

Subject Title:	Computational Intelligence																						
Scientific Area:	Computer Science																						
Course:	European Computer Science																						
Code:	977044																						
Year/Semester:	3/1																						
ECTS:	6																						
Department:	Computer Science and Systems Engineering																						
Instructor:	Carlos Pereira																						
Study plan:	<ol style="list-style-type: none"> 1. Introduction to Computational Intelligence - Paradigms and Applications 2. Advanced Topics of Neural Networks 3. Advanced Topics of Fuzzy Systems 4. Neuro-Fuzzy Systems 5. Evolutionary Computation and Collective Intelligence <ol style="list-style-type: none"> 5.1 PSO - Particle Swarm Intelligence 5.2 ACO - Ant Colony Optimization 6 Applications (Finance, Web-Mining, Robotics, Biomedicine, Bioinformatics, Control Systems) 																						
Language:																							
Type of instruction:	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Activities</th> <th style="width: 15%;">Total Hours</th> <th style="width: 15%;">Hours/week</th> <th style="width: 45%;">Comments</th> </tr> </thead> <tbody> <tr> <td>Theoretical</td> <td style="text-align: center;">28</td> <td style="text-align: center;">2</td> <td></td> </tr> <tr> <td>Theoretical-Practical</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Practical</td> <td style="text-align: center;">42</td> <td style="text-align: center;">3</td> <td></td> </tr> <tr> <td>Tutorial guidance</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			Activities	Total Hours	Hours/week	Comments	Theoretical	28	2		Theoretical-Practical				Practical	42	3		Tutorial guidance			
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Theoretical-Practical																							
Practical	42	3																					
Tutorial guidance																							
Learning objectives:	<p>The course programme allows that the student obtains a detailed view of the field of Computational Intelligence (CI) and recognize the importance of the area with illustration of real case studies.</p> <p>The advantages and disadvantages of each technique are discussed allowing the students to develop a critical analysis of the methodologies.</p> <p>It allows the student to identify problems and apply successfully the combination of techniques from the area of CI.</p>																						
Generic learning outcomes and competences:	<p>This course presents the main paradigms of Computational Intelligence (CI), including neural networks, fuzzy and neuro-fuzzy systems and new paradigms of evolutionary computation. By the end of this course, students should be able to:</p> <ul style="list-style-type: none"> - Identify the main paradigms and algorithms of CI; - Analyze a real world problem, identify its main characteristics and apply the correct algorithms - Recognize the advantages and limitations of the different algorithms - Justify the main options taken during the development of the algorithms - Develop in an autonomous way new strategies for a real world problem from different fields: Finance, Web-Mining, Robotics, Biomedicine, Bioinformatics, Control Systems, etc... 																						

Bibliography:	<p>Computational Intelligence: An Introduction, Andries P. EngelBrech Neural networks design, Martin T. Hagan, Howard B. Demuth, Mark Beale Neural Networks: A Comprehensive Foundation, Simon Haykin Computational Intelligence: Concepts to Implementations, Russ Eberhart and Yuhui Shi Introduction to Data-mining - Pang-Ning Tan, Michael Steinbach, Vipin Kumar Fuzzy Logic with Engineering Applications, Timothy Ross, Mc-Graw Hill, 1995.</p>
Progress assessment:	<p>The course includes theoretical and practical lectures. The theoretical lectures present the methodologies and examples of applications to case studies. Practical classes focus on the implementation of algorithms and give support to the resolution of a project and seminar. Students are evaluated based on two components, Theoretical (10 points) and Practical (10 points). The theoretical component is assessed through a written examination. The evaluation of the practical component is performed through two practical works and a research work (seminar):</p> <p>Practical Assignment 1 - Case Study analysis and application of neural networks (2 points) Practical Assignment 2 - Development of an application incorporating CI algorithms to solve a real problem (5 points) Seminar - Research work (3 points)</p> <p>The written exam allows the demonstration of the acquired knowledge and the ability to apply the methodologies to typical problems.</p> <p>The practical component, including the a project (delivered in two phases) and a research work (seminar and paper) allow students to acquire the skills necessary for conducting autonomous research and applying knowledge to new situations.</p>

