

ECTS Information Package: Degree Programme

Bachelor's degree in

ELECTRONICS AND COMPUTER ENGINEERING

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A - General Description

Programme Title - Engenharia Electrotécnica e de Computadores

Qualification awarded - Bachelor's degree in Electronics and Computer Engineering

Level of qualification - First-Cycle degree, ISCED Level 5, EQF Level 6

Specific admission requirements

<u>General</u>

In order to be eligible to this bachelor's degree, students must hold the high-school diploma or legally equivalent qualification. Application can also be made through the following special entry routes:

- Students coming from the Portuguese education system through re-admission, degree change and transfer schemes;
- Holders of a Foundation Course Diploma (CET);
- Adults aged more than 23 who have passed tailor-made examinations intended to assess their ability to pursue higher education studies;
- Holders of Intermediary or Graduate degree diplomas;
- Students coming from foreign higher education.

Specific

Entry Subjects: Mathematics and Physics-Chemistry

The degree in Electronics and Computer Engineering also accepts:

Students who have completed the technological specialisation course (CET) in Electrical Installations and Industrial Automation providing equivalence to 5 modules of the degree.

Students who have completed the technological specialisation course (CET) in Automation, Robotics and Industrial Control providing equivalence to 5 modules of the degree.



Specific arrangements for recognition of prior learning (formal, non-formal and informal)

<u>General</u>

The policy and procedures for accreditation of prior learning are specified in the Regulations for the Recognition and Validation of Qualifications and skills of Escola Superior de ESTT-IPT available at http://webmanager.ipt.pt/mgallery/default.asp?obj=4536

<u>Specific</u> Not applicable.

Qualification requirements and regulations:

180 ECTS credits distributed across 6 curricular semesters (3 years), each with 40 weeks of full-time study (20 weeks per semester). Total study hours per year: 1620 (1 ECTS credit = 27 h work load).

The course structure comprises 5 to 6 modules per semester with the second-year students having the chance to choose one of the two available major areas: Energy or Automation. The third-year students must carry out a practical Project or a Professional Internship.

Profile of the program:

The Electrotechnical and Computer Engineering degree (LEEC) was designed to provide the students with a solid scientific and technological basis, in order to give the best response not only to the current demands of the labour market, but also throughout their entire professional life. It is important to highlight in this course, a wide range of career opportunities which translates into high employment rates (about 96%) of our graduates.

Comprising two major areas (Industrial Automation and Energy), the degree aims at delivering first-cycle level professionals prepared to perform duties with scientific accuracy and technological timeliness in the various electricity and electronics related domains. Graduates of this degree acquire varied and versatile skills to conceive, design, plan and implement systems in areas such as control, automation, robotics, energy, machinery, electrical vehicles, electrical installations, domotics, electronics, telecommunications and production and use of electrical power.

Throughout each academic year, extra-class activities are performed, namely seminars, conferences and field trips that greatly contribute to the scientific training of students and their contact with the industrial reality.

The programme guidelines place special emphasis on R&D of applied projects in partnership with companies (Mitsubishi, Compta), business associations (Nersant), business associations (Acitofeba), industrial innovation laboratory (LINE.IPT) and research institutions (IT - Institute of Telecommunications, and ISR - Institute for Systems and Robotics) as a strategic motor of economical development, innovation and growth of productive capacity.



Key learning outcomes:

Major/Branch in Energy:

Graduates in Electronic and Computer Engineering majoring in Energy should be able to design, implement, explore, manage and maintain facilities for the supply, transformation and use of energy complying with safety regulations as well as design, select and maintain energy equipments of industrial units and of electronic, electromechanical and automation systems from extractive, processing and technical installations. They will also have competencies in such areas as renewable energy, energy management and quality and project management.

Major/Branch in Industrial Automation:

Graduates in Electronics and Computer Engineering majoring in Automation should be able design, manage, control and maintain industrial systems, namely automated production systems, automated control and supervision processes, robotic control systems and communication systems. They will also be familiar with electronic systems, electromechanical drive systems, electrical and telecommunication systems and project management.

