UNIVERSITY POLITEHNICA OF BUCHAREST

FACULTY OF ENGINEERING IN FOREIGN LANGUAGES

FIELD: COMPUTERS AND INFORMATION TECHNOLOGY
SPECIALTY: Engineering of the Internet of smart devices in English language

TEACHING PLAN COURSE CONTENT

14 weeks/semester

Legend: "Ver" = form of evaluation (E=examination during the session, V = colloquium), "C" = Course (hours/week); "S" = Seminary; "L" = Laboratory; "P"=Project

Among the optional subjects, only one of each group will be taught, according to the choice of the students. Optional subjects will only be taught if a sufficient number of students choose them, to constitute the group.

1st Year, 1st Semester

Discipline	No. of credits	hours/weeks				Form of assessment
		C	S	L	P	
Analiză matematică 1/Calculus 1	4	2	2			E
Algebră liniară, geometry analitică și diferențială/Linear Algebra, Analytical and Differential Geometry	4	2	2			E
Electrotehnica 1/ Electrical Engineering 1	4	2	1	1		E
Sisteme de operare 1 / Operating Systems 1	4	2		2		V
Programarea calculatoarelor și limbaje de programare 1 / Computer Programming and Programming Languages 1	4	2		2		E
Grafică asistată de calculator/ Computer Aided Graphics	3	1		2		V
Mecanică și teoria mecanismelor / Mechanics and Mechanism Theory	3	2	1			E
Educație fizică și sport 1 / Physical Education 1	2		1			V
Limbă străină 1 / Foreign Language 1	2		1			V
Optional disciplines						
Expresie și comunicare 1 / Professional Communication 1	2	1	1		.	V
Tehnici și sisteme de lucru colaborativ 1 / Collaborative Work 1	2		2			V
Limba și cultura română pentru studenți străini 1 / Romanian Language and Culture for Foreign Students 1	2		2			V

CALCULUS 1

This discipline aims to familiarize students with the fundamentals of mathematics and engineering, by acquiring the basic notions of differential calculus. Calculus 1 continues the theory of functions of a single variable (from college).

The discipline covers the following subjects: real and complex numbers, sequences and series of numbers, sequences and series of functions, partial derivatives, differential, extrema and bound extrema, implicit functions.

LINEAR ALGEBRA, ANALITICAL AND DIFFERENTIAL GEOMETRY

The discipline studies introductory chapters in linear algebra, analytic and differential geometry and aims to familiarize students with their main approaches, models and explanatory theories, used in solving practical applications and problems, with relevance to stimulate the learning process in students. It also addresses as a specific subject specific basic notions, concepts and principles, all of which contribute to the training of students with an overview of methodological and procedural milestones related to the field.

Knowledge of vector calculus for its application in engineering sciences, elements of linear algebra: vector spaces, bases, vectors and eigenvalues, general scalar product, norm, distance, angle of two vectors, orthogonality, bilinear and quadratic forms, elements of analytical geometry: straight, plane, conical, quadric.

ELECTRICAL ENGINEERING 1

Introduction and presentation of the basic knowledge of the theory of electric circuits with concentrated parameters, through the prism of applications of interest in electronics, telecommunications and information technologies. Among the topics covered: Kirchhoff's theorems, circuit elements, resistive circuits, non-linear DC circuits, capacitors, inductors, etc.

OPERATING SYSTEMS 1

This discipline is studied in the field and specialization and aims to familiarize students with the main approaches, models and explanatory theories of the field, used in the resolution of practical applications and problems, with relevance to stimulate the learning process in students.

The discipline addresses basic (or advanced) notions, specific concepts and principles as a specific subject, all of which contribute to the transmission / training of students with an overview of methodological and procedural benchmarks related to the field.

- The main objective of the course is to provide an overview of computers, computer networks and computer operating systems. At the same time, educate students on the cyber-security of computer systems.
- The main objective of the course is to provide a first view of the computer operating systems of computers.
- The course presents the basic concepts and mechanisms of modern operating systems and virtualization.
- It focuses on the principles and organization of operating systems, but also on the practical part to illustrate key concepts in practical contexts.
- By the end of the course, students will understand some of the basic concepts of computer operating systems.

COMPUTER PROGRAMMING AND PROGRAMMING LANGUAGES 1

Thanks to this course, students must be introduced to computer science and first and foremost to programming (the fundamental concepts and principles) and learn Java, chosen as the "support" language: basic notions, data types, variables , expressions, control structures, methods, recusions, basic concepts of object-oriented programming, relationships between classes: association, inheritance, polymorphism, abstract classes, input/output in Java.

COMPUTER AIDED GRAPHIC

The objective of the course and the practical work is to learn the international technical language (Technical Graphics) which is the basis of the training of engineers in all industrial fields, a language which makes it possible to express themselves and to transmit ideas is engineering projects. Learn the techniques and conventions of representation by projections for technical

objects. Among the subjects of the course: projection systems, introduction to technical drawing with AutoCAD, dimensional description of parts: the scale of the drawing, dimensioning techniques.

MECHANICS AND MECHANISM THEORY

Training of computer skills in order to calculate the different mechanical quantities specific to the taught chapters of the discipline: equilibrium of the material point, torsor of the forces applied on a rigid, centers of mass, equilibrium of the rigid, equilibrium of body systems, kinematics of absolute movement of the point, kinematics of the absolute movement of the rigid, kinematics of the relative movement of the point, structural analysis of the mechanisms: kinematic elements and couples, etc.

PHYSICAL EDUCATION 1

The discipline responds concretely to the current requirements of development and evolution at the national and international level, contributing to the optimization of the state of health; the prevention of the appearance of global and segmental physical deficiencies, the formation and maintenance of the correct attitudes of the body; the stimulation of students' interest in the systematic and independent practice of physical exercise individually and collectively on a daily or weekly basis; create the habit of observing the standards of hygiene sports and accident prevention; develop the capacity for self-defense and self-improvement.

FOREIGN LANGUAGE 1

This discipline aims to facilitate the development of students' skills to use specific grammar and vocabulary elements of the Spanish language, in a professional/technical-scientific context, as well as their ability to work individually and in a team.

The discipline addresses as a specific subject the basic notions of grammar, lexicon and professional communication, all of which contribute to the training of students in professional communication skills in Spanish. The study of this discipline facilitates the acquisition of skills to present and interpret concepts, facts and opinions, in oral and written form (listening, speaking, reading and writing) and the development of skills of mediation and intercultural understanding, so that the future engineer can interact appropriately in social, professional and culturally diverse contexts outside of school.

PROFESSIONAL COMMUNICATION 1

The course aims to transmit to students the knowledge and know-how allowing them to communicate in situations related to the fields: educational, professional and public. It aims to develop language communication skills in students, namely linguistic, pragmatic and sociolinguistic skills, allowing them to take courses in French, take notes, consult specialist documentation in French, write CVs, accounts reports, summaries, reports, make presentations, interact for professional and associative purposes in a multicultural environment. It also aims to train communication skills relating to production (oral and written), reception (oral and written) and interaction.

COLLABORATIVE WORK 1

Course objectives:

- Demonstrate team spirit and action to update professional knowledge, economic and organizational culture.
- Identify, describe and advance the project management process, assume different roles within a team and describe, clearly and concisely, in a language of international circulation.
- Ability to present and demonstrate knowledge and skills.

