The main language of instruction at Coimbra Institute of Engineering is Portuguese. However, some courses from degree and master programs can be offered in English and/or with a tutorial support in English.

The ECTS catalogue includes subject contents in English. The Students can choose subjects from this Catalogue to the study plan proposal (Learning Agreement) to be analyzed carefully by the Departmental Coordinators and to be adjusted if necessary.

This ECTS catalogue contains information which is valid for this academic year. ISEC reserves the right to adjust the courses offered during the academic year and is not responsible for typing errors or printing mistakes.

Prof. Luís Castro  
International Relations Office Coordinator  
Coimbra Institute of Engineering  
Rua Pedro Nunes  
Quinta da Nora  
3030-199 Coimbra  
PORTUGAL

Ms Dâlia Pires  
Contact Person  
Tel.: (+351) 239 790 206  
ri@isec.pt

Prof. Carlos Pereira  
Informatics Engineering Department Coordinator  
Coimbra Institute of Engineering  
Rua Pedro Nunes – Quinta da Nora  
3030 – 199 Coimbra  
PORTUGAL

Tel.: (+351) 239 790 206  
cpereira@isec.pt
## Code 6069010- MASTER Informatics and Systems Course

<table>
<thead>
<tr>
<th>Code</th>
<th>Title - Portuguese</th>
<th>Title - English</th>
<th>ECTS</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>60014591</td>
<td>Metodologias de Desenvolvimento de Software</td>
<td>Software Development Methodologies</td>
<td>7.5</td>
<td>1º Semester</td>
</tr>
<tr>
<td>60014605</td>
<td>Design e Arquitecturas de Software</td>
<td>Software Architecture and Design</td>
<td>7.5</td>
<td>1º Semester</td>
</tr>
<tr>
<td>60014616</td>
<td>Plataformas de Desenvolvimento</td>
<td>Development Platforms</td>
<td>7.5</td>
<td>1º Semester</td>
</tr>
<tr>
<td>60014627</td>
<td>Análise de Requisitos</td>
<td>Requirements Engineering</td>
<td>7.5</td>
<td>1º Semester</td>
</tr>
<tr>
<td>690105</td>
<td>Engenharia e Gestão de Sistemas de Informação</td>
<td>Information Systems Management and Engineering</td>
<td>7.5</td>
<td>2º Semester</td>
</tr>
<tr>
<td>690106</td>
<td>Testes e Qualidade de Software</td>
<td>Test and Software Quality</td>
<td>7.5</td>
<td>2º Semester</td>
</tr>
<tr>
<td>690108</td>
<td>SSD+CU+LE1</td>
<td>Decision Support Systems</td>
<td>7.5</td>
<td>2º Semester</td>
</tr>
<tr>
<td>690107</td>
<td>Projecto de Software</td>
<td>Software Project</td>
<td>7.5</td>
<td>2º Semester</td>
</tr>
<tr>
<td>60014684</td>
<td>Seminários Industriais</td>
<td>Industrial Seminars</td>
<td>7.5</td>
<td>1º Semester</td>
</tr>
<tr>
<td>690115</td>
<td>Bioinformática</td>
<td>Bioinformatics</td>
<td>7.5</td>
<td>1º Semester</td>
</tr>
<tr>
<td>60014745</td>
<td>Data Warehousing</td>
<td>Data Warehousing</td>
<td>7.5</td>
<td>1º Semester</td>
</tr>
</tbody>
</table>
# Program Contents

## Course Unit

DECISION SUPPORT SYSTEMS

### Subject type
Elective

### Research Area
Computer Science

### Year 1 Semester 2

### ECTS
7.5

<table>
<thead>
<tr>
<th>Activity Type</th>
<th>Working Hours Per Week</th>
<th>Total Hours</th>
<th>Activity Type</th>
<th>Total Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical Lectures</td>
<td>2</td>
<td>28</td>
<td>Study</td>
<td>91.5</td>
</tr>
<tr>
<td>Theoretical-Practical Lectures</td>
<td></td>
<td></td>
<td>Works / Group Works</td>
<td>45</td>
</tr>
<tr>
<td>Practical-Laboratory Lectures</td>
<td>2</td>
<td>28</td>
<td>Project</td>
<td></td>
</tr>
<tr>
<td>Tutorial Orientation</td>
<td></td>
<td></td>
<td>Evaluation</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Additional</td>
<td></td>
</tr>
</tbody>
</table>

