

Course guide

270101 - DSI - Information Systems Design

Last modified: 11/07/2025

Unit in charge: Barcelona School of Informatics
Teaching unit: 747 - ESSI - Department of Service and Information System Engineering.
Degree: BACHELOR'S DEGREE IN INFORMATICS ENGINEERING (Syllabus 2010). (Optional subject).
Academic year: 2025 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: ENRIQUE MAYOL SARROCA
Others: Primer quadrimestre:
ENRIQUE MAYOL SARROCA - 10

PRIOR SKILLS

Those obtained in subjects pre-required to this subject

REQUIREMENTS

- Prerequisite IES

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

CSI2.2. To conceive, deploy, organize and manage computer systems and services, in business or institutional contexts, to improve the business processes; to take responsibility and lead the start-up and the continuous improvement; to evaluate its economic and social impact.

CSI3.3. To evaluate technological offers for the development of information and management systems.

CSI4.2. To participate actively in the design, implementation and maintenance of the information and communication systems.

CSI4.3. To administrate databases (CES1.6).

CT2.2. To demonstrate knowledge and capacity to apply the characteristics, functionalities and structure of data bases, allowing an adequate use, design, analysis and implementation of applications based on them.

CT2.3. To design, develop, select and evaluate computer applications, systems and services and, at the same time, ensure its reliability, security and quality in function of ethical principles and the current legislation and normative.

Generical:

G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

TEACHING METHODOLOGY

In order for the teaching methodology designed for this subject to have the expected effects, it is required that the student must have been present for a minimum of 70% of the class hours.

The subject is structured in different types of sessions.

There is a two-hour class a week where the teacher (or some students) present the main concepts of the topic planned for that week with an expository and participatory class with the rest of the students.

The exercise sessions are intended both to work on the concepts explained in the concept presentation sessions by solving small exercises, sharing the exercises solved by the students, or discussing texts studied by the students independently.

The individual study of texts is complemented by the completion of a questionnaire that the teacher can collect (at the beginning of class) to be evaluated and that must be used to guide the discussion that takes place in the exercise session.

The resolution of exercises proposed before the session can be collected by the teacher (at the beginning of the class) to be evaluated. During the exercise session a student presents a solution and it is discussed between all the students and the teacher.

On some occasions, the teacher proposes an exercise or quiz that is solved during this session in small groups, which the teacher can collect to be evaluated and which will be commented on at the end of the session.

The hours of independent work are intended for the individual study of the student, the completion of exercises, the reading of texts proposed by the teacher and activities for the deepening of the subject matter by the student

In addition, two types of work are planned for the student:

- Realization of a Case Study or Practical Work of the course, consisting of deciding which strategy of adopting a software solution is to be carried out for a business need, carrying out the detailed design of the same. This work will be done in groups of 2/3 students.
- Small tasks to search for information related to the topic of the subject. These assignments consist of given the teacher's specifications on a topic not covered in sufficient detail in class, the students must carry out a search for the most relevant bibliography and synthesis of the topic. This work is carried out individually or in groups of 2/3 students and preparing a document with a structure and content previously agreed upon with the teacher. In general, these papers will be presented in class for public discussion among all other students.

LEARNING OBJECTIVES OF THE SUBJECT

1. Understand and know how to choose between different alternatives for the construction and implementation of an IS to the organization.
2. Explain what is an IS development methodology and explain the differences between different specific methodologies.
3. Define what IS design is and the principles that guide this process.
4. Defining the concept of architecture YES, explain some of the most important architectural patterns and their characteristics.
5. Learn to design a simple IF based on a layered architecture.
6. To perform the logical design of databases for an IS from the conceptual framework and management patterns using persistence.
7. Learn to describe the main responsibilities of a database administrator
8. Know how to describe what the integration of components and / or applications and topologies and levels of integration.
9. Learn what it is the acquisition of standard packages, the selection criteria and techniques of adaptation, extension and parameterization.
10. Knowing what is outsourcing the development of an SI, existing strategies, make decisions, as well as advantages and disadvantages.
12. Being aware of the need for a continued and updated knowledge of new types of IF required by the market, new technologies available and new design methodologies.

STUDY LOAD

Type	Hours	Percentage
Hours large group	30,0	20.00
Hours medium group	30,0	20.00
Guided activities	6,0	4.00
Self study	84,0	56.00

Total learning time: 150 h

CONTENTS

Introduction to the Design of Information Systems

Description:

We introduce the concepts of Information System, Information Technology, and what is the IS design activity.

Ways to get an IS

Description:

We discuss and comment alternative ways to incorporate an information system to the organization: custom development, outsourcing development, acquisition standard packages, hiring external services, ...

Development Methodologies

Description:

We introduce the concept of software development methodology. We analyze two examples of methodologies. We present the principles that guide the design process.

IS Architecture

Description:

We present the concepts of enterprise architecture and architecture of a IS. We study the most important architectural patterns. We present the characteristics of the IS architecture.