ROMANIAN LANGUAGE AND CULTURE FOR FOREIGN STUDENTS 1

Course objectives:

- Develop students' communication skills by emphasizing the four fundamental components: listening, writing, reading and speaking.
- The ability to use in real contexts appropriate communication situations of simple or phraseological units that incorporate cultural and civilizational connotations.
- Ability to use grammatical structures appropriately.

1st Year, 2nd Semester

Discipline	No. of credits	hours/weeks				Form of assessment
		C	S	L	P	
Analiză matematică 2 / Calculus 2	4	2	2			E
Fizică 1 / Physics 1	4	2	1	1		E
Dispozitive electronice și electronică analogică / Electronic Devices and Analog Electronic	4	2		2		E
Proiectare logică / Logic Design	2	1		1		V
Programarea calculatoarelor și limbaje de programare 2 / Computer Programming and Programming Languages 2	4	2		2		E
Structuri de date si algoritmi/Data Structures and Algorithms	4	2		2		V
Programare Web / Web Programming	4	2		2		E
Educaţie fizică şi sport 2 / Physical Education and Sports 2	2		1			V
Limbă străină 2 / Foreign Language 2	2		1			V
Optional disciplines						
Expresie și comunicare 2 / Professional Communication 2	2		2			V
Tehnici și sisteme de lucru colaborativ 2 / Collaborative Work 2	2		2			V
Limba și cultura română pentru studenți străini 2 / Romanian Language and Culture for Foreign Students 2	2		2			V

CALCULUS 2

This discipline aims to familiarize students with the fundamentals of mathematics and engineering, by acquiring the basic notions of differential calculus. Calculus 2 pursues the theory of functions of a single variable (from middle school).

The classical course of Calculus 2 mainly contains the theory of the integral of functions of several real variables: improper integrals and integrals with parameters, double and triple integrals, curvilinear and surface integrals. Thanks to integral formulas (Green-Riemann, Gauss-Ostrogradski, Stokes), an introduction to field theory is made. The course also contains a brief introduction to the theory of metric spaces and applications of the fixed point principle.

PHYSICS 1

The discipline addresses the basic notions, concepts and principles specific to physics, all of which contribute to the formation of logical and scientific thinking in students. Among the topics

covered: elements of Analytical Mechanics, principles of special relativity, electromagnetism and electromagnetic optics, electromagnetic field.

ELECTRONIC DEVICES AND ANALOG ELECTRONIC

The discipline addresses as a specific subject the following specific basic/advanced notions, concepts and principles, which all contribute to the transmission/training to/from the students of an overview of the methodological and procedural steps related to the field: elements of physics of semi- conductors, pn Junction, Diodes, TEC-J Transistors, Bipolar Transistors, MOS Transistors, Analog circuits with transistors and diodes.

LOGIC DESIGN

Introduction to Digital Logic Digital integrated circuits are ubiquitous these days and the course presents an introduction and basic principles in their design and use that will be useful for years to come.

At the end of the course, students should know:

• Know and use logic gates

• Optimization using Karnaugh diagrams or the algebraic method

• Basics of designing using combinatorial logic circuits

• Basics of designing using sequential logic circuits

COMPUTER PROGRAMMING AND PROGRAMMING LANGUAGES 2

The course is an introduction to scientific programming using Python. It focuses on the basic language as well as the main libraries used in science and engineering. Students will learn to use language to solve real and technical problems.

At the end of the course, students should be able to:

- Write code in Python
- Read data from files and the Internet
- Process data
- Graph the results
- Perform code debugging
- Use libraries like Numpy, Scipt, MatplotLib
- Demonstrate their ability to solve scientific and technical problems.

DATA STRUCTURES AND ALGORITHMS

The course has as its objective the design, development and implementation of fundamental data structures and data related to the structure of algorithms in C / C++.

WEB PROGRAMMING

Develop a simple web application, familiarize students with the main software development methodologies for web projects. Know and use html, css, javascript, PHP to create a web application.

PHYSICAL EDUCATION AND SPORTS 2

Goals :

- improving basic motor skills (strength, endurance, speed, coordination, flexibility);
- the acquisition and consolidation of basic elements and techniques in athletics, gymnastics, sports games, application sports and their application in conditions of competitions or bilateral games
- learning basic notions with the rules of organization and conduct of sports games (volleyball, basketball, handball, gymnastics) of the various competitions;
- stimulate students' interest in the systematic and independent practice of physical exercise individually and collectively on a daily or weekly basis;
- create the habit of respecting the standards of sports hygiene and accident prevention;
- development of self-defense capacity and self-improvement.

FOREIGN LANGUAGE 2

This discipline aims to facilitate the development of knowledge of the French language (grammar, lexicon, written expression, oral expression), in order to form ordinary and professional communication skills. Develop written and oral comprehension skills allowing students to correctly decode various authentic documents (specialty articles, press articles, conferences, etc.), to identify their purpose and style. Enrichment of the technical vocabulary specific to the different situations of professional conversation. Ability to use grammatical structures in situational contexts

PROFESSIONAL COMMUNICATION 2

The course aims to transmit to students the knowledge and know-how allowing them to communicate in situations related to the fields: educational, professional and public. It aims to develop language communication skills in students, namely linguistic, pragmatic and sociolinguistic skills, allowing them to take courses in French, take notes, consult specialist documentation in French, write CVs, accounts reports, summaries, reports, make presentations, interact for professional and associative purposes in a multicultural environment. It also aims to train communication skills relating to production (oral and written), reception (oral and written) and interaction, integrating the intercultural component. Develop written and oral comprehension skills allowing students to correctly decode various authentic documents (specialty articles, press articles, conferences, etc.), to identify their purpose and style. Perfect written production skills and perform a linguistic upgrade so that students are able to produce different types of texts (write letters, reports, summaries, articles, essays). Develop oral production skills allowing them to interact during internships, forums, conferences, congresses, etc. conferences, etc.), to identify its purpose and style. Perfect written production skills and perform a linguistic upgrade so that students are able to produce different types of texts (write letters, reports, summaries, articles, essays). Develop oral production skills allowing them to interact during internships, forums, conferences, congresses, etc. conferences, etc.), to identify its purpose and style. Perfect written production skills and perform a linguistic upgrade so that students are able to produce different types of texts (write letters, reports, summaries, articles, essays). Develop oral production skills allowing them to interact during internships, forums, conferences, congresses, etc.

COLLABORATIVE WORK 2

Course objectives:

- Demonstrate team spirit and action to update professional knowledge, economic and organizational culture.
- Identify, describe and advance the project management process, assume different roles within a team and describe, clearly and concisely, in a language of international circulation.
- Ability to present and demonstrate knowledge and skills.

ROMANIAN LANGUAGE AND CULTURE FOR FOREIGN STUDENTS 2

Course objectives:

• Develop students' communication skills by emphasizing the four fundamental components: listening, writing, reading and speaking.

• The ability to use in real contexts appropriate communication situations of simple or phraseological units that incorporate cultural and civilizational connotations

• Ability to use grammatical structures appropriately.

