

22-23

DEGREE



MÁSTER UNIVERSITARIO EN INGENIERÍA DE LAS TECNOLOGÍAS EDUCATIVAS

CODE 311201

UNED

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INTRODUCTION

The e-learning industry generated a value of around 190,000M USD in 2018, and its growth is expected to represent an increase of 7% per year until 2025. The rise of ICT in education has been very significant in recent years in which both the public and private sectors have made significant investments in a mature industry with great demand.

In this scenario of sustainable and growing evolution, the appearance of the 2020 pandemic phenomenon has motivated the vast majority of professions to adapt to telecommuting. Education is one of them, since the pandemic has catalyzed the adaptation of training to virtual environments and has proven to be a key factor for business continuity in practically all educational institutions.

It is expected that, both due to the evolution expected before the pandemic and due to the enormous restrictions on mobility due to it, the development of technological alternatives and ICT-based training will speed up more than expected due to the evolution itself of the industry, and the consequences will change the way of learning and teaching.

The first immediate consequence will be an increase in the expected demand for training for the production and implementation of ICT-based technological solutions for teaching.

One of the fundamental aspects in recent years in relation to the generation of content, both in educational environments and in others, is electronic accessibility, support products, and the benefits that their adoption brings to people with and without disabilities who use such services and digital resources. Within this master's degree, subjects are offered where the needs and preferences related to accessibility are studied. The preparation of the study plan for such subject has been carried out with the collaboration of the National Organization of the Spanish Blind (Organización Nacional de Ciegos Españoles, ONCE).

To satisfy this demand from a technological point of view and with a solid base that allows training and updating of knowledge throughout life, is what we propose this master's degree for.

OBJECTIVES AND COMPETENCES

Currently, traditional training offers have begun to use technologies and services traditionally related only to distance education to improve the acquisition of their learning results. This happens both in educational institutions at the university and pre-university level, but also in large companies that decide to provide training to their workers. In addition, education is one of the Sustainable Development Goals (SDGs) of the United Nations. Students who complete this Master will achieve the necessary skills to address the following SDGs and their goals:

- Objective 4: Education.
- Target 4.3: By 2030, ensure equal access for all men and women to quality technical, vocational and higher education, including university education.
- Target 4.4: By 2030, substantially increase the number of young people and adults who have the necessary skills, including technical and vocational skills, to access employment, decent work and entrepreneurship.

- Target 4.a: Build and upgrade educational facilities that are gender-responsive and child-sensitive, offering safe, non-violent, inclusive and effective learning environments for all.
- Target 4.c: By 2030, substantially increase the supply of qualified teachers, including through international cooperation for teacher training in developing countries, especially least developed countries and small island developing States.
- Goal 8: Decent work and economic growth.
- Target 8.5: By 2030, achieve full and productive employment and decent work for all women and men, including youth and persons with disabilities, as well as equal pay for work of equal value.

In this context, this Master provides Computer Engineering professionals with training of 60 ECTS credits, equipping them with skills in the field of educational technologies. As the final part of the Master, the Master Thesis (Trabajo Fin de Máster, TFM) enhances personal skills, in various aspects, ranging from the integration of technologies, to the adequate presentation of results and conclusions on the subject of the Master. One of the strategic objectives of the UNED is to open up to all sectors of society with plural and interdisciplinary proposals. It is also important to attract students who are interested in delving into specific subjects, such as educational technologies, and who already have an important scientific and cultural base in other areas of knowledge. The complete information on the subjects and the competences they cover is found in the verified report, although the representative table of the specific competences and the subjects they cover is included below (Table 1), using the identifiers shown in the Table 2 and the competency identifiers below.

Table 1: Mapping between subjects and competences

Subj ect ID	CG1	CG2	CG3	CG4	CT1	CT2	CE1	CE2	CE3	CE4	CE5	CE6	CE7	CE8	CE9
1	X	X		X	X	X		X					X		X
2	X	X	X	X	X	X	X	X	X	X					
3	X		X	X	X	X	X	X	X				X		
4	X	X			X	X						X	X		
5	X	X	X		X	X	X						X	X	
6	X		X	X	X	X			X	X	X				
7	X		X	X	X	X	X		X				X		
8	X			X	X	X		X	X				X	X	
9	X		X	X	X	X		X	X						
10	X			X	X	X		X	X				X	X	
11	X	X	X	X	X	X									