Subject Title:	Information Systems II
Scientific Area:	Information Systems
Course:	European Computer Science
Code:	
Year/Semester:	3/1
ECTS:	5
Department:	Computer Science and Systems Engineering
Instructor:	Viriato António Pereira Marinho Marques
Study plan:	<p><u>THEORETICAL CLASSES</u></p> <ul style="list-style-type: none"> ➤ Information Systems <ul style="list-style-type: none"> ➤ Terminology ➤ Brief overview of UML ➤ Brief overview of SCRUM ➤ Knowledge and organizations ➤ Business Intelligence ➤ Cloud Computing ➤ Introduction to datawarehouses and OLAP <ul style="list-style-type: none"> ➤ DW design (ETL, OLAP, Reporting) ➤ Client applications ➤ KPI's and scoreboards ➤ Microsoft BDIS ➤ Introduction to Data-Mining <ul style="list-style-type: none"> ➤ Overview ➤ Data pre-processing ➤ Tasks: classification, clustering, association, regression, outlier detection ➤ Open-source and proprietary development environments (BIDS, Oracle, WEKA, Rapidminer, Pentahoo, Microstratgy) ➤ Data-mining in the BIDS environment ➤ Knowledge Management <ul style="list-style-type: none"> ➤ Knowledge types ➤ Role of information systems: sites, OLTP, OLAP, data-mining, IA techniques, help-desk, e-learning, GIS, e-commerce ➤ Introduction to Balanced Scorecards ➤ The Organization in the Digital Era <ul style="list-style-type: none"> ➤ Decision Support Systems ➤ Group Decision Support Systems ➤ Executive DSS's ➤ The changes implied by the introduction of IS's ➤ Internal processes and quality (ISO 9000, TQM, TPM, Six-Sigma) ➤ Requirement Analysis ➤ SI's life cycle ➤ Security and Control ➤ International IS's

	<p><u>PRACTICAL CLASSES</u></p> <p>Seminars about Management Information Systems and their Cloud and Business Intelligence solutions (SAP, PHC, Primavera, Sage)</p> <p><u>TUTORIAL GUIDANCE / LAB CLASSES</u></p> <p>Implementation of an OLAP system based on Microsoft BIDS - Business Intelligence Development Studio - (datawarehouse, ETL, cube, OLAP server, KPI, Excel client)</p> <p>Implementation of data-mining models based on Microsoft BIDS (classifiers, clustering, association rules)</p> <p>Implementation of a Discrete Simulation model based on ExtendSim (ImagineThat software Inc.)</p>																				
Language:	English																				
Type of instruction:	<table border="1"> <thead> <tr> <th>Activities</th> <th>Total Hours</th> <th>Hours/week</th> <th>Comments</th> </tr> </thead> <tbody> <tr> <td>Theoretical</td> <td>14</td> <td>1</td> <td></td> </tr> <tr> <td>Theoretical-Practical</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Practical</td> <td>14</td> <td>1</td> <td></td> </tr> <tr> <td>Tutorial guidance</td> <td>28</td> <td>2</td> <td></td> </tr> </tbody> </table>	Activities	Total Hours	Hours/week	Comments	Theoretical	14	1		Theoretical-Practical				Practical	14	1		Tutorial guidance	28	2	
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Theoretical	14	1																			
Theoretical-Practical																					
Practical	14	1																			
Tutorial guidance	28	2																			
Learning objectives:	<p>To know and understand datawarehousing a OLAP services</p> <p>To know and understand data-mining basic principles and applications</p> <p>To know and understand how discrete simulation can be an helpful DSS</p> <p>To know when to apply and how to implement datawarehouses and data-mining models</p> <p>To know when to apply and how to implement discrete simulation models</p> <p>To know the general architecture of commercial Management Information Systems</p>																				
Generic learning outcomes and competences:	<p>Recognize problems where the studied models may be of help</p> <p>Knowledge acquisition</p> <p>Development of solutions based on the studied models</p> <p>Implementation of development environments</p>																				
Bibliography:																					
Progress assessment:	<p>Seminars: 6 marks</p> <p>Tutorial guidance / Lab classes : 6 marks</p> <p>Final Exam : 8 marks</p>																				