2nd year, 1st Semester

Discipline	No. of credits	hours/weeks				Form of assessment
		C	S	L	P	
Matematici speciale 1 / Special Mathematics 1	4	2	2			E
Teoria probabilităților și statistică matematică / Probability Theory and Mathematical Statistics	3	2	1			E
Fizica 2 / Physics II	3	2		1		E
Programare orientată pe obiecte / Object Oriented Programming	4	2		2		E
Electronică digitală / Digital Electronics	4	2		2		V
Baze de date 1 / Databases 1	4	2		1	1	E
Macroeconomie / Macroeconomics	2	1	1			V
Limbă străină 3 / Foreign Language 3	2		1			V
Optional disciplines						
Achiziția și prelucrarea datelor / Data Acquisition and Processing Instrumentație virtuală / Virtual Instrumention	4	2		1		E
Optional disciplines						
Limba străină pentru ingineri 1 / Foreign Language for Engineers 1	2		2			V
Limba și cultura română pentru studenți străini 3 / Romanian Language and Culture for Foreign Students 3	2		2			V
Educație fizică și sport 3 / Physical Education and Sports 3	2		2			V
Prelucrarea avansată a documentelor tehnice 1 / Technical Documents Advanced Processing 1	2		2			V

SPECIAL MATHEMATICS 1

Operate fundamental notions in mathematics, engineering and computer science. Operate fundamental notions of advanced mathematics: Fourier series, Fourier transform, complex integrals, partial differential equations.

PROBABILITY THEORY AND MATHEMATICAL STATISTICS

The acquisition of knowledge in the field of Probability and Mathematical Statistics as well as the ability to correctly use statistical models in theoretical and practical problems. Objectives: correctly determine the factors that appear in the statistical modeling of phenomena; understand the theoretical and practical context of the use of the applications studied; adapt models and methods of statistical calculation to specific problems of engineering sciences.

PHYSICS II

Course contents: elements of quantum physics, condensed matter physics,elements of nuclear physics. Objectives: working with the foundations of mathematics, engineering and computer science, designing hardware, software and communication components, finding solutions using the tools of computer science and engineering.

OBJECT ORIENTED PROGRAMMING

Familiarizes students with the basics of object-oriented programming in the Java programming language. Familiarizes students with the main software development methodologies. Concepts covered: classes, objects, inheritance, polymorphism, abstract classes, threads, collections, graphical interfaces.

DIGITAL ELECTRONICS

The course represents an introduction to digital electronics and its implementation using FPGA and VHDL circuits. The student acquires knowledge in digital electronics, minimizes logic circuits, uses combinatorial and sequential circuits, performs tests with simulation software, performs implementations and tests with FPGA devices.

At the end of the course, students will be able to:

- Use logic gates
- Optimization using Karnaugh diagrams
- Design using combinational logic circuits
- Design using sequential logic circuits
- Test with the Logisim simulator
- Implement and run simple VHDL circuits on Spartan FPGA boards
- Use output devices: LED, LCD, 7-segment, VGA, relay control and motors in the development environment

Use input devices: buttons, keyboard, mouse in the development environment.

DATABASES 1

Familiarizes the student with a framework for storing, processing and analyzing structured data in a relational database management system (RDBMS). Overview of enterprise RDBMS applications and the SQL standard in specific implementations.

MACROECONOMY

The subject aims to ensure the formation and assimilation of the economic way of thinking that allows the identification and application of entrepreneurial decisions at the micro level.Economy is related to the allocation of limited resources, scarcity and choice involves trade-offs and every decision would have an opportunity cost. The aim is to encourage the development of the ability to analyze and evaluate economic activity based on the interpretation of statistics and graphs.

FOREIGN LANGUAGE 3

This discipline aims to facilitate the development of oral and written expression skills in French, the ability to use elements of language to describe and explain technical processes, the ability to understand specialist written / oral text, ability to work individually and as a team. Goals:

- The acquisition of skills to receive an orally transmitted message (understand the overall meaning of a message, extract factual information from a message), to produce an oral message (design of oral messaging referring to itself and to d other / activities / ideas) to receive a message sent in writing (understand the overall meaning of a text read silently, synthesis of the information read), to produce a written message (write sentences / paragraphs / larger text on various subjects of general interest or in particular).
- Develop professional presentation skills.
- Various technical vocabulary conversation work situation.
- The ability to converse on professional/technical topics.

Optional disciplines (same package)

DATA ACQUISITION AND PROCESSING

Assimilation of knowledge on the structure of data acquisition systems, on the basics of digital signal processing and the development of instrumentation software applications

Goals :

- Presentation of the architecture of modern intelligent instrumentation systems, trends in standardization and instrumentation buses, data purchasing and processing systems,

signal conditioning, analog-to-digital signal conversion, communication in data acquisition systems, instrumentation control via the Internet.

- Introduction to signal processing in time and frequency.
- Assimilation of knowledge related to instrumentation software: the concept of the virtual tool, LabWindows / CVI, graphical programming in LabVIEW.
- Presentation of examples of application-oriented instrumentation systems

VIRTUAL INSTRUMENTATION

Contents: Control elements and indicators. Palette of commands and tools. Control elements and indicators for scalar values. Range of functions. Functions for numeric values, for boolean values, for alphanumeric values (string - string). Creating links in diagrams. Functions for scalar values. Comparison functions. Functions for working with date-time and dialog values. Menus and element design. Own menus in the panel, in the diagram. Modes of representing numeric values. Menus specific to numeric, boolean, alphanumeric elements. Functions for vector values (Array). Definition of the data type of an array. Definition of the values and the number of visible values. Definition of the number of dimensions. Construction of tables in the diagram. Cluster-like data. The own menu of Cluster type items. Functions for cluster-like elements. Graphic representations. Elements for graphical representations. The Waveform Chart element. The Waveform Graph element. Elements for XY chart.

Optional disciplines:

FOREIGN LANGUAGE FOR ENGINEERS 1

The practical English / German course aims to develop the four basic elements: written and oral comprehension, written and oral expression (listening, speaking, reading, writing).

ROMANIAN LANGUAGE AND CULTURE FOR FOREIGN STUDENTS 3

The practical course of the Romanian language for foreign students considers the development of the four fundamental components: written and oral comprehension, oral and written expression – listening, speaking, reading and writing.

Goals:

a) The development of foreign students' ability to understand written and verbal messages in Romanian. Vocabulary development and enrichment of grammar knowledge.

b) The development of students' communication skills. The development of oral fluency and precision. The development of the ability to use grammatical structures and notions of vocabulary in the students' own communication contexts.
c) Consolidation of grammar knowledge through academic writing activities and communication activities such as: discussions, presentations, descriptions, negotiations, telephone conversations.
d) The development of the ability to understand the cultural aspects and the Romanian civilization following their presentation within the framework of the Romanian language seminar for foreign students.

PHYSICAL EDUCATION AND SPORTS 3

The discipline aims to help students maintain an optimal health condition of students practicing physical training, in order to increase the work potential required by daily activities. Goals: development of basic physical abilities and specific abilities of the different sports disciplines; get into the habit of permanently and continuously practicing physical exercises and training during leisure time; educate the spirit of fair play, form efficient behavior and a positive attitude, as well as lead a disciplined life.