Table 2: Mapping between subjects and their ID

Subject	ID
Multimedia contents for education	1
Standards and design of educational objects	2
Digital services and infrastructures for education	3
Educational data mining and student modelling	4
Technological support for teaching and learning processes	5
OER Development and Publishing Tools	6
Integration of online laboratories and components	7
Serious games for learning (OPTIONAL)	8
Educational robotics (OPTIONAL)	9
Accessibility in elearning (OPTIONAL)	10
Master Thesis (Trabajo Fin de Máster, TFM)	11

MASTER'S COMPETENCES:**BASIC**

CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, often in a research context

CB7 - That students know how to apply the knowledge acquired and their ability to solve problems in new or little-known environments within broader (or multidisciplinary) contexts related to their area of study

CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments

CB9 - That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to specialized and non-specialized audiences in a clear and unambiguous way
CB10 - That students have the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.

GENERAL

CG1 - Being able to define and formalize through Information and Communication Technologies (ICT) an educational strategy that meets the needs of the student.

CG2 - Being able to understand and apply the appropriate technologies to assess and improve the quality of teaching in a technological environment.

CG3 - Dimension, configure and exploit hardware and software tools, and integrate educational standards and strategies for ICT-based teaching.

CG4 - Be able to design, create and evaluate educational content using the different standards, formats and existing technologies.

TRANSVERSAL COMPETENCES

CT1 - Being able to approach and develop innovative projects in scientific, technological and multidisciplinary environments.

CT2 - Being able to make decisions and formulate judgments based on objective criteria (available experimental, scientific or simulation data).

SPECIFIC COMPETENCES

CE1 - Be able to recommend implementations of educational systems that combine the different available technologies integrated through standards.

CE2 - Be able to design, program and use both physical and virtual experimental teaching resources using the different existing technologies.

CE3 - Be able to share and integrate multiple experimental teaching resources, both physical and virtual, using standards.

CE4 - Be able to produce linked and open educational content, labeled with standardized metadata.

CE5 - Know different forms of public knowledge sharing, such as learning repositories or MOOC courses.

CE6 - Identify and use intelligent student modeling and analysis techniques to encourage their self-regulated learning.

CE7 - Identify and use learning platforms to promote educational processes adapted to users.

CE8 - Know the e-learning standards, educational theories and instructional design, necessary to create digital educational objects.

CE9 - Be able to create, edit and publish multimedia content, including the necessary servers for it.

CAREER OPPORTUNITIES

PROFESSIONAL OUTINGS

From a professional point of view, the graduates of this Master's degree will have wide professional opportunities due to the fact that since the pandemic, a large number of institutions have decided to implement online training, for which it is necessary to deploy educational technologies such as those taught in this Master. For this reason, high levels of employability are expected among graduates.

ACADEMIC DEPARTURES

The proposed Master's degree provides Computer Engineering professionals with a training of 60 ECTS credits, providing them with well-defined professional skills both in specific

technologies of Computer Engineering and in leadership and management skills in the field of Engineering. The Master's Thesis (Trabajo Final de Master, TFM) enhances personal skills, in various aspects, ranging from the integration of technologies, to the adequate presentation of results and conclusions.

INVESTIGATION OUTPUTS

Computer Science is one of the most active research fields, both nationally and internationally, and one in which more innovations are produced. This is reflected in the priority lines at European and national level. Thus, in the Horizon 2020 program, Information and Communication Technologies (ICT) play a crucial role in promoting innovation and competitiveness in industry and services. Professors with extensive research experience participate in the Master's degree, which has a positive influence on training students to carry out research activities that are necessary in companies: project requests, surveillance and technological advice or responsibility for research activities.

ACCESS PREREQUISITES

General access requirements:

The requirements for access to master's studies at the UNED are regulated in RD 1393/2007, of October 29, which establishes the organization of official university education, which was modified by RD 861/2010. Article 16 establishes the following:

1. To access the official Master's degrees, it will be necessary to be in possession of an official Spanish university degree or another issued by a higher education institution belonging to another Member State of the European Higher Education Area that authorizes it for access to Master's teachings.
2. Likewise, graduates may access educational systems outside the European Higher Education Area without the need for homologation of their degrees, after verification by the University that they accredit a level of training equivalent to the corresponding official Spanish university degrees. and that empower in the country issuing the title for access to postgraduate education. Access through this route will not imply, in any case, the homologation of the previous degree held by the interested party, nor its recognition for other purposes than that of studying the Master's degree.