Subject Title:	Optimization and Decision Support Methodologies																						
Scientific Area:	Informatics Engineering																						
Course:	Informatics Engineering																						
Code:	977046																						
Year/Semester:	3 st year/1 nd semester																						
ECTS:	6																						
Department:	Systems and Informatics Engineering																						
Instructor:	Ana Rosa Pereira Borges (Theoretical lessons and Theoretical-Practical lessons) and Teresa Raquel Corga Teixeira da Rocha (Practical lessons)																						
Study plan:	<p>Theoretical content:</p> <ol style="list-style-type: none"> 1. The linear programming model (revisions) 2. Integer linear programming 3. Pos-Optimization and Sensitivity analysis 4. Multi-objective linear programming 5. Goal Programming <p>Theoretical-practical/practical content:</p> <ul style="list-style-type: none"> - Resolution of theoretical-practical exercises involving the various chapters of the theoretical program - Computational implementation of algorithms 																						
Language:	Portuguese																						
Type of instruction:	<table border="1"> <thead> <tr> <th>Activities</th> <th>Total Hours</th> <th>Hours/week</th> <th>Comments</th> </tr> </thead> <tbody> <tr> <td>Theoretical</td> <td>28</td> <td>2</td> <td></td> </tr> <tr> <td>Theoretical-Practical</td> <td>28</td> <td>2</td> <td></td> </tr> <tr> <td>Practical</td> <td>14</td> <td>1</td> <td></td> </tr> <tr> <td>Tutorial guidance</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			Activities	Total Hours	Hours/week	Comments	Theoretical	28	2		Theoretical-Practical	28	2		Practical	14	1		Tutorial guidance			
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Theoretical-Practical	28	2																					
Practical	14	1																					
Tutorial guidance																							
Learning objectives:	Based on the concepts acquired in Operations Research, in this curricular unit students expand their knowledge in optimization and decision support areas. Accordingly, will be introduced methodologies to apply to more complex decision problems than those previously studied, as is the case of problems involving multiple objectives, integer variables, etc..																						
Generic learning outcomes and competences:	<p>After attending this curricular unit, students must:</p> <ol style="list-style-type: none"> 1 - Know and understand the fundamental characteristics of the most representative optimization and decision support problems 2 - Identify different approaches that can be used to solve them. 3 - Solve simple practical problems using the appropriate optimization and decision support algorithms and interpret the obtained solution(s). 4 - Be able to implement computationally some of the optimization and decision support algorithms. 																						
Bibliography:	- "Introduction to Operations Research", Hillier F.S., Lieberman G.J., McGraw-Hill, 2001.																						

	<ul style="list-style-type: none"> - “Programação Linear multiobjectivo: do modelo de programação linear clássico à consideração explícita de várias funções objectivo”, Clímaco J. N., Antunes C.H. e Alves M. J., Coimbra – Imprensa da Universidade, 2003. - “Programação Linear” (Volumes I e II), Ramalhete, M. , Guerreiro, J. , Magalhães A., McGraw-Hill, 1985. - Notes and slides to support classes (made available on Moodle).
<p>Progress assessment:</p>	<p>Two ways of assessment are enabled to students:</p> <p>a) Final Assessment</p> <ul style="list-style-type: none"> - Final individual written examination = 17 marks in [0, 20] (minimum required mark of 30%) + - Practical work = 3 marks in [0, 20]. <p>b) Continuous Assessment</p> <ul style="list-style-type: none"> - 2 individual written tests performed in classes = (8,5 + 8,5) marks in [0, 20] (minimum required mark of 30% in each test) + - Practical work (3 marks in [0, 20]). <p>The final examination and the tests are essentially practical, The approval requires a grade greater than or equal to 10 ([0, 20]).</p>

Subject Title:	Web Programming																						
Scientific Area:	Informatics Engineering - EC																						
Course:	Informatics Engineering - EC																						
Code:	977041																						
Year/Semester:	3 nd year/1 nd semester																						
ECTS:	6																						
Department:	Systems and Informatics Engineering																						
Instructor:																							
Study plan:																							
Language:																							
Type of instruction:	<table border="1"> <thead> <tr> <th>Activities</th> <th>Total Hours</th> <th>Hours/week</th> <th>Comments</th> </tr> </thead> <tbody> <tr> <td>Theoretical</td> <td>28</td> <td>2</td> <td></td> </tr> <tr> <td>Theoretical-Practical</td> <td>42</td> <td>3</td> <td></td> </tr> <tr> <td>Practical</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Tutorial guidance</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			Activities	Total Hours	Hours/week	Comments	Theoretical	28	2		Theoretical-Practical	42	3		Practical				Tutorial guidance			
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Theoretical-Practical	42	3																					
Practical																							
Tutorial guidance																							
Learning objectives:																							
Generic learning outcomes and competences:																							
Bibliography:																							
Progress assessment:																							

