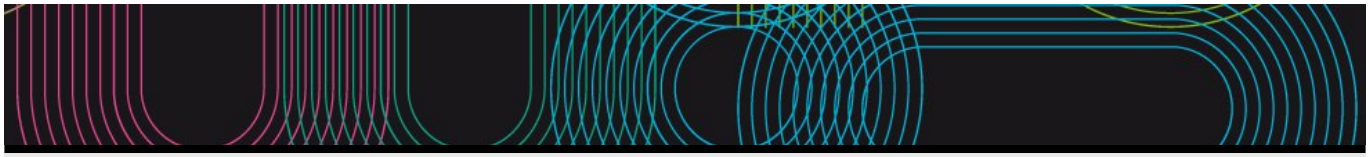

IDENTIFYING DATA				
Web Engineering				
Subject	Web Engineering			
Code	V05M145V01212			
Study programme	Telecommunication Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	5	Optional	1st	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Santos Gago, Juan Manuel			
Lecturers	Álvarez Sabucedo, Luis Modesto Santos Gago, Juan Manuel			
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General description	The Web, initially conceived as a simple system for the telematic distribution of information, has become, as a whole, in the database more extensive and heterogeneous existing today. Furthermore, the Web has become an important platform for delivery of sophisticated electronic services in very different domains, such as commerce, education, public and private administration, health, leisure, etc. The fundamental objective of this course is to explore some of the main techniques and mechanisms that underlie the development of Web applications, i.e. the software applications that provide services to users through a Web browser. It is not the aim of this course to delve into the technologies for building dynamic web pages (it is assumed here that the student has previous knowledge of these issues), but to analyse the techniques and acquire the skills necessary, on the one hand, to be able to locate and use the existing implicit "knowledge" on the Web and, on the other hand, to be able to design and develop services accordingly to the software distribution models that dominate the Web. The course will be taught in Spanish or Galician, although the teaching materials (slides, bibliographic documentation, etc.) will be available predominantly in English.			

Competencies	
Code	
A1	CB1 Knowledge and understanding needed to provide a basis or opportunity for being original in developing and/or applying ideas, often within a research context.
A2	CB2 Students must apply their knowledge and ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study.
A3	CB3 Students must integrate knowledge and handle complexity of formulating judgments based on information that was incomplete or limited, including reflections on social and ethical responsibilities linked to the application of their knowledge and judgments.
A4	CB4 Students must communicate their conclusions, and the knowledge and reasons stating them-, to specialists and non-specialists in a clear and unambiguous way.
A5	CB5 Students must have learning skills to allow themselves to continue studying in largely self-directed or autonomous way
B5	CG5 Capacity for development, strategic planning, direction, coordination and technical and financial management of projects in all fields of Telecommunication Engineering following quality and environmental criteria.
B6	CG6 Capacity for general direction, technical direction and management of research, development and innovation projects in companies and technological centers.
B8	CG8 Ability to apply acquired knowledge and to solve problems in new or unfamiliar environments within broader and multidiscipline contexts, being able to integrate knowledge.
C6	CE6 Ability to model, design, implement, manage, operate, and maintain networks, services and contents.
C8	CE8 Ability to understand and know how to apply the operation and organization of the Internet, new generation Internet technologies and protocols, component models, middleware and services.

Learning outcomes

Expected results from this subject	Training and Learning Results
Know the evolution of the Web and understand the technologies in use today	A5 B8 C8
(*)	
Know and be able to use advanced search techniques for both Web documents and other resources accessible through the Web	A1 A2 A4 A5 B8 C8
Know and be able to use mechanisms to represent and manage knowledge on the Web	A1 A2 A3 A5 C8
Know to propound, analyze and design innovative Web applications using the models and patterns that predominate in the Web	A2 A4 B5 B6 B8 C6 C8