Specific access requirements to the master's degree:

Preference will be given to higher graduates in Computer Science: graduates, engineers or Computer Science graduates. It is recommended that the students of our master's degree have level B1 (of the Common European Framework of Reference for Languages). Thus, students must be able to read texts in English. No knowledge of the other language skills (speaking, writing and listening) in the mentioned languages is required.

ADMISSION CRITERIA

The body in charge of the selection and admission of students to this University Master's Degree will be the Commission formed by the Coordinator of the Degree in the ETS of Computer Science, the Secretary of the Master's Degree and a permanent professor of the Master's teaching team, according to the assessment criteria which are detailed below:

1. Access degree (up to 4 points): Adequacy of the Degree by which the master's degree in the area of Engineering is accessed

2. Academic record (up to 3 points).

3. Curriculum Vitae (up to 3 points).

a. Professional experience. Students who present a curriculum vitae of professional experiences that support their ability to successfully follow the program will be positively valued with a score of up to 1.5, as long as they have access to the university according to current regulations (up to 1.5 points).

b. Further training. Other non-university postgraduate degrees in Computer Science (up to 0.5 points).

c. Knowledge of languages. Preference will be given to those who have an intermediate and/or advanced knowledge of English (up to 1 point). Knowledge of languages may be demonstrated through the presentation of a degree and/or through other evaluation processes established by the Master's commission (oral test, written test, etc.).

In each of the phases of allocation of places, only the applications of those students who meet and have documented the requirements set and the aforementioned merits will be considered.

NUMBER OF NEW STUDENTS

100 students

CURRICULUM

Number of credits of the Degree: 60 ECTS.

The distribution of credits is as follows:

a. 42 credits of compulsory subjects (7 subjects of 6 credits).

b. 6 credits of elective subjects (3 subjects of 6 credits are offered, that is, 18 elective credits).

c. 12 credits of the Master's Thesis (TFM).

Subject	ECTS	Type	Semester
Multimedia contents for education	6	Compulsory	1
Standards and design of educational objects	6	Compulsory	1

Digital services and infrastructures for education	6	Compulsory	1
Educational data mining and student modelling	6	Compulsory	1
Technological support for teaching and learning processes	6	Compulsory	1
OER Development and Publishing Tools	6	Compulsory	2
Integration of online laboratories and components	6	Compulsory	2
Serious games for learning	6	Optional	2
Educational robotics	6	Optional	2
Accessibility in elearning	6	Optional	2
Master's Thesis (Trabajo Fin de Máster, TFM)	12	Compulsory	2

RULES

- RD 1393/2007, de 29 de octubre, por el que se establece la ordenación de las enseñanzas universitarias oficiales
- RD 861/2010, de 2 de julio, por el que se modifica el Real Decreto 1393/2007, de 29 de octubre, por el que se establece la ordenación de las enseñanzas universitarias oficiales
- RD 43/2015, de 2 de febrero, por el que se modifica el Real Decreto 1393/2007, de 29 de octubre, por el que se establece la ordenación de las enseñanzas universitarias oficiales, y el Real Decreto 99/2011, de 28 de enero, por el que se regulan las enseñanzas oficiales de doctorado.
- RD 822/2021, de 28 de septiembre, Organización de las Enseñanzas Universitarias
- Actualización de los procedimientos de organización y gestión académica de los Másteres Universitarios oficiales y Doctorado de la UNED, para su adaptación en lo dispuesto en el RD. 1393/2007.
- Normas y criterios generales de reconocimiento y transferencia de créditos para los másteres.

- Normas de permanencia en estudios conducentes a títulos oficiales de la Universidad Nacional de Educación A Distancia.
- Regulación de los trabajos de fin de master en las enseñanzas conducente al título oficial de master de la UNED.

PRACTICES

Given the practical nature of the title, in the subjects in which there is an important content of practices, it is detailed which laboratories (face-to-face or virtual) the student will have at their disposal, as well as the necessary applications.

In general, the software needed to carry out the practices is free software that can be run on various platforms. Some examples are virtual machines to simulate different operating systems, development environments for languages such as C or Java, simulators, collaborative tools, classifiers, network analysis applications, etc. In cases where a computer is needed, if the student does not have one, they can go to its Associate Center.

In any case, the School of Computer Engineering of the UNED has several servers that allow the specific realization of practices that require a particular support. Specifically, it has a cold room with 47 physical servers, 43 virtual servers, 9 racks, 2 storage cabinets, 2 air conditioning machines, 8 UPS and a backup library. The School also has 4 laboratories, with computer and experimental equipment.

OFFICIAL DOCUMENTATION

De acuerdo con la legislación vigente, todas las Universidades han de someter sus títulos oficiales a un proceso de verificación, seguimiento y acreditación.