IS Design based on a layered architecture

Description:

We present in detail the layered architecture. The responsibilities of a use case are distributed between architecture layers (Boundary, Control Entity). We perform the design of the Presentation, Domain and Data Management. We make the logical design of the database schema taking into account the conceptual schema. We study two patterns for managing data persistence. We describe the main responsibilities of a Database Administrator.

Application Integration

Description:

We describe in what the integration of applications consists. We describe different levels of integration and integration topologies.

Adoption of standard software

Description:

We describe the general process for the acquisition and selection of standard software. We describe the selection criteria. We present techniques for adaptation and extension of the functionality of standardized software.

Outsourcing software development

Description:

We introduce the concepts of outsourcing and offshoring. We study the strategies to follow and the decisions to make. We analyse candidate projects to outsource their development. The advantages and disadvantages are analysed.

Advances in design of SI

Description:

Briefly analyzed the new advances at methodological level, the new types of IS and new technologies that may affect the activity of IS design.

ACTIVITIES

Subject presentation and discussion on development environments

Description:

The student will participate in the discussion of the different alternatives presented by teacher for building an IS

Specific objectives:

1, 12

Related competencies :

G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

Full-or-part-time: 2h

Theory classes: 2h

Introduction to basic concepts of Information Systems and their professional roles

Description:

The teacher and the students, in a collaborative and participatory way, analyze the meaning of the concept of Information Systems and the activity of Design within the life cycle of an Information system. The student will work by reading different articles about professional roles that will be discussed and synthesized in class.

Specific objectives:

3, 12

Related competencies :

G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

Full-or-part-time: 6h

Self study: 2h

Theory classes: 2h

Laboratory classes: 2h

Study of different IS architectures

Description:

The student complements the descriptions of architectures presented by the teacher with a study based on the bibliography provided and other documentation that the student himself searches for. Students take responsibility for studying architecture in detail and individually. In the laboratory session, the students present their study for discussion among the rest of the class. After the session, the students will complete a questionnaire regarding the conclusions and characteristics of each architecture presented.

Specific objectives:

4, 12

Related competencies :

G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

Full-or-part-time: 10h

Self study: 6h

Theory classes: 2h

Laboratory classes: 2h

Selection techniques for the adoption of standard software.

Description:

The students, based on the reading of different articles, will collaboratively synthesize the definition of the stages and decisions to be taken in a software selection process, and in addition, they will synthesize the main criteria and indicators to take into account in this process of evaluation and comparison of different requests in the selection process.

Specific objectives:

9, 12

Related competencies :

G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

Full-or-part-time: 8h

Self study: 4h

Theory classes: 2h

Laboratory classes: 2h

Study on the outsourcing software development process

Description:

Students will perform a deep study of the theme by reading of supplementary texts.

Specific objectives:

10, 12

Related competencies :

G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

Full-or-part-time: 8h

Self study: 4h

Theory classes: 2h

Laboratory classes: 2h

Debate on development methodologies

Description:

The student studies in some detail the main characteristics of one of the development methodologies, the advantages and limitations, and the differences between the three. The conclusions of this study will be presented in the problem session raising a debate to compare and analyze the three methodologies. After the session, the students will solve an individual questionnaire about the conclusions of the debate.

Specific objectives:

2, 3, 12

Related competencies :

G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

Full-or-part-time: 14h

Self study: 8h

Laboratory classes: 6h

Study of a Layered Architecture

Description:

Students will present in groups different examples of IS with a layered architecture. Afterwards, the students will solve a questionnaire individually with the conclusions and characteristics of the architectures presented and discussed.

Specific objectives:

4, 12

Related competencies :

G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

Full-or-part-time: 10h

Self study: 6h

Theory classes: 2h

Laboratory classes: 2h

Allocation of Responsibilities to Layers and Use Case Realization

Description:

The student will document the Use Case Realization of an IS by means of problems proposed to discuss into the class of problems. At the same time, students apply these concepts in the Case Study of the course.

Specific objectives:

5

Full-or-part-time: 8h

Self study: 4h

Theory classes: 2h

Laboratory classes: 2h

Design of the Presentation Layer

Description:

The student will study the external design of a user interface. Specifically, for the external design, the quality criteria and recommendations to be taken into account will be analyzed, with an assessment and constructive criticism of the design of a web page. Regarding the internal design of the interface itself, the students will create a navigational map to document the behavior of the web.

Specific objectives:

5

Full-or-part-time: 10h

Self study: 6h

Theory classes: 2h

Laboratory classes: 2h

Design of the Domain Layer

Description:

Students will participate in the recall and depth of these decisions.

Specific objectives:

5

Full-or-part-time: 4h

Self study: 2h

Theory classes: 2h

Design of the Persistence Layer

Description:

Students in groups will make different presentations related to the strategy of automatic generation of persistence and the ORM tools in the market. After the session, the students will solve an individual questionnaire referring to the different presentations made in class.

Specific objectives:

5, 6, 12

Related competencies :

G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

Full-or-part-time: 14h

Self study: 6h

Theory classes: 4h

Laboratory classes: 4h

Global questionnaire on 3-layer architecture

Description:

The students will solve a synthesis exercise of the main decisions that need to be taken in the design of a 3-layer architecture, once seen individually in the previous activities.