### Total of Working Hours
195

### Lecturer

<table>
<thead>
<tr>
<th>Activity Type</th>
<th>Name</th>
<th>Qualifications</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical Lectures</td>
<td>Ana Rosa Pereira Borges (<a href="mailto:arborges@isec.pt">arborges@isec.pt</a>)</td>
<td>PhD</td>
<td>Profª. Coordenadora</td>
</tr>
<tr>
<td>Theoretical-Practical Lectures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Practical-Laboratory Lectures</td>
<td>Ana Rosa Pereira Borges (<a href="mailto:arborges@isec.pt">arborges@isec.pt</a>)</td>
<td>PhD</td>
<td>Profª. Coordenadora</td>
</tr>
<tr>
<td>Tutorial Orientation</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Responsible(s) Lecturer (s)
Ana Rosa Pereira Borges (arborges@isec.pt)

### Goals / Skills

It is intended to foster in students the minimum competencies that enable them to understand the key concepts in the area of decision support systems and methodologies of optimization.

The main aim of this curricular unit is to provide students with the minimum necessary concepts to a specialist who can serve as an interface between a System Decision Support and the "staff" of a company. On the other hand, the student must be able to implement a SAD itself.

The knowledge acquired can be applied in solving similar algorithms/problems in a real context.

### Learning outcomes of this curricular unit:
1. Understand the importance of decision support systems and the main concepts related with decision support systems.
2. Identify different types of decision problems and distinct types of optimization methodologies.
3. Identify the suitable algorithm that can be used to solve a simple decision problem.
4. Solve simple practical problems using the appropriate optimization algorithms and interpret the obtained solution(s).
5. Encourage the autonomous study and research work.
Program Contents

- Linear programming with a single objective (revisions)
- Decision linear programming problems with multiple objectives
- Decision linear goal programming problems
- Uncertainty in linear programming problems
- Dynamic programming

Work Done

Individual Research written work or Computational implementation to be done:

Carry out a research work that allows students to deepen some of the topics in the area of Decision Support Systems, and the development of their scientific, research and investigation competences (individual work).

In order to carry out this work, the student will have to search for an appropriate bibliography and do an autonomous study.

Depending on the type of research work chosen, case studies or applications developed within the scope of study may also be presented.

The work, which will consist of a written report, and for works with a classification of more than 16 values of an oral presentation followed by some questions (discussion), will enable to test the ability to communicate (written and/or oral) and critical argumentation of each student.

The presentation (and discussion) of the work is required to works with a rating higher than 16 points. The no-show presentation/discussion of work, corresponding to the assignment of the classification of 16 points in this work component. The presentation/discussion referred to above will focus not only on the content of the respective work, but also in others taught in the course unit. It is scheduled for the afternoon of the day of the 1st Call final examination exam (or on a date to be agreed between the teacher and students, but never after 48 hours following the day of the 1st Call final examination exam).

The themes of student research work should be defined as early as possible.

In addition to the topics to be proposed by the teacher, others may be proposed by the students, which will be later validated by the teacher.

Some Proposed Topics

1 - Group Decision Support Systems
2 - Qualitative aspects of the decision-making process
3 - Decision aide versus decision support
4 - Some examples of decision support systems (different specific areas can be studied by different students)

As an alternative to the Research Work, the student can choose to perform the computational implementation of one of the approaches taught during the classes of the Curricular Unit (chosen between the student and the teacher, as soon as possible). This computational implementation work can be individual or group work, with a maximum of 2 elements.

Students must submit the work in moodle - (until 11h30 p.m. on 9/6/2019)
(a report with +/- 7500 words)

- The delivery date of the work (06/09/2019) is unique and valid for all final examination exam Calls (NORMAL, RECURSO ou ESPECIAL) that students be subject to assessment by final exam.

Teaching Methododology

The lectures are expository (using chalkboard and Power-Point projections) but tend to promote the active participation of students, either by asking questions, either through the resolution of exercises involving the application of the topics being exposed.

In theoretical-practical classes the knowledge acquired in lectures is applied by resolution of exercises. It is necessary an individual study of students out of class (for better monitoring of lessons).

Bibliography

Notes, slides and various content, used in class (available in moodle)

"Programação Linear multiobjetivo: do modelo de programação linear clássico à consideração explícita de várias funções objetivo"
Climaco J. N., Antunes C.H. e Alves M. J.
Coimbra – Imprensa da Universidade, 2003

"Introduction to Operations Research“ – 9th Edition
Hillier, F.S. , Liberman, G.J.

