2 (cont.)
5	T3: data structures of sequential access	Submission of P2 P3. Tokenizer
6	T3: (cont.)	P3 (cont.)
7	T3: (cont.)	Submission P3 P4. Queue simulator
8	P4 (cont.)	P4 (cont. and submission)
9	Exams	
10	T4: Trees and recursion	P5. Heap

11	T4: (cont.)	P5 (cont.)
12	NO CLASS	P5 (cont. and submission)
13	T4: (cont.)	P6. Dijkstra
14	T5: Hash tables	P6 (cont.)
15	P6 (cont.)	P6 (cont. and submission)
16	Exams	
17	Exams	
18	Revisions	
19	Exams	

P = exercises

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 - all activities are mandatory

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

- *Laboratories* (50% of the FG) >= 5
  - 25% First exam
    - Interviews with each group
    - Requirement. P1-P4 must be submitted.
    - Laboratories submitted after the deadline = 0
    - P1 = 10%. P2 = 20%. P3 = 35%. P4 = 35%
  - 25% Second exam
    - Interviews with each group
    - Requirement: P5 & P6 must be submitted.
    - Laboratories submitted after the deadline = 0.
    - P5 = 50% = P6
- *Theory* (50% of the FG) >= 5
  - First exam (20%). 1 hour.
  - Second exam (20%). 1 hours.
  - Participation in plenary sessions (10%)

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.

Pandemy COVID-19

If during the academic course 20/21 arises an emergency due to COVID-19 that limits in-class teaching, the assessment activities will go virtual. The weight of the assessment activities will not change.

We must keep the interpersonal distance of 1.5 metres and use masks during in-person activities.

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