Subject Title:	Portuguese Language and Culture																						
Scientific Area:	Academic area of Humanities																						
Course:	European Computer Science																						
Code:	977048																						
Year/Semester:	3/1																						
ECTS:	6																						
Department:	Computer Science and Systems Engineering																						
Instructor:	Deolinda Simões Marques																						
Study plan:	<p>Main topics are according to A1 level (QECR) and include:</p> <ul style="list-style-type: none"> •Greetings; •Self-profile; •Presenting and introducing oneself and others, and other formal etiquette; •Requesting information: people, places, dates, ... •Describing people; •Professions, nationalities, countries, seasons of the year, animals, days of the week, months, names, colours,... •Directions; •Accommodation: types, prices, ... •Food: places, food, drinks, meals, gastronomy, prices... •Family; •Shopping; •Workplace; •Health: centres, hospitals, pharmacies, ... •Means of transport, commuting, travelling, ... •Weather: climate, ... •Hobbies and cultural activities; •Customs and traditions. •Portuguese history and culture; •Portugal in the European Context. 																						
Language:	English and Portuguese																						
Type of instruction:	<table border="1"> <thead> <tr> <th>Activities</th> <th>Total Hours</th> <th>Hours/week</th> <th>Comments</th> </tr> </thead> <tbody> <tr> <td>Theoretical</td> <td>42</td> <td>3</td> <td></td> </tr> <tr> <td>Theoretical-Practical</td> <td>56</td> <td>4</td> <td></td> </tr> <tr> <td>Practical</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Tutorial guidance</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			Activities	Total Hours	Hours/week	Comments	Theoretical	42	3		Theoretical-Practical	56	4		Practical				Tutorial guidance			
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Theoretical-Practical	56	4																					
Practical																							
Tutorial guidance																							
Learning objectives:	The main goal of the course is to enable the student so that he:																						

<p>Learning objectives:</p>	<p>The main goal of the course is to enable the student so that he:</p> <ul style="list-style-type: none"> • Present students to the Portuguese language at a beginning level. • Develop students' communicative skills so as to be able to get by in a Portuguese-speaking environment. • Practice intensively the sounds of the Portuguese language so as to be understood. • Develop students' reading skills by learning to decode unknown vocabulary. • Teach students to be able to write informal and short compositions. • Familiarize students with the Portuguese culture.
<p>Generic learning outcomes and competences:</p>	<p>By the end of this course, students should be able to speak about themselves, others, their country and the countries where Portuguese is spoken, to use numbers in different contexts and to talk about daily routine, hobbies, eating and drinking and shopping.</p> <ol style="list-style-type: none"> 1. Grammar Regular and irregular verbs in the present tense, articles and pronouns 2. Vocabulary People and travelling, activities, living 3. Reading Reading of small dialogues and short simple texts 4. Listening Take notes on listened texts, identify what they heard, complete texts 5. Writing Short informal letter and short compositions 6. Use of Language To introduce themselves and others and to have a simple dialogue
<p>Bibliography:</p>	<p>- Tavares, Ana. 2004. <i>Português XXI</i> (Q.E.C.R. Nível A1). Lidel. Lisboa. (Students' book and students' workbook that can be borrowed from the school library)</p>