Evaluation Method

Students can choose four different assessment methods:

1) Final evaluation
   a) Witten Final Evaluation (14 points), covering all subjects
      + Individual research work OR computational implementation work (6 points).
      Mandatory minimum of 30% in the written Final Evaluation.
   b) Written Final Evaluation (20 points), covering all subjects
      ✓ The best grade is guaranteed between:
      - Written Final evaluation
      - Written Final evaluation + work

2) Continuous Assessment,
   a) two (2) Written Evaluation Tests to be carried out during the semester (7 points + 7 points),
      covering all the subjects taught until the day of the test
      + Individual research work OR computational implementation work (6 points).
   b) two (2) Written Evaluation Tests to be carried out during the semester (10 points + 10 points), covering all subjects
      covering all the subjects taught until the day of the test
      Mandatory minimum of 30% in each evaluation Test.
      ✓ The best grade is guaranteed between:
      - Written Evaluation Tests
      - Written Evaluation Tests + work

The approval requires a grade greater than or equal to 9,5 ([0, 20]).

• The 1st evaluation test will be held in the class on 02/05/2019
• The date of the 2nd evaluation test (the last one) coincides with the date of the 1st Call final examination exam.
• Mandatory minimum of 30% in each evaluation Test.
• One of the tests failure, implies that the student will move to the final assessment methods.
• Students meeting the minimum required grade of 9,5 (or higher) in the Continuous assessment method will be automatically dismissed from assessment by final evaluation.
• Continuous Assessment grades of approved students will be posted in the 1st call evaluation grade list.

Conditions for Exam Admission

All students can access the exam.
Access Conditions and Attendance Excuse

N:A:

Conditions for Results Improvement
No restriction is placed, and the improvement of the grade to the discipline is possible according to the evaluation rules of the school.

Date
January 22\textsuperscript{nd}, 2019

Signature from the lecturer responsible for the course

Signature of Teacher: \[\text{Signature}\]
Program Contents

Course Unit
SOFTWARE PROJECT

Subject type
Mandatory
Research Area
Computer Science

Year 1
Semester 2
ECTS 7.5

Working Hours

<table>
<thead>
<tr>
<th>Activity Type</th>
<th>Working Hours Per Week</th>
<th>Total Hours</th>
<th>Activity Type</th>
<th>Total Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical Lectures</td>
<td>2</td>
<td>28</td>
<td>Study</td>
<td>35</td>
</tr>
<tr>
<td>Theoretical-Practical Lectures</td>
<td></td>
<td></td>
<td>Works / Group Works</td>
<td>104</td>
</tr>
<tr>
<td>Practical-Laboratory Lectures</td>
<td>2</td>
<td>28</td>
<td>Project</td>
<td></td>
</tr>
<tr>
<td>Tutorial Orientation</td>
<td></td>
<td></td>
<td>Evolution</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Additional</td>
<td></td>
</tr>
</tbody>
</table>

Total of Working Hours 195

Lecturer

<table>
<thead>
<tr>
<th>Activity Type</th>
<th>Name</th>
<th>Qualifications</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical Lectures</td>
<td>João Cunha</td>
<td>PhD</td>
<td>Coordinator Professor</td>
</tr>
<tr>
<td>Theoretical-Practical Lectures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Practical-Laboratory Lectures</td>
<td>João Cunha</td>
<td>PhD</td>
<td>Coordinator Professor</td>
</tr>
<tr>
<td>Tutorial Orientation</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Goals / Skills
The main objective of this course is to provide knowledge, understanding and practice on software processes and project management and development as an engineering activity. This course is concerned with software processes and the knowledge about the planning, organization, and monitoring of all software life-cycle phases. In this course, students participate in the definition of software processes and the development of a software project, being involved in all activities such as project management, requirements analysis, architecture, implementation, and quality assurance. Questions related to communication, group dynamics, or professional practice are also handled. Software processes are defined, assessed and improved.

Program Contents
Definition, evaluation and improvement of software processes; project planning; project monitoring and control; quality assurance; requirements definition and specification; prototypes; formal specification; reliability and safety; verification and validation; maintenance; reuse; group dynamics; risk management.
Work Done

There will be three practical works:
1. Processes definition. This assignment consists of the definition and design of the necessary processes to carry out the software project. The work will be performed by teams with about 6-8 members. Expected delivery and due date: 3/25/2019
2. Execution of a software project, following the previously defined processes, as well as good software engineering practices, related in particular to management (design, quality, risk), analysis, design, implementation and testing. This assignment will be performed by the same teams. Expected delivery and presentation date: exam day.
3. Process assessment and improvement. Each student should focus on an aspect of the processes in use, in order to measure, assess and improve. Expected delivery and presentation date: exam day.

Teaching Methodology

The theoretical classes will be to present the topics, and for milestones reviews or sprint reviews.
The practical classes will be used for progress meetings, monitoring the progress of the project teams.
The projects will be developed mainly outside of the classes, although, at certain times, they may be partially realized during the lessons.
Students who, due to professional or other valid reasons, are unable to attend classes, can follow progress meetings through video conference.