Occupational profiles of graduates with examples:

Graduates from this programme will be prepared to develop their professional activity in a wide range of sectors:

- Telecommunications and power companies;
- Control operators and automated production systems;
- Companies dealing with renewable energy and energy audit;
- Food processing, transport and consumer goods industry;
- Industrial systems maintenance operators;
- Manufacturers and suppliers of electrical and electronic equipment;
- Installation, design and technological development companies;
- Software production and maintenance companies;
- Study, project and consulting units;
- Supervision and standardisation bodies;
- Education, research and training institutions.

Access to further studies:

The bachelor's degree level allows access to postgraduate studies namely Master's and Doctoral programmes.



Course structure diagram with credits

Course code	Course Title	Year	Semester	Credits
91129	Circuit Analysis	1	S1	6
91122	Digital Systems	1	S1	6
911242	Linear Algebra	1	S1	6
91121	Mathematical Analysis I	1	S1	6
91124	Programming and Algorithmics	1	S1	6
911245	Computer-Aided Design and 3D printing	1	S2	3
911213	Electronics I	1	S2	6
91126	Mathematical Analysis II	1	S2	6
91125	Physics	1	S2	6
911240	Programming Techniques	1	S2	6



Examination regulations, assessment and grading

<u>General</u>

General assessment rules are in line with the Portuguese law and described in the Academic Regulations of ESTT-IPT available at http://webmanager.ipt.pt/mgallery/default.asp?obj=4538.

The licenciado degree is awarded a final grade between 10 and 20 within a 0/20 scale as well as its equivalent in the European grading scale.

Specific

In their third year the students must carry out a research project (12 ECTS credits) or a Professional Inernship (12 ECTS credits) which will be the subject of a final report. In both cases the report will be evaluated by an examination panel appointed for that purpose.

Graduation requirements:

The conclusion of the course requires the approval of all units that compose it, including public defense of project work or internship report, making a total of 180 ECTS credits, according to the general and specific valuation rules.

Mode of study:

Full- or part-time. Day/Evening.

Program director or equivalente

<u>Director</u>: Pedro Daniel Frazão Correia <u>Erasmus coordinator</u>: Jorge Manuel Correia Guilherme



Course unit title	Circuit Analysis
Course unit code	91129
Type of course unit	Compulsory
Level of Course unit	First Cycle
Year of Study	First Year
Semester/Trimester when the course unit is delivered	First Semester
Number of ECTS credits allocated	6
Name of Lecturer(s)	Raul Manuel Domingos Monteiro
Learning outcomes of the course unit	NA
Mode of delivery	Face-to-face
Prerequisites and co-requisites	NA
Recommended optional programme componentes	NA
Course contentes	NA
Recommended or required Reading	 Meireles, V.(2010). Circuitos Eléctricos. Lisboa: LIDEL Medeiros Silva, M.(2001). Introdução aos circuitos eléctricos e electrónicos. Lisboa: Fundação Calouste Gulbenkian Vieira, A.(0). Caderno de exercícios de Análise de Circuitos. Acedido em21 de fevereiro de 2017 em http://www.e-learning.ipt.pt/ Nunes, F. e Monteiro, R. (0). Apresentações das aulas teóricas de Análise de Circuitos. Acedido em27 de setembro de 2021 em https://doctrino.ipt.pt
Planned learning activities and teaching methods	NA
Assessment Methods and criteria	NA
Language of Instruction	Portuguese
Work placement(s)	NA

Course unit title	Digital Systems
Course unit code	91122
Type of course unit	Compulsory
Level of Course unit	First Cycle
Year of Study	First Year
Semester/Trimester when the course unit is delivered	First Semester
Number of ECTS credits allocated	6
Name of Lecturer(s)	Manuel Fernando Martins de Barros Francisco José Alexandre Nunes Raul Manuel Domingos Monteiro
Learning outcomes of the course unit	Analysis of essential concepts of digital logic: numerical coding systems, basic logic gates and Boole's Algebra. Analysis and synthesis of combinatorial and sequential circuits & LSI, MSI and LSI. Introduction and design of programable logic devices and microprocessors.
Mode of delivery	Face-to-face
Prerequisites and co-requisites	Not applicable.
Recommended optional programme componentes	Not applicable.
Course contentes	 Introduction 2) Boolean logic functions 3) Logic expressions simplifications 4) Digital representation Logic families of integrated circuits 6) Combinatorial logic circuits of medium complexity 7) Basic sequential circuits 8) Synthesis and analysis of sequential circuits 9) Counters, registers and memories. Programmable Logic Devices 11) Introduction to microprocessers
Recommended or required Reading	 Dias, M.(2013). Sistemas Digitais - Princípio e prática. (Vol. 1). Portugal: https://www.fca.pt/cgi-bin/fca_main.cgi/?op=2&isbn=978-972-722-700-6: FCA Editora de Informática, Lda
Planned learning activities and teaching methods	Lectures, Problem solving classes and Laboratory classes;
Assessment Methods and criteria	Assessment items: a) Written exam (60%) b) Homeworks and Labs (40%) Minimum requirements: Minimum of 9 out 20 for part a) Minimum of 10 out of 20 for part b)
Language of Instruction	Portuguese
Work placement(s)	Not applicable.