Specific objectives:

5

Full-or-part-time: 6h

Self study: 4h

Guided activities: 2h

Responsibilities of the DAtabase Manager of the organization

Description:

Students will analyze and discuss with the teacher the responsibilities of a Database Administrator for an organization and its participation in the activity of designing an IS.

Specific objectives:

7

Full-or-part-time: 4h

Self study: 2h

Theory classes: 2h

Introduction to Application Integration

Description:

The students will deepen the subject from the reading of complementary texts that will be discussed in the problem sessions. In the second session, a gamification activity will be carried out to deepen the study of integration patterns based on messages.

Specific objectives:

8, 12

Related competencies :

G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

Full-or-part-time: 12h

Self study: 6h

Theory classes: 2h

Laboratory classes: 4h

New trends and future

Description:

The student (and teacher), through the literature search and documentation, provide examples of new developments in the design of new types of IS in organizations that are appearing, new trends and new methodological IS architectures.

Specific objectives:

1, 2, 3, 4, 8, 9, 10, 12

Related competencies :

G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

Full-or-part-time: 6h

Self study: 4h

Laboratory classes: 2h

Course practical work

Description:

The students will carry out a synthesis work of the course consisting of the description of a company's IS need and it will be necessary for the alumni to decide the adoption strategy they want to apply, and design the steps and decisions to be taken to carry it out term the work will be in groups.

Specific objectives:

1, 5, 6, 8, 9, 10, 12

Related competencies :

G7. AUTONOMOUS LEARNING: to detect deficiencies in the own knowledge and overcome them through critical reflection and choosing the best actuation to extend this knowledge. Capacity for learning new methods and technologies, and versatility to adapt oneself to new situations.

Full-or-part-time: 20h

Self study: 20h

End of course questionnaire

Description:

It is a questionnaire about the whole subject of course to assess the level of student learning

Full-or-part-time: 8h

Self study: 6h

Guided activities: 2h

GRADING SYSTEM

Final Score (NF) of the technical skills of the subject is obtained by weighting the rating questionnaires and exercises (NQE), Note Case Study course (NCE), the Research Working Note Information (NTR) and Participation Note (NP):

$$NF = 0.35 NQE + 0.25 NCE + 0.30 NTR + 0.10 NP$$

where:

The NQE is the average of the notes of the exercises and quizzes that teachers gather for the kinds of problems. The final questionnaire of course has a weight of 30% within this component. The rest of questionnaires have a weight of 70% within this component. It is required that the student has delivered 80% of the collected works. The final course questionnaire, which is required resolution for all students. Failure to deliver more than 80% of questionnaires / exercise, or not deliver the final questionnaire, this component will be evaluated with NQE = 0.0.

Failure to attend class or work session before the proposed questionnaire, forbids to deliver solved questionnaire.

The NCE is the note concerning the completion of the exercise of Design in layers and / or Standard Software Selection made by the students for the Case Study proposed for the course. Students, with teacher recommendation and taking into account their previous knowledge, made under compulsion of the two exercises. These works are done in small groups of 2-3 students and deliveries will be made with an interview with the teacher to present and explain the work. The note for each student is calculated from record obtained from the work.

The NTR is the note of the work of searching for information given during the course. These works consist of the student search for information to different topics studied in class. According to the topic of study, it is proposed to be made individually or in groups. The note of each student is calculated from record obtained from the work and is proportional to the dedication of each student in the performance of work, the quality of the information and searched, and their capacity for synthesis of their findings.

There is no predetermined number of research information to be requested during the course the student. In all the activities proposed for the student to do a search for information or further learning, or on their own initiative of the student, students prepare a report. This report will contain a list of information sought by the student from references provided by the teacher or references you need the student, with a brief summary of their contents and an analysis of the contribution that has this information regarding the working in class.

Failure to attend the session of research presentations (if any) prevents the opportunity to submit their own work or to solve session questionnaire.

The NP is the assessment by the teacher of the student's participation in the meetings at which the teacher or other students present the concepts of the subject and especially in the discussion sessions of problems. Additionally also takes into account the student's participation in the work of finding information.

The attendance of less than 70% of classes involve an assessment of 0.0 in this section.

The assessment of competence assigned to cross the course is obtained from the evaluation of delivery (NTR) and taking into account participation (NP), and has values □□A, B, C, D, as:

- o if the note is between 8.5 and 10
- or B if the note is between 7 and 8.4
- or C if the score is between 5 and 6.9
- or D if the note is less than 5



BIBLIOGRAPHY

Basic:

- Kurbel, K.E. The making of information systems: software engineering and management in a globalized world. Springer, 2008. ISBN 9783540792604.
- Kroll, P.; Kruchten, P. The rational unified process made easy: a practitioner's guide to the RUP. Addison-Wesley, 2003. ISBN 0321166094.

Complementary:

- Larman, C. Applying UML and patterns: an introduction to object-oriented analysis and design and iterative development. 3rd ed. Prentice Hall PTR, 2005. ISBN 0131489062.

RESOURCES

Hyperlink:

- <http://msdn.microsoft.com/en-us/library/dd673617.aspx>