Bibliography
- Pankaj Jalote, Software Project Management in Practice, Addison-Wesley, 2002
- Andrew Stellman, Jennifer Greene, Applied Software Project Management, O'Reilly, 2006
- Several papers

Evaluation Method

Grades are based on:
1. Process definition: 4 points
2. Project execution: 12 points
3. Processes analysis and improvement: 4 values

Assignments 1 and 2 are performed in teams, however the grades are individual, based on student performance during the assignment, including all contributions in the production of artifacts, writing progress reports and active participation during classes and discussions in forums.
Assignment 3 is individual.
There will be no written exam.

Conditions for Exam Admission

There will be no exam.

Access Conditions and Attendance Excuse

There will be no attendance excuse.

Conditions for Results Improvement

None. The project will end by the established deadlines.

Date
23/1/2019

Signature from the lecturer responsible for the course
Course Unit: TEST AND SOFTWARE QUALITY

Subject type: Mandatory
Research Area: Computer Science

Year: 1  Semester: 2  ECTS: 7.5

<table>
<thead>
<tr>
<th>Activity Type</th>
<th>Working Hours Per Week</th>
<th>Total Hours</th>
<th>Activity Type</th>
<th>Total Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical Lectures</td>
<td>2</td>
<td>28</td>
<td>Study</td>
<td>47</td>
</tr>
<tr>
<td>Theoretical-Practical Lectures</td>
<td></td>
<td></td>
<td>Works / Group Works</td>
<td>90</td>
</tr>
<tr>
<td>Practical-Laboratory Lectures</td>
<td></td>
<td></td>
<td>Project</td>
<td></td>
</tr>
<tr>
<td>Tutorial Orientation</td>
<td>2</td>
<td>28</td>
<td>Evaluation</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Additional</td>
<td></td>
</tr>
</tbody>
</table>

Total of Working Hours: 195

Lecturer:

<table>
<thead>
<tr>
<th>Activity Type</th>
<th>Name</th>
<th>Qualifications</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical Lectures</td>
<td>Jorge Miguel Sousa Barreiros</td>
<td>PhD</td>
<td>Professor Adjunto</td>
</tr>
<tr>
<td>Theoretical-Practical Lectures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Practical-Laboratory Lectures</td>
<td>Jorge Miguel Sousa Barreiros</td>
<td>PhD</td>
<td></td>
</tr>
<tr>
<td>Tutorial Orientation</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Responsible(s) Lecturer(s): Jorge Miguel Sousa Barreiros

Goals / Skills:
- Understanding the role of testing in the software development process.
- Understanding the concepts of error, failure, fault and other relevant concepts.
- Knowing and using test tools
- Analyzing and extracting models based on graphs, logic models, input partitioning and syntax models for testing purposes.
- Knowing and understanding model-based testing
- Defining test requirements
- Creating tests, based on test requirements
Program Contents
1- Introduction
2- Structural models and criteria
3 Logic models and criteria
4 – Input space partitioning models and criteria
5- Syntax based models and criteria
6 – Practical considerations

Work Done
3 Mini projects, to be done in and out of classes, and also a presentation on a selected topic, with identical classification weight. Projects take place in last letive weeks of april, may and june.

Teaching Methododoly
Concept description and analysis in theoretical classes and complemented by application examples in lab classes. Mini projects are also partially done in lab classes.

Bibliography
Theoretical slides:
Ammani & Offutt, "Introduction to Software Testing", Cambridge University Press

Evaluation Method
Exam (12 points)
Mini-projects (8 points)

Conditions for Exam Admission
N/A

Access Conditions and Attendance Excuse
N/A

Conditions for Results Improvement
The exam can be improved according to the general rules in effect I.

Date
Signature from the lecturer responsible for the course
24-01-19
Program Contents

Course Unit
ENGINEERING AND MANAGEMENT OF INFORMATION SYSTEMS

Subject type mandatory Research Area Computer Science

Year 1 Semester 2 ECTS 7.5

Working Hours Unaccompanied Working Hours

<table>
<thead>
<tr>
<th>Activity Type</th>
<th>Working Hours Per Week</th>
<th>Total Hours</th>
<th>Activity Type</th>
<th>Total Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical Lectures</td>
<td>2</td>
<td>28</td>
<td>Study</td>
<td>55</td>
</tr>
<tr>
<td>Theoretical-Practical Lectures</td>
<td></td>
<td></td>
<td>Works / Group Works</td>
<td>80</td>
</tr>
<tr>
<td>Practical-Laboratory Lectures</td>
<td>2</td>
<td>28</td>
<td>Project</td>
<td></td>
</tr>
<tr>
<td>Tutorial Orientation</td>
<td></td>
<td></td>
<td>Evaluation</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Additional</td>
<td></td>
</tr>
</tbody>
</table>