En el caso de la UNED, el Consejo de Universidades recibe la memoria del título y la remite a la ANECA para su evaluación y emisión del Informe de verificación. Si el informe es favorable, el Consejo de Universidades dicta la Resolución de verificación, y el Ministerio de Educación eleva al Gobierno la propuesta de carácter oficial del título, ordena su inclusión en el Registro de Universidades, Centros y Títulos (RUCT) y su posterior publicación en el Boletín Oficial del Estado.

Los títulos oficiales de Máster han de renovar su acreditación antes de los seis años, desde la fecha de inicio de impartición del título o de renovación de la acreditación anterior, con el objetivo de comprobar si los resultados obtenidos son adecuados para garantizar la continuidad de su impartición. Si son adecuados, el Consejo de Universidades emite una Resolución de la acreditación del título.

Estas resoluciones e informes quedan recogidos en el Registro de Universidades, Centros y Títulos (RUCT).

VERIFICACIÓN / MODIFICACIÓN

- Memoria del Título
- Informe de Verificación de la ANECA
- Resolución de verificación del CU

- Informe/s de modificación del Plan de Estudios
- Inscripción del Título en el Registro de Universidades, Centros y Títulos
- Publicación del Plan de Estudios en el BOE

INTERNAL QUALITY ASSURANCE SYSTEM FOR THE TITLE

The UNED has an Internal Quality Assurance System (SGIC-U) that covers all its official bachelor's, master's and doctoral degrees, as well as the services it offers, the design of which was certified by ANECA.

The SGIC-U contemplates all the necessary processes to ensure the quality of its teaching staff, resources and services for students: access, admission and reception, external internships, mobility programs, academic guidance and labor insertion, the monitoring and evaluation of the results of the training, the attention to suggestions and claims and the adequacy of the support staff, among others.

Those responsible for the SGIC are:

- The Title Coordinating Commission
- The Quality Assurance Commission of the Center
- The Dean or Management Team
- The UNED Quality Assurance Commission

Through the Statistical Portal, the UNED provides information to the entire university community both on the results of training and the satisfaction results of the different groups involved.

SGIC documents of the title:

Main performance results

Satisfaction results of the different groups

Quality in the Center

The Internal Quality Assurance System of the UNED has been verified by ANECA in the first call for the AUDIT Program (2009), receiving full certification for this System. This certification indicates that the SGIC is applicable to all Master's degrees taught at the UNED. The Master's Coordination Commission (CCM) is the body responsible for the program's SGIC. Likewise, this commission is responsible for guaranteeing the existence of mechanisms to obtain information regarding the development of the program.

The teaching coordination mechanisms that the degree has are included in the document:

“Updating of the procedures of organization and academic management of the official University Masters and Doctorate of the UNED, for its adaptation in the provisions of the RD. 1393/2007”, approved by agreement of the Governing Council dated December 16, 2008.

Said document states that to facilitate the internal academic coordination of each Degree, and with the academic decision-making bodies of the Center, a Commission will be constituted Center Master's Degree Coordination, responsible for the organization and

control of results.

The Center Master's Degree Coordination Commission is made up of:

- Director of the ETS of Computer Engineering
- Coordinator of the Master: Dr. D. Miguel Rodríguez Artacho
- Secretary of the Master: Dr. D. Agustín Caminero Herráez
- Representative of the Administration and Services Staff: Ms. Aída Calvo Candano
- Student representative: Alberto Llorente Mediavilla
- Department Representatives:
 - DIA: Dr. D. Luis de la Torre Cubillo / Dra. Ms. Natividad Duro Carralero (alternate)
 - IA: Dr. D. Félix de la Paz López
 - ISSI: Dr. Ms. Magdalena Clay Cobián / Dr. Juan José Escribano Ródenas (alternate)
 - LSI: Dra. Ms. Covadonga Rodrigo San Juan
 - SCC: Dr. D. Roberto Hernández Berlinches / Dr. Ms. María Carolina Mañoso Hierro (alternate)

PROFESSIONAL ATTRIBUTIONS

Computer Engineering, and therefore this Master, does not yet have officially recognized professional attributions.

EQUIPO DOCENTE

GENDER EQUALITY

Consistent with the assumed value of gender equality, all the denominations that in this Guide refer to single-person, representative, or members of the university community and are made in the masculine gender, when they have not been replaced by terms generic, shall be understood as interchangeably in female or male gender, depending on the sex of the holder who performs them.