TECHNICAL DOCUMENTS ADVANCED PROCESSING 1

Subjects discussed:

- Research Methodology (Introduction) and Scientific Popularization
- Practical activities (writing technical documents).
- writing science
- Which medium for which audience?
- Make a bibliography: cite sources
- Study of news and scientific events.

2nd year, 2th Semester

Discipline	No. of credits	hours/weeks				Form of assessment
		C	S	L	P	
Macroeconomie / Macroeconomics	3	1	1			V
Limbaje formale și translatoare / Formal Languages, Automata and Compilers	4	2		2		E
Metode numerice / Numerical Methods	4	2		2		E
Sisteme de operare 2 / Operating Systems 2	4	2		1	1	E
Limbă străină 4 / Foreign Language 4	2		2			V
Proiectarea algoritmilor / Algorithm Design	4	2		2		E
Teoria sistemelor / Systems and Signals Theory	5	2	1	1		E
Optional disciplines						
Măsurători electronice, senzori și traductoare / Electronic Measurement Sensors and Transducers	4	2		2		E
Electrotehnica 2 / Electrotehnics 2						
Optional disciplines						
Prelucrarea avansată a documentelor tehnice 2 / Technical Documents Advanced Processing 2	2		2			V
Educație fizică și sport 4 / Physical Education and Sports 4	2		2			V
Limba și cultura română pentru studenți străini 4 / Romanian Language and Culture for Foreign Students 4	2		2			V
Limba străină pentru ingineri 2 / Foreign Language for Engineers 2	2		2			V

MACROECONOMICS

The formation and assimilation of the economic way of thinking that allows the identification and application of entrepreneurial decisions at the macro level. Knowledge of the macro-economic nomenclature how: multiplier, monetarism, the natural rate of unemployment, budgetary policy. Improving the ability to evaluate and interpret materials, articles or reports on macroeconomic topics. Work with macroeconomic concepts such as: inflation, unemployment, interest rate, gross domestic product, economic growth, exchange rate, etc. Make correlations between specific macro-economic phenomena. Understand the main causes and effects of macroeconomic imbalances. Improvement of individual decisions on the solutions adopted in terms of macroeconomic imbalances. Working with the specific concepts of primary financial markets. Develop the ability to analyze and evaluate economic activity based on the interpretation of statistics and graphs. Present the mechanism of the market economy, macroeconomic balance and macroeconomic imbalances.

FORMAL LANGUAGES, AUTOMATA AND COMPILERS

Presentation of the general concepts of formal languages and how programming languages work. To introduce students to the field of finite automata, regular expressions and context-free grammars. Introduction to general principles related to parsers, compilers and source optimization.

NUMERICAL METHODS

Learn the basic principles and fundamental methods for the numerical resolution of computational problems. Learn the main numerical methods for solving various categories of problems: solving nonlinear equations, solving systems of linear equations, functions and data approximation by interpolation and regression, derivatives and integrals approximation, solving differential equations. Implement numerical algorithms with the Matlab / Octave programming language.

OPERATING SYSTEMS 2

Familiarize students with the concept of operating systems. Familiarize students with the main software development methodologies using the operating system interface. Present case studies and specific implementations for Windows and Linux.

FOREIGN LANGUAGE 4

This discipline aims to facilitate the development of oral and written expression skills in French, the ability to use elements of language to describe and explain technical processes, the ability to understand specialist written / oral text, ability to work individually and as a team. Objects:

- The acquisition of skills to receive an orally transmitted message (understand the overall meaning of a message, extract factual information from a message), to produce an oral message (design of oral messaging referring to itself and to d other / activities / ideas) to receive a message sent in writing (understand the overall meaning of a text read silently, synthesis of the information read), to produce a written message (write sentences / paragraphs / larger text on various subjects of general interest or in particular).
- Develop professional presentation skills.
- Various technical vocabulary conversation work situation.
- The ability to converse on professional/technical topics.

ALGORITHMS DESIGN

The course aims to design, develop and implement several advanced data structures and algorithms based on data structures, in C/C++ and Java. The students will exercise the implementation of the algorithms studied during the course within the framework of concrete problems.

SYSTEMS AND SIGNALS THEORY

The course defines the basic notions and concepts of signals and systems theory. Analog signals and systems are processed. The course gives the basics of signal theory and the general concepts and associated systems are presented. They are analyzed signals and systems in continuous time and discrete time. We want to create abilities to apply the basic notions relating to the concepts of the signal and the system in order to carry out specific functions in electronics.We present: Fourier analysis of periodic and non-periodic signals in continuous time, elements of distribution theory related to signals and systems, Hilbert transform for continuous-time signals, convolution and correlation of signals at continuous time, the Laplace transform, the sampling theorem, harmonic modulations - amplitude modulation, frequency modulation, phase modulation -, system concepts, Fourier analysis of discrete signals in the periodic and non-periodic times, the z-transform and the discrete Fourier transform, the convolution and correlation of discrete signals and the concepts of discrete-time systems.

Optional disciplines (same package)

ELECTRONIC MEASUREMENT, SENSORS AND TRANSDUCERS

Topics covered: the principles of electrical and non-electrical measurements, architecture of measurement systems, signal conversion, data transmission protocols, virtual instrumentation, definition of the concepts of sensor, transducer and actuator, metrological classifications and characteristics, areas of use, determination of static and dynamic characteristics of sensors and actuators, presentation of signal conditioning blocks specific to the use of sensors and actuators in the field, networks of intelligent sensors, transmission of data in chains smart sensor-based measurement tools.

ELECTROTECHNICS 2

Contents: Formulation of electrical circuit problems. Calculation methods. Formulation of electromagnetic field problems. Description of stationary regimes. Methods of analysis and calculation. Use of various CAD software for modeling electrical circuits or electromagnetic

field problems. Solving electrical circuits in different modes (direct current, alternating current, transient). The ability to model various applications of different electromagnetic devices in different regimes. Use, in the context of numerical modeling, of the knowledge acquired during the profile courses of the first and second semesters, for a better understanding of electromagnetic phenomena and for an awareness of the importance of simulating electrical circuit/field problems in computer-aided design. Apply learned theory to model electrical circuit/electromagnetic field problems.

Optional disciplines:

TECHNICAL DOCUMENTS ADVANCED PROCESSING 2

Subjects discussed:

- Develop in students the techniques of understanding technical texts with particular attention given to the referential and lexical component.
- Develop the ability to identify the structure of the scientific text and the skills of writing production according to the IMRAD standard
- Develop the language skills (linguistic, pragmatic and socio-cultural) enabling them to write scientific papers
- Develop written and oral comprehension skills enabling students to correctly decode various authentic documents (specialty articles, press, conferences, etc.), to identify the purpose and style for different types of texts (write letters, reports, summaries, articles, essays). Develop oral production skills allowing them to interact during internships, forums, conferences, congresses, etc.

PHYSICAL EDUCATION AND SPORTS 4

The discipline aims to help students maintain an optimal health condition of students practicing physical training, in order to increase the work potential required by daily activities. Goals: development of basic physical abilities and specific abilities of the different sports disciplines; get into the habit of permanently and continuously practicing physical exercises and training during leisure time; educate the spirit of fair play, form efficient behavior and a positive attitude, as well as lead a disciplined life.