Total of Working Hours 195

Lecturer

<table>
<thead>
<tr>
<th>Activity Type</th>
<th>Name</th>
<th>Qualifications</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical Lectures</td>
<td>Fernanda Brito Correia</td>
<td>Master (8 years-previous Bologne)</td>
<td>Prof. Adjunta</td>
</tr>
<tr>
<td>Theoretical-Practical Lectures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Practical-Laboratory Lectures</td>
<td>Paulo Miguel Mariano</td>
<td>Master (7 years-previous Bologne)</td>
<td>Assistente</td>
</tr>
<tr>
<td>Tutorial Orientation</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Responsible(s) Lecturer(s) Fernanda Brito Correia

Goals / Skills
Teach knowledge so that students acquire the ability to prepare a study of Information Systems planning in an organization comprising all the components that should be taken into account in this planning.

Competences
Objectives/ learning goals
Knowledge and Understanding
A.1. Understanding the importance of information management in organizations.
A.2. Understand key concepts related to an organization's business model, its processes and information architecture.
A.3. Understanding the dynamic and evolutionary nature of Information Systems (IS) in organizations.
A.4. Identify and describe the main types of IS / IT in organizations.
A.5. Identify and describe the main approaches and methods of Information Systems planning (ISP).
A.6. Describe the main methodologies for managing and evaluating the impacts of IS / IT in Organizations.
A.7. Understand the significance of business process reengineering.

Application of Knowledge and Understanding
B.1. Analyze and describe the business processes of an Organization and the corresponding Information needs.
B.2. Analyze and describe the IS / IT of an organization.
B.3. Describe the information architecture of an organization.
B.4. Analyze the main shortcomings of an organization's IS / IT.
B.5. Propose guidelines for the evolution of an existing IS.

Knowledge Integration and Judgment
C.1. Justify the main options taken in carrying out the work of ISP in an organization.
C.2. Propose and justify changes to an organization's business processes.
C.3. To recommend, in a justified manner, the priority SI / IT investment projects for the organization.
C.4. To propose a methodology of management of the impacts of IS / IT for the organization studied.
C.5. Evaluate and select priority areas to be developed in an IS based on an analysis.

Communication
D.1. To prepare documentation related to the study of ISP in an Organization.
D.2. Ability to communicate and evolve ideas in a teamwork context.
D.3. Ability to obtain information relevant to the ISP based on the interview of people of the organization for which the system is intended.
D.4. Ability to synthesize the collected information that must be transmitted, clearly distinguishing the fundamental of the accessory.
D.5. Simplicity and clarity in the presentation of the results obtained, both written and oral.
D.6. Communicate and present the work done, justifying the options taken.

Self-Learning Skills
E.1. Promote the autonomous development of new strategies for analysis and structuring of information.
E.2. Enhancing the ability to interpret norms or working methods and their application to a real and concrete case.
E.3. Enhance the ability to organize and manage teamwork.

Program Contents
1. Introduction to Information Systems.
2. Information Systems management.
3. Information Systems planning.

Work Done
A group work (with several stages of individual defenses) is carried out, which consists of applying the method taught of ISP to a company or organization.

Teaching Methodology
Exposition of the subjects, combined with practical application to real cases. Presentations of the students during the various stages of the content taught. Follow-up of the work carried out. In all classes there may be assessment moments for the practical work components.

Bibliography
- Correia, Fernanda Brito - "Textos de Apoio", 2019
- B-On – http://b-on.pt
Evaluation Method
It contains a practical work that is mandatory and consists of the preparation of a study of ISP of a company or organization. The work is carried out in a group and is carried out during the semester, with individual oral presentations in classes, mandatory individual defenses and the presentation of a final report. In all classes there are assessment moments for the practical work component. Theoretical exam (30% weight - minimum of 30%) and practical work (Report 35%, Individual Work done in class, Presentation and Defense 35%).

Conditions for Exam Admission
All students have access to the exam, only obtaining approval if they fulfill the requirements defined in the previous point (Evaluation Method).

Access Conditions and Attendance Excuse
Não existe dispensa de frequência

Conditions for Results Improvement
There is only one edition of the practical work and it cannot be improved.