Course unit title	Linear Algebra
Course unit code	911242
Type of course unit	Compulsory
Level of Course unit	First Cycle
Year of Study	First Year
Semester/Trimester when the course unit is delivered	First Semester
Number of ECTS credits allocated	6
Name of Lecturer(s)	Carlos Filipe Perquilhas Baptista
Learning outcomes of the course unit	NA
Mode of delivery	Face-to-face
Prerequisites and co-requisites	NA
Recommended optional programme componentes	NA
Course contentes	NA
Recommended or required Reading	 Fernandes, V. e Giraldes, E. e Smith, P. (1997). Curso de Álgebra Linear e Geometria Analítica. (pp. 1-376). Lisboa: McGraw-Hill Ferreira, M. e Amaral, I. (2008). Álgebra Linear: Matrizes e Determinantes. (Vol. 1°). (pp. 1-240). Portugal: Edições Sílabo Ferreira, M. e Amaral, I. (2009). Álgebra Linear: Espaços Vetoriais e Geometria Analítica. (Vol. 2°). (pp. 1-160). Portugal: Edições Sílabo Leon, S. (2010). Linear Algebra with Applications. (pp. 1-552). USA: Pearson
Planned learning activities and teaching methods	NA
Assessment Methods and criteria	NA
Language of Instruction	Portuguese
Work placement(s)	NA



Course unit title	Mathematical Analysis I
Course unit code	91121
Type of course unit	Compulsory
Level of Course unit	First Cycle
Year of Study	First Year
Semester/Trimester when the course unit is delivered	First Semester
Number of ECTS credits allocated	6
Name of Lecturer(s)	Maria Manuela Morgado Fernandes Oliveira
Learning outcomes of the course unit	a)- Provide the mathematical foundations required in other modules of the programme. b)- Provide skills to work with differential and integral calculus of functions of one real variable.
Mode of delivery	Face-to-face
Prerequisites and co-requisites	Not applicable.
Recommended optional programme componentes	Not applicable.
Course contentes	 Preliminaries. 2- Real functions of a real variable. 3- Limits and continuity. 4- Differential calculus. 5- Integral calculus.
Recommended or required Reading	 - , .(2013). Cálculo. (Vol. 1). São Paulo: Thomson Pioneira - , .(2007). Cálculo um novo horizonte. (Vol. 1). São Paulo: Bookman - , .(1995). Cálculo com Geometria Analítica. (Vol. 1). São Paulo: Makron Books - , .(1999). Princípios de Análise Matemática Aplicada. (Vol. 1). Lisboa: McGraw-Hill
Planned learning activities and teaching methods	Theoretical lectures, with presentation and illustration of the proposed subjects. Theoretical-practical lectures in which exercises are proposed and solved.
Assessment Methods and criteria	Continuous assessment: two written tests. Exam assessment: one written test.
Language of Instruction	Portuguese
Work placement(s)	Not applicable.