ROMANIAN LANGUAGE AND CULTURE FOR FOREIGN STUDENTS 4

The practical course of the Romanian language for foreign students considers the development of the four fundamental components: written and oral comprehension, oral and written expression – listening, speaking, reading and writing.

Goals:

a) The development of foreign students' ability to understand written and verbal messages in Romanian. Vocabulary development and enrichment of grammar knowledge.

b) The development of students' communication skills. The development of oral fluency and precision. The development of the ability to use grammatical structures and notions of vocabulary in the students' own communication contexts.

c) Consolidation of grammar knowledge through academic writing activities and communication activities such as: discussions, presentations, descriptions, negotiations, telephone conversations.

d) The development of the ability to understand the cultural aspects and the Romanian civilization following their presentation within the framework of the Romanian language seminar for foreign students.

FOREIGN LANGUAGE FOR ENGINEERS 2

The ability to communicate fluently and correctly in oral and written contexts in English/German. The possibility of using the concepts learned from academic writing to write an argumentative text, a memo, a report, a CV and a cover letter. The ability to maintain a familiar interview context, usages, vocabulary and record formality specific to this stage of one's professional career.

3rd Year, 1er Semester

Discipline	No. of credits	hours/weeks				Form of assessment
		C	S	L	P	
Prelucrarea numerică a semnalelor / Digital Signal Processing	4	2		2		E
Baze de date 2 / Database 2	4	2		1		E
Rețele de calculatoare / Computer Networks	4	2		2		E
Prelucrarea imaginilor / Image Processing	4	2		1		V
Ingineria programelor / Software Engineering	4	2		2		E
Inteligenta artificiala 1 / Artificial Intelligence 1	4	2		2		V
Structura și organizarea calculatoarelor / Computer Architecture	4	2		2		E
Optional disciplines						
Contabilitate și informații financiare / Accounting and Financial Information	2	1	1			V
Drept - instrumente juridice pentru ingineri / Rights - Judicial Tools for Engineers						

DIGITAL SIGNAL PROCESSING

Presentation of analysis, synthesis and methods for the implementation of structures used in digital signal processing. We present the main methods for analyzing digital signals: the Fourier transform for discrete time signals and the Z transform. We also present the specific algorithms for the design of digital filters with finite impulse response and digital filters with impulse response infinite.

The assimilation of techniques for the analysis and design of finite impulse response digital filters and infinite impulse response digital filters, verification by simulation. Learning and using MATLAB software for design, analysis of digital signals and simulation of digital systems.

The application of theoretical notions of digital signal processing in practical applications

The ability to design and analyze specific functional blocks.

The use of MATLAB software in general and specific in digital signal processing and digital algorithms.

DATABASE 2

This course will introduce students to the growing field of data science (data analysis and visualization) and provide them with some of its basic principles and tools, as well as its general mindset. Basically, students will learn how to extract knowledge from data. In the treatment of topics related to data science, the emphasis will be on breadth more than depth, therefore on the integration and synthesis of concepts and their application to the resolution of real life problems of various fields (business, education, medicine). Students will learn the concepts, techniques, and tools needed to address various aspects of data science practice, including data collection and integration, exploratory data analysis, predictive modeling, descriptive modeling, data visualization, data product creation, evaluation and effective communication. Students will learn to use R and Python to mine datasets.

COMPUTER NETWORKS

Acquire the fundamental concepts of computer networks. This course gives students the necessary information to design a corporate network on different facets: wide area network linking the various sites of the company by means of the available operator offers, mobile network for nomadic users, and internal network to the company as interconnection of several local networks. It presents the basics of the technologies used in computer and telecommunications networks (architecture, access techniques, transmission), then details the data transfer services offered to companies, including operators. It describes the main technologies used in corporate networks: local networks, metropolitan networks, wide-area networks, wireless networks (Wi-Fi), LAN interconnect equipment, and protocols used by the Open Systems Interconnection (OSI) standard view. It also describes the different mobile networks available (GSM, GPRS/EDGE, UMTS). This course gives a general view of the complementarity between networks and information systems and the information systems used by companies.

IMAGE PROCESSING

The objective of the course is to familiarize the students with the general techniques of grayscale image processing and analysis, namely the operations or the succession of operations which aim to improve the quality of the image (the processing) and to extract the characteristics of interest necessary for decision-making (the analysis). Thus, the course attacks the operators and the fundamental techniques of acquisition, improvement, filtering, image segmentation and

parametric description of the components of real scenes, illustrating them through typical industrial systems and applications.

The purpose of the practical work and to illustrate to the students in an interactive way the techniques of image processing and analysis using a dedicated environment (Matlab).

SOFTWARE ENGINEERING

Provide a comprehensive perspective on software development, through the systematic treatment of all industry-related aspects: modeling, life cycle, quality management, configuration, maintenance, documentation. Apply software engineering techniques to a complex application. Implementation of UML models and tests.

ARTIFICIAL INTELLIGENCE 1

Topics Covered: Introduction to Artificial Intelligence, Uninformed Search Strategies, Informed Search Strategies, Game Theory, Propositional Logic, First-Order Predicate Logic, Rule-Based Systems, Uncertain Reasoning, Automatic Planning, Networks semantics, Machine learning algorithms I, Machine learning algorithms II, Version space learning, Natural language processing.

COMPUTER ARCHITECTURE

The course presents the architecture of computer systems. We study the main components, the instruction set of the microprocessor and the assembly language, the information storage system, the input / output system, the optimization of the calculation process. The student acquires knowledge on the hardware, its design and the interface with the software, as well as on the methods of improvement of the performances. At the end of the course, students should know:

- Intel 80x86 processor architecture
- The use of memory, buses and caches
- The use of hard disks and RAID
- Use interrupts and DMA
- Concepts such as pipeline, virtual memory, process, parallel architecture.
- Students will learn assembly language programming for the 80x86 microprocessor.

Optional disciplines (same package)

ACCOUNTING AND FINANCIAL INFORMATION

The course aims to familiarize with the key terms, concepts and techniques specific to financial accounting. Knowledge of organizational forms of entities, users of accounting information. Knowledge and understanding of the basic principles of financial accounting. Understand recording transactions in accounting for fixed assets, inventories, receivables, cash, equity, income and expenses of an economic entity. The presentation and interpretation of financial statements in order to continue the decision-making process.

RIGHTS – JUDICIAL TOOLS FOR ENGINEERS

The general objective of the course has two aspects:

Ob1 it aims first of all for the student to be able to identify and understand the main legal rules (whatever their sources) both for operators and for international trade operations

Ob2 recognize the basic rules of commercial and international contracts and implement the rules through practical exercises and analysis of current events.