Contents

Topic	
The Web The contents of this topic are related to the achievement of competency CE8	Historical evolution and current state Underlying technologies
Searching information on the Web The contents of this topic are related to the achievement of competencies CB1, CB2, CB4, CB5 and CE8	Algorithms based on Information Retrieval techniques Algorithms based on link analysis Metadata and text indexing Processing large volumes of data
Knowledge Representation on the Web The contents of this topic are related to the achievement of competencies CB1, CB2, CB3, CB4, CB5 and CE8	Computational logic and logical inference The Semantic Web: Knowledge on the Web accessible to machines Semantic Web technologies Folksonomies and social tagging
Models of software components for the Web The contents of this topic are related to the achievement of competencies CB2, CB5, CE6 and CE8	Reference models and architectures Description of Web services Common development patterns on the Web
Case Studies The contents of this topic are related to the achievement of competencies CB2, CB3, CB4, CB5, CG5, CG6, CG8, CE6 and CE8	Recommendation services Social Web Internet of Things Collective Web intelligence

Planning

	Class hours	Hours outside the classroom	Total hours
Master Session	14	5	19
Practice in computer rooms	8	32	40
Projects	4	32	36
Short answer tests	2	6	8
Reports / memories of practice	0	10	10
Jobs and projects	2	10	12

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description

Master Session	The first session of the course is aimed to present the context in which the subject is framed and to describe the specific activities to be undertaken by the student to achieve the predefined learning objectives. In the subsequent sessions the fundamental concepts addressed in the course are presented in class by the faculty, emphasizing the more complex aspects and proposing possible application scenarios. This methodology is mainly focused to the achievement of the competencies CB1, CB5 and CE8.
Practice in computer rooms	The faculty proposes a number of exercises in order to practice with the concepts and techniques discussed in the theoretic lectures. In particular, it is envisaged the realization, in pairs, of practical exercises about i) search algorithms of general information and ii) mechanisms to access and make use of information available on the Web, mainly information published by means of Knowledge Representation techniques. This methodology is mainly focused to the achievement of the competencies CB3, CB4, CB5 and CE8.
Projects	The students, organized in groups of 3 or 4 people, will have to carry out a complete case study, consisting of the proposal, design, development and presentation of a web application that makes use of the technologies and techniques discussed in first part of the course. This methodology is mainly focused to the achievement of the competencies CB2, CB4, CG5, CG6, CG8, CE6 and CE8.

Personalized attention

Methodologies	Description
Master Session	In the master classes, lecturers will be solve particular doubts and will give guidance on the theoretical and practical contents.
Practice in computer rooms	During the in-classroom practice sessions students will be monitored and any questions that may arise will be addressed. Furthermore, lecturers will be available during tutoring hours to solve doubts.
Projects	During the in-classroom project sessions students will be monitored and any questions that may arise will be addressed. Furthermore, lecturers will be available during tutoring hours to solve doubts.

Assessment

	Description	Qualification	Training and Learning Results		
Short answer tests	Students will conduct individually, without supporting material, a knowledge test. This test will consist of a written exam in which questions relating to theoretical concepts covered in the keynote sessions arise.	35	A1 A4 A5		C8
Reports / memories of practice	Students must submit a report for each of the practical exercises proposed by the faculty. The reports must describe quantitatively and qualitatively the solutions adopted, justifying its use over other alternatives when relevant.	30	A2 A3 A4	B8	C8
Jobs and projects	In a first phase, students must prepare a proposal for an innovative project that makes use of technologies and techniques discussed in the course. This proposal will be presented in class and analyzed and valued by classmates (peer review) and by the lecturer according to a predefined rubric. The rubric will be made available to students before the start of the project. In a second phase, at project completion, each group must provide a report that documents the design of the proposed solution and the achieved results. This report will be evaluated by the lecturer based on the attainment of the initial objectives and the quality of the solution used to achieve them.	35	A3 A4	B5 B6 B8	C6 C8

Other comments on the Evaluation

Two evaluation systems will be offered to the students in this course: Continuous Evaluation and Single Evaluation (at the end of the semester). The student must choose, in the first week of class, the modality that will continue. Once the choice is made, the student may not change the system.

Regardless of the evaluation system chosen, the pass mark for the course is 5 out of 10. Below the characteristics of both systems and the particularities of the subsequent calls are detailed.