Subject Title:	Ethics and Deontology																						
Scientific Area:	Informatics Engineering																						
Course:	Informatics Engineering																						
Code:	911969																						
Year/Semester:	3 rd year/2 nd semester																						
ECTS:	3																						
Department:	Department of Informatics Engineering and Systems																						
Instructor:	Pedro Miguel Pina de Jesus																						
Study plan:	<ol style="list-style-type: none"> 1. The necessity and types of behaviour regulation. 2. The importance of ethics and deontology in the practice of engineering. 3. General ethics and professional/sectorial ethics. 4. Ethics in engineering. 5. Professional values and codes of ethics and deontology. 6. Ethics, rights and duties of the technical engineer. 7. The ethical decision. 8. Legal issues related to computing engineering in the context of intellectual property, privacy and e-commerce. 																						
Language:	Portuguese																						
Type of instruction:	<table border="1"> <thead> <tr> <th>Activities</th> <th>Total Hours</th> <th>Hours/week</th> <th>Comments</th> </tr> </thead> <tbody> <tr> <td>Theoretical</td> <td>42</td> <td>3</td> <td></td> </tr> <tr> <td>Theoretical-Practical</td> <td>0</td> <td>0</td> <td></td> </tr> <tr> <td>Practical</td> <td>42</td> <td>3</td> <td></td> </tr> <tr> <td>Tutorial guidance</td> <td>0</td> <td>0</td> <td></td> </tr> </tbody> </table>			Activities	Total Hours	Hours/week	Comments	Theoretical	42	3		Theoretical-Practical	0	0		Practical	42	3		Tutorial guidance	0	0	
Activities	Total Hours	Hours/week	Comments																				
Theoretical	42	3																					
Theoretical-Practical	0	0																					
Practical	42	3																					
Tutorial guidance	0	0																					
Learning objectives:	<ul style="list-style-type: none"> ✓ Provide a broad overview of the concepts and theories on ethics and deontology in general and in the field of computer engineering. ✓ Develop the ability to apply the knowledge acquired in solving specific problems in a hypothetical working context ✓ Enhance ability for ethical decision making in an organizational environment. ✓ Encourage group work, independent study and the ability to communicate with different audiences. 																						
Generic learning outcomes and competences:	<ul style="list-style-type: none"> ✓ Understand the process of ethical analysis. ✓ Understand the different ethical options at business, organization and cooperation levels. ✓ Solve practical cases and analyze case studies about ethical decisions. ✓ Make ethical decisions in an organizational context. ✓ Work in group, study independently and communicate clearly. ✓ Know the terms of the substantive legal protection (and its enforcement) of (a) e-commerce and information society services and (b) privacy and personal data. 																						
Bibliography:	<ul style="list-style-type: none"> ✓ Carapeto, Carlos, e Fonseca, Fátima (2012), Ética e deontologia - Manual de Formação, OET; ✓ Rego, Arménio, e Braga, Jorge (2010), Ética para Engenheiros, - Desafiando a Síndrome do 																						

	<p>Vaivém Challenger, 2.ª Edição, LIDEL</p> <ul style="list-style-type: none"> ✓ ANACOM (2006). O Comércio Electrónico em Portugal – O Quadro Legal e o Negócio. Lisboa: Autoridade Nacional de Comunicações ✓ Castro, Catarina Sarmento e (2005), Direito da Informática, Privacidade e Dados Pessoais, Almedina, Coimbra ✓ Chaves, Rui Moreira (2005), Regime jurídico da publicidade, Almedina, Coimbra ✓ Farinho, Domingos Miguel Soares (2006), Intimidade da Vida Privada e Media no Ciberespaço, Almedina, Coimbra ✓ Gonçalves, Luís Manuel Couto (2012), Manual de Direito Industrial, Almedina, Coimbra ✓ Gonçalves, Maria Eduarda (2003), Direito da Informação - Novos Direitos e Formas de Regulação na Sociedade da Informação, Almedina, Coimbra ✓ Oliveira, Elsa Dias (2002), A protecção dos consumidores nos contratos celebrados através da Internet, Almedina, Coimbra ✓ Pereira, Alexandre Libório Dias (1999), Comércio electrónico na Sociedade da Informação: da segurança técnica à confiança jurídica, Almedina, Coimbra ✓ Pereira, Alexandre Libório Dias (2008), Direitos de autor e liberdade de informação, Almedina, Coimbra ✓ Pereira, Joel Timóteo Ramos (2004), Compêndio Jurídico da Sociedade da Informação, Quid Juris, Lisboa.
<p>Progress assessment:</p>	<p>Frequency assessment:</p> <ul style="list-style-type: none"> ✓ 1 oral presentation with a weight of 25% in the final grade and subject to a minimum score of 7.0. ✓ 1 group written work with a weight of 25% in the final grade and subject to a minimum score of 7.0. ✓ 1 individual written test, with a weight of 50% in the final grade and subject to a minimum grade of 7.0; <p>Final assessment:</p> <ul style="list-style-type: none"> ✓ 1 individual written test, with a weight of 50% in the final grade and subject to a minimum grade of 7.0; ✓ 1 individual written working paper with a weight of 25% in the final grade and subject to a minimum score of 7.0.