3rd Year, 2th Semester

Discipline	No. of credits	hours/weeks				Form of assessment
		C	S	L	P	
Ingineria sistemelor inteligente / Intelligent Systems Engineering	3	2		1	1	E
Criptografie aplicată / Applied Cryptography	3	2		2		E
Prelucrare grafică / Computer Graphics	2	2		1		E
Rețele de calculatoare - Proiect / Computer Networks - Project	2				2	V
Rețele inteligente de distribuție a energiei electrice / Intelligent Electricity Distribution Networks	2	2		1		E
Inteligență artificială 2 / Artificial Intelligence 2	3	2		1		V
Programare logică și programare funcțională / Logical Programming and Functional Programming	3	2		1	1	E
Marketing digital / Digital Marketing	2	1		1		E
Practică / Internship	360 (12 weeks * 6h/day)					V
Optional disciplines						
Logistică industrială modernă / Modern Industrial Logistic	2	2		1		V
Nanotehnologii pentru industria IoT / Nanotechnology for IoT Industry						
Robotică și sisteme multiagent / Robotics and Multi-Agents Systems						
Optional disciplines						
Interfețe om-mașină / Human Computer Interaction	3	2		1		V

INTELLIGENT SYSTEMS ENGINEERING

Define intelligent systems and highlight why systems engineering is needed to develop intelligent systems; provide knowledge related to the life cycle model of a system and the phases of a system development process (concept development phase, engineering development phase, post-development phase), related to relationship between systems engineering and project management, risk management and quality management. Give the knowledge and qualification necessary to work with systems engineering tools (such as MS Project, risk plan, quality plan, SysML tools - Modelio, Visual Paradigm). Model intelligent systems via SysML diagrams, develop WBS and Gantt chart.

APPLIED CRYPTOGRAPHY

- The possibility of modeling, characterizing, selecting and testing the solutions and algorithms used in cryptography, depending on the field of application.
- Theoretical area: - Ability to practice and experiment with the use of cryptographic primitives in various security mechanisms and services or in applications requiring a high level of protection and authentication.
- Scope: Modeling, characterization, selection and testing of solutions and algorithms.

COMPUTER GRAPHICS

- The acquisition of knowledge on the mathematical expression of graphic transformations in two and three dimensions. The formation of the ability to use these transformations and combine them for various purposes.
- Understand how the "graphics strip" (graphics pipeline) works.
- The acquisition of knowledge on the realistic rendering of 3D scenes by applying algorithms for the elimination of non-visible faces of the image.
- Acquire fundamental knowledge on the introduction of light into images, by simulating reflection and refraction based on empirical models. Increasing the realism of computer-generated images, by adding shadows to images, simulating transparency and fog. Understanding a global illumination model: Ray-tracing.

For apps:

- Familiarity with the OpenGL library for the development of 3D graphics applications
- Deepen the theoretical knowledge transmitted during the course, by developing 2D and 3D graphics applications
- The acquisition of the ability to use the knowledge acquired in practical examples.
- Training skills in designing and deploying graphical applications by completing homework.

COMPUTER NETWORKS - PROJECT

Acquire the fundamental concepts of computer networks. This course gives students the information needed to design a corporate network on different facets: long distance network linking the various sites of the company by means of the available operator offers, mobile network for nomadic users, and internal network to the company as interconnection of several local networks. It presents the basics of the technologies used in computer and telecommunications networks (architecture, access techniques, transmission), then details the data transfer services offered to companies, including by operators. It describes the main

technologies used in corporate networks: local networks, metropolitan networks, wide area networks, wireless networks (Wi-Fi), LAN interconnect equipment, and protocols used by the Open Systems Interconnection (OSI) standard view. It also describes the different mobile networks available (GSM, GPRS/EDGE, UMTS). This course gives a general view of the complementarity between networks and information systems and the information systems used by companies.

INTELLIGENT ELECTRICITY DISTRIBUTION NETWORKS

- Knowledge of equipment and methods for planning and controlling emerging electrical systems for power distribution;
- The smart grid discipline provides students with the opportunity to learn new concepts, apply analysis methods, and design modern power distribution solutions, including microgrids, to analyze critically the performance of electrical energy storage, regulatory environments and standards for connection, operation and control of distributed generators at national and international levels.
- The course is a working guide for all university activity: in addition to the theoretical aspects, preponderant in a basic discipline, through the course exercises and the proposed homework, the discipline allows learners to understand a thought ingenious to find the elements of a control algorithm to solve a concrete problem.
- The applications are made to help the student to implement the theoretical notions acquired during the course. The applications consist of a variety of activities (performing laboratory work, interpreting results, evaluating the quality of the measurement process) through which the student obtains skills to later adapt to any job. To develop team spirit, the laboratory work and the associated report are developed by teams of 5 students.

ARTIFICIAL INTELLIGENCE 2

A clear understanding of deep learning, the theoretical foundations of the design, design and implementation of systems that involve it, in order to address the main current applications, including image classification and processing big data. Develop practical applications related to the design of deep learning systems and their implementation in Python using TensorFlow. Use of parallel computing, including GPUs, for processing intensive tasks. Deployment of machine learning systems trained on small and inexpensive devices (embedded, IoT).

LOGICAL PROGRAMMING AND FUNCTIONAL PROGRAMMING

The course offers an introduction to the principles of logic and functional programming. The course presents the fundamental concepts and associated techniques for developing clear and concise programs. Introduce methods to transform these programs into more effective programs. The course provides hands-on experience using modern functional programming languages such as Scala and logical programming languages such as Prolog.

DIGITAL MARKETING

Acquire skills to conduct promotional campaigns in the online environment. Appropriate use of concepts specific to the language of digital marketing. Different perception of advertisements, visualization of aesthetic and manipulation manners. Appropriate use of tools to conduct a promotional campaign. Knowledge of the team: information on hierarchy, functions, budgetary considerations.

INTERNSHIP

The objective of practical training is skills development opportunities for students in higher technical education in order to increase skill levels and rapid insertion into the labor market. The discipline aims to link training with the dynamics of the labor market through practical training in companies, organizations, and research units that have been the subject of software engineering systems engineering and applications. Students will develop the ability to conduct bibliographic research on a specific topic, strengthen professional communication skills and teamwork and improve their ability to work planning, effective time management. The practice is seen as a complex approach to design.

Optional disciplines (same package)

MODERN INDUSTRIAL LOGISTIC

Identification of the concepts, principles, methods and industrial logistics tools specific to the operating system. The use of basic computer knowledge assisted graphics and digital technologies for the questions of explanation and interpretation of assisted design and the design of specific systems and technologies of industrial logistics, theoretical and experimental research and computer processing status information. By applying the principles, methods and tools of

digital technologies for the design of specific systems and industrial logistics programming, databases, assisted graphics and the acquisition and digital processing of data from specific industrial logistics systems.

NANOTECHNOLOGY FOR IoT INDUSTRY

Acquire basic knowledge of nanomaterials and nano-devices; The course builds skills, competencies and provides students with the knowledge to use analysis and control methods and techniques for the detection and operation of devices used in IOT engineering; also, through its content and approach, the course is designed to develop creativity and interest in in-depth research, including research activities.

ROBOTICS AND MULTI-AGENT SYSTEMS

At the end of the course students should be able to:

- understand the basic concepts of intelligent robotics
- know the basic paradigms in the field of intelligent robotics
- understand the principles of designing agent-oriented control architectures according to the application
- design intelligent agents capable of solving various classes of problems
- model behaviors using the Finite Automata formalism
- analyze finite automaton type models

In addition, students should hone their documentation skills, write materials and present their work.