Continuous Evaluation

The student must carry out 5 assessment activities that can be divided into 3 groups:

- 1 theoretical exam (theory assessment). The score of this test corresponds to the Grade of Theory (GTheory)
- 2 practical exercises (practical assessment). These exercises are done by pairs, achieving both members the same score. Each exercise has the same weight and their mean corresponds to the Grade of Practice (GPractice)
- 2 assessment activities related to the development of a project (project assessment) carried out by a group of 3-4 students. The first activity involves the presentation of the project proposal and has a relative weight of 0.4. The second activity concerns the evaluation of the project elaboration, for which "work packages", individually coordinated by each group member, will be defined. Each activity is evaluated according to a predefined rubric which mainly includes elements of group evaluation (e.g. level of innovation of the proposal, degree of utilization of techniques discussed in class), but also elements of individual assessment (e.g. quality of the exposition, achievements in the assigned "work package"). The weighted average of these activities corresponds to the Grade of Project (GProject)

The student must obtain a minimum grade of 3.5 (out of 10) in each of the groups to pass the course. As long as this condition is met, the final Mark (M) of the student is the weighted average of scores in each group, based on the following relation:

M = 0,35 * GTheory + 0,3* GPractice + 0,35 * GProject

If the student has not achieved a score of 3,5 in any of the groups, the final Mark will be the minimum between 4 and the value obtained according to the above relation.

In addition, the following rules must be observed:

- A student attending any scheduled activity of the continuous evaluation modality is considered he/she definitely has chosen that evaluation system, and he/she may not appear as "No Presented" in the transcripts.
- The continuous assessment activities are not recoverable. That is, if a student does not attend any of them at the scheduled date, the faculty has no obligation to repeat it.

Single Evaluation

Students who chooses the Single Evaluation system shall submit the software and the report of a project whose functionality, scope and formats will be agreed upon with the faculty (at least one month prior to the delivery date). In addition, the student must take a written examination that includes both theoretical questions and problems and practical exercises. The date of the examination, and delivery of the project, will be established on the School Board and officially communicated through appropriate channels.

The final Mark in this evaluation system is the harmonic mean of the scores obtained in the examination and in the project.

Evaluation of subsequent calls

The second call will be governed by a procedure similar to the Single Evaluation system. Thus, the student must submit a project and take a written exam. The final Mark is the harmonic mean. However, if the student had a score higher than 4 in the project (whether by continuous or single evaluation system) he/she would not be required to submit the project and he/she would keep the previous score. When submitting the project report and software, the valid score will be always the mark of the new submission. Similarly, if the student had a score higher than 4 in the theoretical part of the single evaluation system or a mean score over 4 between the scores of theory and practice of the continuous evaluation system, the student may waive the exam, in which case the score of the theoretical part would be the previously obtained (score of the theoretical part in the single evaluation or the mean of theory and practice in the continuous evaluation).

None of the marks obtained in the course, regardless of the chosen system of evaluation will be retained for subsequent courses.

Sources of information

Basic Bibliography

R. Baeza-Yates, B. Ribeiro-Neto, **Modern Information Retrieval. The concepts and technology behind search**, 2th Edition, Addison Wesley,

G. Antoniou, P. Groth, F. van Harmele, R. Hoekstra, **A Semantic Web Primer**, 3th Edition, MIT Press,

Complementary Bibliography

G. Shroff, **The Intelligent Web: Search, smart algorithms, and big data**, Oxford University Press,

W.B. Croft, D. Metzler, T. Strohman, **Search Engines: Information Retrieval in Practice**, Pearson,

J. Domingue, D. Fensel, J.A. Hendler, **Handbook of Semantic Web Technologies**, Springer,

S. Casteleyn, F. Daniel, P. Dolog, M. Matera, **Engineering Web Applications**, Springer,
J. Leskovec, A. Rajaraman, J. Ullman, **Mining of Massive Datasets**, Cambridge University Press,
T. Berners-Lee, **The next web**, 2009

Recommendations