Date
25/02/19

Signature from the lecturer responsible for the course
Fernanda Maria Brito Correia
Program Contents

Course Unit
INFORMATION SYSTEMS PROJECT

Subject type
Mandatory
Research Area
Computer Science

Year 1 Semester 2 ECTS 7.5

Working Hours
Activity Type Working Hours Per Week Total Hours
Theoretical Lectures 2 28
Theoretical-Practical Lectures 2 28
Practical-Laboratory Lectures 2 28
Tutorial Orientation

Unaccompanied Working Hours
Activity Type Total Hours
Study 28
Works / Group Works 54
Project 54
Evaluation Additional 3

Total of Working Hours 195

Lecturer
Activity Type Name Qualifications Category
Theoretical Lectures Jorge Bernardino PhD Coordinator
Theoretical-Practical Lectures Jorge Bernardino PhD Coordinator
Practical-Laboratory Lectures Jorge Bernardino PhD Coordinator
Tutorial Orientation

Goals / Skills
Develop knowledge and understanding skills in the area of Information Systems Design. Identify the concepts underlying the design of information systems. Develop the ability to apply the knowledge acquired in solving specific problems of business life. Provide students with the ability to work in groups, developing interpersonal relationships as a way to improve their insertion in the job market.

Program Contents
Theoretical: Project Management:
1. Introduction
2. Project life cycle and organization
3. Project management processes
4. Integration management
5. Management of scope
6. Time Management
7. Cost management
8. Quality management
9. Human resources management
10. Communications management
11. Risk management
12. Procurement management
13. Stakeholders management

Practice: Current Approaches to the Information Systems Project
1 - Open source project management tools
2 - Implementation based on Packages versus implementation by measure
3 - Outsourcing Information System
4 - Management of a real project

Work Done
Evaluation of open source project management tools
Management of a project of an information system

Teaching Methodology
Presentation of the theoretical foundations of information systems projects
Research of project management tools
Bibliographic collection and follow-up research

Bibliography
- Slides presented in class

Evaluation Method
Continuous evaluation
- Presentations throughout the semester: 40%
- Individual research work: 50%
- Defence 10%

Final classification = 0.4 * Presentations + 0.5 * Research works + 0.1 Defence

Exam evaluation
- Exam: 40%
- Individual research work: 50%
- Defence 10%

Final classification = 0.4 * Presentations + 0.5 * Research works + 0.1 Defence

Conditions for Exam Admission
Students can only access the exam by submitting and defending the research works.

Access Conditions and Attendance Excuse
Those provided by law.

Conditions for Results improvement
The classification obtained in the research works will be used in all exams of the academic year (normal, resource and special).

Date
20th January 2019

Signature from the lecturer responsible for the course

Jorge Bernardino
**Course Unit**  
**BUSINESS INTELLIGENCE**

**Subject type**  
Mandatory  

**Research Area**  
Computer Science

**Year**  
1st  
2nd  

**ECTS**  
7.5

<table>
<thead>
<tr>
<th>Activity Type</th>
<th>Working Hours Per Week</th>
<th>Total Hours</th>
<th>Activity Type</th>
<th>Total Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical Lectures</td>
<td>2</td>
<td>28</td>
<td>Study</td>
<td>50</td>
</tr>
<tr>
<td>Theoretical-Practical Lectures</td>
<td></td>
<td></td>
<td>Works / Group Works</td>
<td>50</td>
</tr>
<tr>
<td>Practical-Laboratory Lectures</td>
<td>2</td>
<td>28</td>
<td>Project</td>
<td>35</td>
</tr>
<tr>
<td>Tutorial Orientation</td>
<td></td>
<td></td>
<td>Evaluation</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Additional</td>
<td></td>
</tr>
</tbody>
</table>

**Total of Working Hours**  
195

**Lecturer**

<table>
<thead>
<tr>
<th>Activity Type</th>
<th>Name</th>
<th>Qualifications</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical Lectures</td>
<td>Viriato Marques</td>
<td>PhD</td>
<td>Coordinator Professor</td>
</tr>
<tr>
<td>Theoretical-Practical Lectures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Practical-Laboratory Lectures</td>
<td>Viriato Marques</td>
<td>PhD</td>
<td>Coordinator Professor</td>
</tr>
<tr>
<td>Tutorial Orientation</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Goals / Skills**

To know, understand and use data warehouses, OLAP systems, data mining algorithms and development tools. To implement data warehouses, OLAP systems, KPI's. To implement pivot tables, dashboards and reports. To apply, evaluate and get conclusions from data mining techniques. To supervise and implement projects in the BI field. To have a perspective of the use and importance of BI in models such as Balanced Scorecards.

