DEGREE CURRICULUM

DATA STRUCTURES

Coordination: GARRIDO NAVARRO, JUAN ENRIQUE

Academic year 2017-18

DATA STRUCTURES 2017-18

Subject's general information

<table>
<tr><td>Subject name</td><td>DATA STRUCTURES</td></tr>
<tr><td>Code</td><td>102010</td></tr>
<tr><td>Semester</td><td>1st Q(SEMESTER) CONTINUED EVALUATION</td></tr>
<tr><td>Typology</td><td>
<table>
<tr><th>Degree</th><th>Course</th><th>Typology</th><th>Modality</th></tr>
<tr><td>Double bachelor's degree: Degree in Computer Engineering and Degree in Business Administration and Management</td><td>2</td><td>COMPULSORY</td><td>Attendance-based</td></tr>
<tr><td>Bachelor's Degree in Computer Engineering</td><td>2</td><td>COMPULSORY</td><td>Attendance-based</td></tr>
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<tr><td>ECTS credits</td><td>6</td></tr>
<tr><td>Groups</td><td>1GG,3GM</td></tr>
<tr><td>Theoretical credits</td><td>3</td></tr>
<tr><td>Practical credits</td><td>3</td></tr>
<tr><td>Coordination</td><td>GARRIDO NAVARRO, JUAN ENRIQUE</td></tr>
<tr><td>Department</td><td>INFORMATICA I ENGINYERIA INDUSTRIAL</td></tr>
<tr><td>Teaching load distribution between lectures and independent student work</td><td>Work in class (40%)
Work out of class (60%)</td></tr>
<tr><td>Important information on data processing</td><td>Consult this link for more information.</td></tr>
<tr><td>Language</td><td>Catalan and Spanish</td></tr>
<tr><td>Distribution of credits</td><td>Juan Enrique Garrido (GG, GM3): 6 ECTS
Xavier Domingo (GM1): 3 ECTS
Juan Manuel Gimeno (GM2): 3 ECTS</td></tr>
<tr><td>Office and hour of attention</td><td>Appointments made by email</td></tr>
</table>

DATA STRUCTURES 2017-18

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
DOMINGO ALBIN, JAVIER JUAN	xdomingo@diei.udl.cat	3	By appointment
GARRIDO NAVARRO, JUAN ENRIQUE	juanenrique.garrido@diei.udl.cat	6	By appointment
GIMENO ILLA, JUAN MANUEL	jmgimeno@diei.udl.cat	3	By appointment

Subject's extra information

Data Structures is a second year course (first semester) within the degree of Software Engineering at University of Lleida. To follow this subject properly, some previous knowledge/skills on programming, Java, and object-oriented programming are recommended.

Data Structures is designed to follow up on Programming II by delving into Object Oriented Programming. Java will be the OOP language used throughout the course.

Data Structures aims to deepen and widen Algorithms and Complexity by discussing algorithms related to data structures in terms of the “Big-Oh” notation.

Data Structures is designed to keep the student’s workload as constant as possible throughout the course.

Learning objectives

- To be conversant with the main types of data structures: sequential access, trees, and tables.
- To delve into object oriented programming: design and develop interfaces, abstract classes, and generics in data structures by using the Java Collections Framework.
- To analyse operations and algorithms by using Big Oh notation, and develop more efficient algorithms.
- To delve into recursion; design and develop recursive methods to traverse tree and turn these methods into iterative ones.
- 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

Cross-disciplinary Competences

- **EPS1**. Capacity to solve problems and prepare and defence arguments inside the area of studies.
- **EPS5**. Capacity of abstraction and of critical, logical and mathematical thinking.

Specific Competences

- **GII-FB3**. Capacity to understand and master the basic concepts of discreet mathematics, logical, algorithmic and computational complexity, and its application to solve engineering problems.
- **GII-CRI6.** 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.

- **GII-CRI7**. Knowledge, design and efficient use of the types and data structure more suitable for solving a problem.
- **GII-CRI8**. Capacity to analyse, design, build and keep safety and efficiency in applications, choosing the paradigm and the most suitable programming languages.

Subject contents

1. Introduction to the Analysis of Algorithms

2. Object Oriented Programming Concepts

    2.1 Types, Interfaces and Inheritance

    2.2 Introduction to the JCF

3. Sequential Data Structures

    3.1 Stacks

    3.2 Lists: ArrayList and LinkedList

    3.2 Circular and priority queues

4. Arborescent Data Structures

    4.1 Definitions and notations

    4.2 Review of recursion

    4.3 Binary Trees

    4.4 Traversals

    4.5 Binary Seach Trees

    4.6 M-ary Search Trees

5. Introduction to Other Data Structures

Methodology

Big-size Group: Theory (3 crèdits)

- Theory: Classes supported by handnotes.
- Practice: Always working on examples.

Mid-size Groups: LAboratory (3 crèdits)

- Practice on exercises and projects (groups of two).
- Personalized monitoring.
- Use of an Integrated Development Environment (Netbeans).

Autonomous Work:

- Study.
- Project completion.

Development plan

Week	Big-size Group	Mid-size Group	Autonomous Work
1	1. Analysis Algoritmes	Laboratory 1	Study and project
2	2. OOP Aspects	Laboratory 1	Study and project
3	2. OOP Aspects	Laboratory 1	Study and project
4	2. OOP Aspects	Laboratory 2	Study and project
5	3. Sequential DS	Laboratory 2	Study and project
6	3. Sequential DS	Laboratory 3	Study and project
7	3. Sequential DS	Laboratory 3	Study and project
8	3. Sequential DS	Exam preparation	Study
9	First Midterm		
10	4. Arborescent DS	Laboratory 4	Study and project
11	4. Arborescent DS	Laboratory 4	Study and project
12	4.Arborescent DS	Laboratory 5	Study and project
13	5. Other DS	Laboratory 5	Study and project
14	5. Other DS	Laboratory 5	Study and project
15	Exam preparation	Laboratory 6	Study and project
16	Second Midterm		Study
17	Second Midterm		Study
18	Tutories		Study and project
19	Recovery Exams		Study

Evaluation

Acr	Description	Weight	Minimum Grade	Mandatory	Recoverable	Ind/Grup
Mid1	First Midterm Exam Themes 1, 2, 3 Laboratories 1 to 3	25%	4,0	Yes	Yes	Ind
Mid2	Second Midterm Exam Themes 4 and 5 Laboratories 4 to 6	25%	4,0	Yes	Yes	Ind
Lab	(lab1 + lab2 + lab3 + lab4 + lab5 +lab6) /6	50%	5,0	Yes	Yes	2

Final grade = 0,25 * Mid1 + 0,25 * Mid2 + 0,5 * Lab

- The maximum grade in a remedial (first or second) midterm exam will be of 8.
- The maximum grade in the recovery of a laboratory activity will be 6.
- Passed grades will be maintained for the same course but not between them.
- The evolution of the student will also be taken into account when computing the final grade.
- **To pass the subject all mandatory activities have to be passed.**

Bibliography

William J. Collins. Data Structures and the Java Collections Framework. Third edition. John Wiley & Sons, 2010. USA.

Adam Drozdek. Data Structures and Algorithms in Java. Second edition. Thomson Learning, 2005. USA.

Maurice Naftalin, Philip Wadler. Java Generics and Collections. O'reilly, 2007. USA.

Josep Maria Ribó. Apropament a les estructures de dades del del programari lliure. 2014.

Mark Allen Weiss. Data Structures & Problem Solving Using Java. Fourth Edition. Addison Wesley, 2010. USA.