Optional disciplines:

HUMAN COMPUTER INTERACTION

Acquire basic knowledge in human-machine interface design and evaluation. Design and production of simple specific interfaces. Topics Covered: Human Perception and Memory, Human Psychology, Reasoning and Problem Solving Techniques, Interface Hardware, Interface Design Principles, Rules and Heuristics, Interface Usability Assessment, Implementation Tools of the interface.

4th Year, 1st Semester

Discipline	No. of credits	hours/weeks				Form of assessment
		C	S	L	P	
Proiect interdisciplinar / Interdisciplinary Project	2				2	V
Internetul dispozitivelor inteligente / Internet of Things	4	2		1		E
Proiectarea cu microprocesoare / Design with Microprocessors	4	2		1		V
Sisteme mobile și integrate / Mobile and Embedded Computing	4	2		1	1	E
Securitatea Sistemelor Electronice de Plăți / ePayment Systems Security	4	2		2		E
Optional disciplines						
Comunicații mobile în industria 4.0 / Mobile Communications in Industry 4.0	4	2		2		E
Sisteme suport pentru decizii / Decision Support Systems						
Analiza datelor de dimensiuni mari / Big Data Analytics						
Proiectarea sistemelor de programe și aplicații / Applications and Software Design	4	2		2		E
Web Semantic / Semantic Web						
Evaluarea sistemelor IoT / IoT Systems Evaluation	4	2		2		E
Sisteme de control neliniare / Nonlinear Control Systems						
Orașul inteligent / Smart City						
Optional disciplines						
Detecția și acționarea dispozitivelor în IoT / Sensing and Actuation from Devices in IoT	3	2		1		V
Securitatea cibernetică / Cybersecurity	4	2		1	1	V

INTERDISCIPLINARY PROJECT

Acquire the fundamental concepts of IoT systems. This project gives students the necessary information to design an intelligent system on different facets. Study the internet paradigm of smart devices (of things), using smart devices in complex information systems. They will have to be able to write specifications for an intelligent system and even to design such a network. This projectwill allow the acquisition of the know-how essential for the proper development of the fundamental concepts of computers and networks of intelligent and communication devices.

INTERNET OF THINGS

Study the Internet paradigm of smart devices, using smart devices in complex information systems. Learn specific protocols for machine-to-machine communication. Development of applications on development boards using sensors and actuators. Connecting smart devices to the Internet.

DESIGN WITH MICROPROCESSORS

Familiarize students with the architectures of embedded systems, know the internal structure of microcontrollers, study the support circuits necessary for embedded systems, design of embedded systems, programming of embedded systems.

MOBILE AND EMBEDDED COMPUTING

Familiarize students with the basics of programming on mobile devices. Familiarize students with the main software development methodologies for mobile application projects. Presentation of case studies and implement various solutions for these applications.

e-PAYMENT SYSTEMS SECURITY

Knowledge of the mathematical foundations of cryptographic systems which represent the basis of different types of bank cards and electronic payment systems. Deepen the models, methods, mechanisms and tools for the development and management of electronic payment systems. Know the laws, regulations and standards that are the basis of electronic payment systems and the associated security infrastructures. Correctly and efficiently implement cryptographic algorithms for electronic payment systems using the Java Card subset. Understand and use tools to analyze and test the means of magnetic and chip card fraud.

Optional disciplines:

MOBILE COMMUNICATIONS IN INDUSTRY 4.0 (PACKAGE 1)

During the course, students get acquainted with general issues related to mobile communications: mobile radio channel, multiple access, cellular network. Applications related to GSM, DECT or TETRA technologies are taken into account. The applications are intended to allow students to familiarize themselves with the measurement and simulation techniques used in mobile communications using technologies such as GSM, UMMTS in order to evaluate their performance.

DECISION SUPPORT SYSTEMS (PACKAGE 1)

Teach students to work with quantitative techniques and methods - mathematics used in decision management. Assimilation of theoretical knowledge of systems modeling to help in the decision-making process. Skill training to use different models to simulate real-life situations to make various decisions after rigorous quantitative analysis. Obtain the skills needed for software development in R or MATLAB.

BIG DATA ANALYTICS (PACKAGE 1)

To familiarize the student with a framework for storing, processing and analyzing structured data in RDBMSs and unstructured data using “Big Data” concepts and technologies. Overview of enterprise RDBMS applications and the SQL standard in specific implementations. Learning Hadoop Distributed File System concepts and related concepts, applications and languages, including NoSQL.

APPLICATIONS AND SOFTWARE DESIGN (PACKAGE 2)

The course provides students with a broad understanding of software design techniques and specific skills in model management.

At the end of the semester, students will be able to:

- describe what software design means and why it exists in the software life cycle,
- understand and apply the coupling and cohesion of components in an OO design
- describe the main design patterns,
- exercise design patterns,
- identify costly design decisions to change,
- Describe the main architectural styles,
- Analyze and evaluate the architectural qualities,
- demonstrate a working knowledge of the value of software reusability.

SEMANTIC WEB (PACKAGE 2)

Semantic Web applications exchanged "intelligent" information through languages such as XML/RDF. This course aims to define the main characteristics of the Semantic Web and its components (metadata, schemas, ontologies), to define and use metadata (XML - Extensible Markup Language, RDF - Resource Description Framework, OWL - Web Ontology Language, queries SPARQL), to define and use ontologies (OWL specification, ontology engineering, alignment and merging of ontologies). Applications integrated into the Semantic Web, such as

semantic services, will also be presented. The main applications of the Semantic Web will be highlighted: knowledge management, information retrieval.

IoT SYSTEMS EVALUATION (PACKAGE 3)

Understand the basics of analyzing and measuring the performance of computer systems. Understand the details of valuation activity in commercial, public, and small and medium enterprises.

NONLINEAR CONTROL SYSTEMS (PACKAGE 3)

The study of nonlinear servo systems, which also affects certain aspects of nonlinear electronics, is part of the general theory of dynamical systems, an interdisciplinary scientific activity.
The processes modeled either by ordinary differential equations or by recurrent equations are considered. The students acquire notions specific to the theory of nonlinear systems and the methods of identification and modeling of characteristic phenomena for the solution of nonlinear problems. Familiarization with cause and effect in nonlinear systems. Management of control methods and minimization of undesirable effects in nonlinear systems.

SMART CITY (PACKAGE 3)

To provide knowledge on smart technologies specific to electrical engineering and their use in order to develop communities and smart cities. Transmit essential information on the implementation of the Smart City strategy. Allow in-depth knowledge of technologies specific to the smart city: advanced monitoring systems, real-time data collection and processing, traffic monitoring, lighting equipment, IoT technologies, implementation of renewable energies in the smart city, technologies for the automation of distribution and cloud computing. Use modern technologies in the realization of systems that can be used in smart city networks.

Optional disciplines:

SENSING AND ACTUATION FROM DEVICES IN IoT

Acquisition of basic knowledge related to the detection and actuation of devices for IoT applications. The formation of skills, aptitudes; The course gives students the knowledge to use the methods and techniques of analysis and control of sensing and actuation from devices used in IOT engineering. In addition, through its content and approach, the course is designed to develop creativity and interest in deepening the field, including research activities.