Course unit title	Programming and Algorithmics
Course unit code	91124
Type of course unit	Compulsory
Level of Course unit	First Cycle
Year of Study	First Year
Semester/Trimester when the course unit is delivered	First Semester
Number of ECTS credits allocated	6
Name of Lecturer(s)	Paulo Alexandre Gomes dos Santos Pedro Daniel Frazão Correia
Learning outcomes of the course unit	Solving problems using algorithms. Using a programming language to express an algorithm. Using 'C' programming language to build a computer program.
Mode of delivery	Face-to-face
Prerequisites and co-requisites	Not applicable.
Recommended optional programme componentes	Not applicable.
Course contentes	Introduction to Computers and Programming. Algorithms and languages. Data manipulation. Decision-making structures. Repetition structures. Composite data structures (arrays; structures; strings). Modularity. Iterative and recursive algorithms.
Recommended or required Reading	- , .(1999). Linguagem C. Portugal: FCA
Planned learning activities and teaching methods	Lectures: course content presentation Practical classes: Laboratorial classes with practical experiments.
Assessment Methods and criteria	Continuous assessment: Theoretical Part (60%): Two closed-book tests with a minimum average mark of of 7 out of 20. Practical Part (40%): Practical Work with a minimum mark of 10 out of 20. Exam-based assessment: Theoretical (60%): Closed-book test with a minimum mark of 7 out 20. Practical (40%): mark of the practical work done as part of continuous assessment or closed-book test with a minimum mark of 10.
Language of Instruction	Portuguese
Work placement(s)	Not applicable.



Course unit title	Computer-Aided Design and 3D printing
Course unit code	911245
Type of course unit	Compulsory
Level of Course unit	First Cycle
Year of Study	First Year
Semester/Trimester when the course unit is delivered	Second Semester
Number of ECTS credits allocated	3
Name of Lecturer(s)	Pedro Manuel Granchinho de Matos
Learning outcomes of the course unit	Provide the students with the ability to design and develop new products as well as solving general engineering problems. Design mechanical components using CAD systems and 3-D CAD systems.
Mode of delivery	
Prerequisites and co-requisites	Not applicable.
Recommended optional programme componentes	Not applicable.
Course contentes	1. Introduction to technical drawing ; 2. CAD systems; 3. 3D CAD systems 4. Computer numerically controlled (CNC)
Recommended or required Reading	
Planned learning activities and teaching methods	Lectures and problem-solving classes.
Assessment Methods and criteria	Project worth 100% of the final mark
Language of Instruction	Portuguese Mentoring in English
Work placement(s)	Not applicable.



Course unit title	Electronics I
Course unit code	911213
Type of course unit	Compulsory
Level of Course unit	First Cycle
Year of Study	First Year
Semester/Trimester when the course unit is delivered	Second Semester
Number of ECTS credits allocated	6
Name of Lecturer(s)	Jorge Manuel Correia Guilherme
Learning outcomes of the course unit	Provide knowledge of the main semiconductor devices and circuits. The students will become familiar with matters such as diodes, bipolar and MOS transistors, operational amplifiers, and their main applications.
Mode of delivery	Face-to-face
Prerequisites and co-requisites	Not applicable.
Recommended optional programme componentes	Not applicable.
Course contentes	Semiconductor properties. Diodes, bipolar, MOS and JFET transistor. LED diodes, Hall effect. Rectifiers, limiters, log amplifiers. Single stage transistor amplifiers. Operational amplifiers. Precision rectifiers. Comparators. Oscillators. Digital electronics. Logic gates, microelectronics technology, digital families. Differential pair. Active loads. Current sources. Precision voltage generators
Recommended or required Reading	 Gray, P.(2009). Analysis and Design of Analog Integrated Circuits. (Vol. 1). US: John Wiley & Sons Smith, S.(2015). Microelectronic Circuits. (Vol. 1). England: Oxford Press, Silva, M.(1999). Circuitos com Transístores Bipolares e MOS. (Vol. 1). Lisboa: Gulbenkian Silva, M.(1996). Introdução aos circuitos Eléctricos e Electrónicos. (Vol. 1). Lisboa: Gulbenkian Razavi, B.(2014). Fundamentals of Microelectronics. (Vol. 1). NY: Wiley
Planned learning activities and teaching methods	Lectures, tutorials and laboratory sessions
Assessment Methods and criteria	Written Examination 70%, Lab work 30%. Mandatory lab assignments carried out throughout the semester (30%)
Language of Instruction	Portuguese
Work placement(s)	Not applicable.