**Program Contents**

- SQL Server BIDS – Introduction:
  - Installation
  - Services
  - Configuration and Management Studio
• Introduction to ETL in BIDS: basic ETL project (read and write, queries, aggregations, lookup, error recovery); SQL Server Agent.
• The OLAP concept
• Basic Analysis Services project in BIDS:
  o Architecture and data propagation
  o The front-ends role
  o OLAP project: implementation and deployment
  o DM project: implementation, deployment, conclusions
• Advanced project with Analysis Services of BIDS
  o MDX (Management Studio examples)
  o Introduction to MDX scripts
  o Calculations, Actions, Aggregations, Perspectives, Translations
  o Partitions: ROLAP / MOLAP configuration
  o KPI concept and definition in BIDS
• Front-End Tools and dashboards
  o Excel, Power-pivot and DAX
  o Power BI (desktop)
• Reporting and dashboards in BIDS:
  o Simple Reporting projects
  o Shared connections and datasets
  o Reporting toolbox and advanced reporting projects
  o Report Server configuration and deployment for Internet
• Connecting applications to OLAP servers
• ADODM
• Application template in VB or C# with OLAP and ADODM
• Creating and managing knowledge in organizations
• Vision of Skandia and Balanced Scorecards models. The role of KPIs

• Data Mining:
  o Association Rules: A-priori e FPGrowth
  o Clustering: K-Means, AHC and DBScan
  o Linear Regression
  o Outlier detection algorithms and techniques

• Business Intelligence

Work Done
Implementation of data warehouses, ETL, OLAP systems e KPIs. Implementation of Reports, PowerBI desktop and Excel, Smqll application with ADODM. Data mining techniques with BI Studio, RapidMiner and Weka. Practical exercises with MDX in SQL Server.

Teaching Methodology
Theoretical classes using slides and some application examples
Application exercises
Development of practical works using Microsoft BI Development Studio, Excel, PowerBI desktop, Rapidminer and Weka.

Bibliography
Business intelligence
Santos & ramos, FCA, 2010

Introduction to Data-mining
Tan, Steinbach, Kumar (Pearson), 2008

Delivering BI with Microsoft SQL Server
Larson, 2012

Foundations of SQL Server Business Intelligence
Langit, 2009
Data Mining: Concepts and Techniques
Han, Kamber, Morgan Kaufman, 2006

MDX with Microsoft SQL Server 2008R2 Analysis Services Cookbook
Plasevoll, Tomislav, PACKT enterprise, 2011

Microsoft SQL Server 2008 Analysis Services Unleashed
Gorbach, Irina et al., SAMS 2008

Powerpoint slides about all the subjects
Solved exercises
Solved past exams questions
Practical works with some possible solutions

Evaluation Method
Exam – 10 points
Final Practical Work – 10 points to be finished until 1 week before 1st call exam or 2nd call exam

Conditions for Exam Admission
No restrictions

Access Conditions and Attendance Excuse
Accordign to the law

Conditions for Results Improvement
Access to 2nd exam call for improvement of classification of the 1st exam call

The final practical work is unique, i.e., we can accept a single version of the work without possibility of improvement. For special epoch exams there is the possibility of a new practical work, but with a theme different from that used in the normal epoch(e).

Date
2019/2/4

Signature from the lecturer responsible for the course
Program Contents

Course Unit
UBQUITOUS COMPUTING

Subject type
Elective

Research Area
Computer Science

Year
1
Semester
2nd

ECTS
7.5

Working Hours

<table>
<thead>
<tr>
<th>Activity Type</th>
<th>Working Hours Per Week</th>
<th>Total Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical Lectures</td>
<td>2</td>
<td>28</td>
</tr>
<tr>
<td>Theoretical-Practical Lectures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Practical-Laboratory Lectures</td>
<td>2</td>
<td>28</td>
</tr>
<tr>
<td>Tutorial Orientation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Unaccompanied Working Hours

<table>
<thead>
<tr>
<th>Activity Type</th>
<th>Total Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study</td>
<td>60</td>
</tr>
<tr>
<td>Works / Group Works</td>
<td>69</td>
</tr>
<tr>
<td>Project</td>
<td></td>
</tr>
<tr>
<td>Evaluation</td>
<td>5</td>
</tr>
<tr>
<td>Additional</td>
<td>5</td>
</tr>
</tbody>
</table>

Total of Working Hours
195

Lecturer

<table>
<thead>
<tr>
<th>Activity Type</th>
<th>Name</th>
<th>Qualifications</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical Lectures</td>
<td>Ana Cristina da Costa Oliveira Alves</td>
<td>PhD</td>
<td>Assistant Professor</td>
</tr>
<tr>
<td>Theoretical-Practical Lectures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Practical-Laboratory Lectures</td>
<td>Ana Cristina da Costa Oliveira Alves</td>
<td>PhD</td>
<td>Assistant Professor</td>
</tr>
<tr>
<td>Tutorial Orientation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responsible(s) Lecturer(s)</td>
<td>Ana Cristina da Costa Oliveira Alves</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Goals / Skills
After attending this course, students should:

- Have a broad view on the technologies that support ubiquitous computing
- Know the big picture on: wireless sensor networks, the different kinds of RFID systems, the different systems for indoor location
- Have a first understanding on the Global Navigation Satellite Systems (GNSS)
- Understand the main principles of the design of ubiquitous systems
- Understand process of development of a field study: types of field studies; study design; participants; data analysis; technology; security and privacy
- Understanding the relation between spatial databases and GIS
- Know some spatial data models
- Know what is a geographic data model and possible representations for geographic data
- Know some rudiments of computational geometry
- Know the main data analysis methods regarding context-awareness data processing

Program Contents

- **Introduction**
  Mark Weiser vision; introduction to the concepts of: context awareness; pro-activity; computers as human proxies.

- **Post-PC computing**
  Surrounded by computational power and data, opportunities, and implications; from GUI to UUI; sensor networks, internet of things, opportunistic sensors, and private sensors; security and privacy.

- **Field studies**
  Types of field studies. Design. Participants.

- **Behavior and context modelling**
  4-w Model: who, when, where, what. Understanding individual needs, activities, land-use and mobility.

- **Data processing**
  Knowing your data and pre-processing; Data Fusion; classification, clustering and analysis of time series.

- **Privacy**
  Understanding privacy. Technical solutions. Addressing privacy

- **Location**
  Location representation; location systems; approaches to determining location; error reporting; indoor location systems; outdoor location systems.

- **The future**
  Intelligent Transport Systems, Smart cities; Participatory Government; Energy and Sustainability; Precision Agriculture.

Work Done

A practical work will be carried out (or a set of, necessarily, 3 smaller works) that will consist in the development and implementation of a field study where the concept(s) of: context awareness, privacy, pro-activity and processing of collected data.

Teaching Methodology

Theoretical classes (2 hours/week)
Practical classes (2 hour/week)
In this course unit, the teaching methodologies aim to foster student involvement encouraging his active participation since the beginning. With the knowledge and understanding of the subjects taught in lectures and with the understanding of solutions and algorithms from the state-of-the-art in Ubiquitous Computing, conditions are created for students to develop skills to conceptualize and implement a new application concerning: context awareness, privacy, pro-activity, and data processing.

Bibliography

- Ubiquitous Computing Fundamentals. Edited by John Krumm. CRC Press, 2010


• Other several papers (generally available online)

Evaluation Method
The evaluation consists of a theoretical exam (given in the respective periods or in phases during the semester - continuous evaluation) and of a self-proposed practical work (or 3 works proposed by the teacher), specifically:
- The theoretical component worth 8 values of the final grade (40%), with a minimum required of 3 values;
- The practical work worth 12 values of the final grade (60%). There are 3 student profiles for this practical work: Development, Data Analysis, or Full Continuous Evaluation. On the first 2 profiles the evaluation is distributed over:
  • Proposal presentation (5%) - Submission date: April 25th, 2019, Presentation day: theoretical class the next day
  • First version of a paper describing the application or field study to develop (without results yet) (20%) Scheduled date: May 31st, 2019
  • Final presentation + demo + complete version of the previous paper (35%) – Day of the respective exam: June 28th, 2019 or July 15th, 2019

The Full Continuous Evaluation is only to those students who are present in 75% of practical classes, and consists of 3 practical works proposed by the teacher - Scheduled date for the delivery of each work: April 18th, 2019; May 23rd, 2019; Day of the respective exam: June 28th, 2019 or July 15th, 2019.

These works cover almost all topics lectured. The submission of these works are distributed along the semester and are supplemented by a technical report describing the decisions taken during the development of each work.

In the special season, the full continuous evaluation is individual as the other two evaluation profiles, and in all evaluation profiles, the evaluation elements will all be delivered together as follows:
  • Article to describing the application including its architecture, the data collection, visualization and analysis phases (25%)
  • Final presentation with demonstration of the application (35%)
For those who choose profiles 1 and 2, the teacher must validate the theme of the work previously.

Conditions for Exam Admission
All students are eligible to take final exams

Access Conditions and Attendance Excuse
Continuous assessment is only allowed for students who attend 75% of the practical classes.

Conditions for Results Improvement
Students who have not passed the subject have access to the alternative period of exams provided. Students who have passed the subject can sign up for improving exam grade in the period of exams. The score obtained in the previous exam will be assured.

Date
31/01/19

Signature from the lecturer responsible for the course