Course unit title	Mathematical Analysis II
Course unit code	91126
Type of course unit	Compulsory
Level of Course unit	First Cycle
Year of Study	First Year
Semester/Trimester when the course unit is delivered	Second Semester
Number of ECTS credits allocated	6
Name of Lecturer(s)	Maria Cristina Oliveira da Costa
Learning outcomes of the course unit	NA
Mode of delivery	
Prerequisites and co-requisites	NA
Recommended optional programme componentes	NA
Course contentes	NA
Recommended or required Reading	 Jerónimo, M. e Azenha, A. (1995). Cálculo Diferencial e Integral em R e Rn. (Vol. 1). (pp. 1-610). Lisboa: Mac Graw-Hill Silva, J.(1999). Princípios de Análise Matemática Aplicada. (Vol. 1). (pp. 1-472). Lisboa: McGraw-Hill Zill, D. e Cullen, M. (2009). Advanced Engineering Mathematics. (Vol. 2). (pp. 1-1008). Sudbury: Jones & Bartlett Publishers Swokowsi, E.(1995). Cálculo com Geometria Analítica. (Vol. 1). (pp. 2-744). São Paulo: Makron Books
Planned learning activities and teaching methods	NA
Assessment Methods and criteria	NA
Language of Instruction	NA
Work placement(s)	NA



Course unit title	Physics
Course unit code	91125
Type of course unit	Compulsory
Level of Course unit	First Cycle
Year of Study	First Year
Semester/Trimester when the course unit is delivered	Second Semester
Number of ECTS credits allocated	6
Name of Lecturer(s)	Eugénio Manuel Carvalho Pina de Almeida
Learning outcomes of the course unit	NA
Mode of delivery	
Prerequisites and co-requisites	NA
Recommended optional programme componentes	NA
Course contentes	NA
Recommended or required Reading	 -, .(2002). Sistema Internacional de Unidades Lisboa: Platano editora -, .(2000). Física. (Vol. I). S. Paulo: Livros Técnicos e Científicos -, .(2000). Física - um curso Universitário (vol. I - Mecânica e vol. II - Campos e Ondas). Brasil: Edgard Blutcher
Planned learning activities and teaching methods	NA
Assessment Methods and criteria	NA
Language of Instruction	NA
Work placement(s)	NA



Course unit title	Programming Techniques
Course unit code	911240
Type of course unit	Compulsory
Level of Course unit	First Cycle
Year of Study	First Year
Semester/Trimester when the course unit is delivered	Second Semester
Number of ECTS credits allocated	6
Name of Lecturer(s)	Pedro Daniel Frazão Correia
Learning outcomes of the course unit	Master the C programming language. Implement and use elementary linear and hierarchical data structures and basic sorting algorithms. Learn to classify algorithms according to their execution time.
Mode of delivery	Face-to-face
Prerequisites and co-requisites	Concepts of programming and algorithms. Elementary knowledge of C.
Recommended optional programme componentes	Not applicable
Course contentes	C language: pointers; passing parameters to functions; structures; dynamic memory. ADTs, Lists, Queues, Stacks, algorithms, Big-O notation, selection sort, bubble sort, insertion sort, binary trees.
Recommended or required Reading	 Damas, L.(1999). Linguagem C. Portugal: FCA Rivest, R. e Stein, C. e Leiserson, C. e Cormen, T. (2009). Introduction to Algorithms, Third Edition. USA: MIT Press Sedgewick, R.(1997). Algorithms in C, Parts 1-4 Fundamentals, Data Structures, Sorting, Searching. USA: Addison-Wesley Adrego da Rocha, A.(2014). Estruturas de Dados e Algoritmos em C. PT: FCA W. Kernighan, B. e Ritchie, D. (1988). The C Programming Language. USA: Pearson
Planned learning activities and teaching methods	Lectures, laboratory involving problem solving and consolidation of knowledge using the computer; Tutorial support.
Assessment Methods and criteria	Continuous assessment: - Practical Exercises (20%) - Written Test (30%) - Practical assignment (50%). Other periods of examination: - Written exam (40%) - Practical assignment (60%). All Assessment Periods: - Minimum marks: Tests and Examinations 7 out of 20; Practical assignments 10 out 20.
Language of Instruction	Portuguese
Work placement(s)	NA