CYBERSECURITY

The main objective of the course is to provide an overview of computer security. It will also make it possible to sensitize the students on the problems of a computer network and of a computer itself. At the end of the course, students will understand some basic concepts regarding network management and computer network security.

Topics :

- Network management
  - ob The infrastructure used for network management
  - ob The standard management framework used on the Internet: SMI, MIB, SNMP
- Security applied to computer networks
  - ob Network Security Principles: Cryptography, Message Integrity, Endpoint Authentication
  - ob Application security (email, DNS)
  - ob Security for TCP connections (SSL / TLS)
  - ob Network Layer Security (IPsec)
  - ob Network access control (firewall / firewall)
  - ob Securing local networks (Wi-Fi and switched Ethernet)
- Security

4th Year, 2th Semester

Discipline	No. of credits	hours/weeks				Form of assessment
		C	S	L	P	
Inteligență computațională integrată / Integrated Computing Intelligence	4	2		1	1	V
Etica hacking și apărarea sistemului / Ethical Hacking and System Defence	4	2		2		V
Realitate virtuală și augmentată / Virtual and Augmented Reality	3	2		1		V
Antreprenoriatul în industrie 4.0 / Entrepreneurship in Industry 4.0	3	2		1		V
Elaborarea proiectului de diplomă / Diploma Project Elaboration	4				4	V
Practică pentru elaborarea proiectului de diplomă / Diploma Project Internship	5	60 hours (2 weeks *30 hrs/week)				V
Optional disciplines						
Bioinformatică / Bioinformatics Standarde principale pentru sistemele de informare în domeniul e-sănătate / Key Standards in Health Information Systems	3	2		1		V
Impact environmental și concepția ecologică a produselor IoT / Environmental Impact and Ecological Concept of IoT Products Managementul proiectelor IoT / IoT Project Management	4	2			1	V

INTEGRATED COMPUTING INTELLIGENCE

A clear understanding of the idea of autonomous systems (which evolve on their own, without any human intervention), including the theoretical basis for conception, design and implementation of such systems. Development of practical projects and small-scale applications (autonomous mobile robot) related to the implementation of general and real concepts.

ETHICAL HACKING AND SYSTEM DEFENCE

The objective of the course is to provide a first vision of computer security and to increase students' sensitivity to computer security. At the end of the course, students will understand the basic concepts of network management and computer network security:

- oh Ethical hacking: security from an offensive point of view
- oh Analysis of security from an offensive point of view
- oh Developing “outside the box” thinking

Computer security helps to understand how networks and computers can be strengthened against virtual attacks. It is a growing field that may offer new jobs in the near future. The course aims to

examine the basics of networks and computer systems, studying their vulnerabilities and determining how to protect them against attacks.

VIRTUAL AND AUGMENTED REALITY

The course will introduce students to the emerging fields of virtual reality and augmented reality, by introducing them to the different aspects of reality, the different categories of applications, the technologies and the devices used. Emphasis will be placed on applying the concepts in everyday life to solve problems that may arise in different fields (medicine, education, business). Students will learn the concepts, techniques and tools needed to create virtual or augmented reality applications. Students will be able to create graphical applications for the desktop, web or mobile using known 3D graphics engines (Unity, Unreal Engine). They will learn how to integrate multimodal virtual reality devices into their applications (Oculus Rift, HTC Vive, Google Cardboard, Leap Motion). Students will also be able to integrate the Vuforia SDK into augmented reality applications for mobile devices.

ENTREPRENEURSHIP IN INDUSTRY 4.0

Improve entrepreneurship skills, especially in Industry 4.0. Improve knowledge of technological entrepreneurship, improve entrepreneurial skills, apply knowledge and skills in reality and in simulated environments.

DIPLOMA PROJECT ELABORATION

The application of fundamental and specialized knowledge in order to solve complex technical problems in applied electronic systems. Execution of its functions, using precise identification of objectives, available resources and timeliness. Scientific writing of the graduation project.

Optional disciplines:

BIOINFORMATICS (PACKAGE 1)

Topics covered: population genetic analysis, information and entropy, data structures and information detection in text sequences, DNA sequence analysis, sequence analysis using Markov chains , sequence analysis using hidden Markov models, sequence analysis using position-specific matrices, sequence pair alignment, multiple sequence alignment, phylogenetic trees, sequence pattern method DNA, gene prediction, genome, comparative genomics.

KEY STANDARDS IN HEALTH INFORMATION SYSTEMS (PACKAGE 1)

The purpose of this course is to learn the data, information, and knowledge standards essential to the successful implementation of local, regional, and national health information systems. The target skills consist of identifying the appropriate level of HITSP standards for an IT problem and selecting the appropriate standard within that level; create use cases and an organizational process to define an interoperability standard for a specific health/regional situation; participate in a national standards development process; be able to understand key concepts and use HL7 and ISO/IEEE 11073 medical device standards. Standard clinical terminology including SNOMED, clinical terms version 3 (reading codes), UMLS, ICD-9-CM, ICD-10-CM and ICD-10-PCS, CPT/HCPCS, medical linguistics, medical vocabulary standards, natural language processing and the role of Healthcare vocabularies and clinical terminologies in the electronic health record will be taught. In the lab, students will use clinical terminology classifications, define use cases and an organizational process to define an interoperability standard similarly to HITSP standards for a specific health/regional situation, build applications based on HL7 and ISO/IEEE 11073 standards for medical device communications. Medical vocabulary standards, natural language processing, and the role of healthcare vocabularies and clinical terminologies in the electronic health record will be taught. In the lab, students will use clinical terminology classifications, define use cases and an organizational process to define an interoperability standard similarly to HITSP standards for a specific health/regional situation, build applications based on HL7 and ISO/IEEE 11073 standards for medical device communications. Medical vocabulary standards, natural language processing, and the role of healthcare vocabularies and clinical terminologies in the electronic health record will be taught. In the lab, students will use clinical terminology classifications, define use cases and an organizational process to define an interoperability standard similarly to HITSP standards for a specific health/regional situation, build applications based on HL7 and ISO/IEEE 11073 standards for medical device communications.

ENVIRONMENTAL IMPACT AND ECOLOGICAL CONCEPT OF IoT PRODUCTS (PACKAGE 2)

Understand the elements involved in an environmental assessment of a product and a system and the indicators for eco-design. Be able to analyze an environmental life cycle analysis. Be able to determine the main indicators that guide product eco-design.

IoT PROJECT MANAGEMENT (PACKAGE 2)

This course describes the different stages of designing a software project, from programming to user training. Principle and management of the software project. Management of requirements engineering, management of design engineering, code construction engineering, testing strategies, software maintenance and evolution. Principle and techniques of management specific to the development of software engineering projects, including measurement and estimation, process improvement, quality engineering, development support tools and configuration management. Application of software engineering standards (including ISO, IEEE and industry standards) for the planning, management, and execution of software engineering projects. The objective of the course will be to acquire a global vision of the life cycle of a software project and the associated management techniques and tools and to acquire a first vision of management techniques. Software development projects are often complex, diverse and constantly changing. The successful conduct of these projects requires strong team management and effective project control. This training provides the tools to organize project goals, create realistic plans, and build and manage a competent team through each phase of the lifecycle. Software development projects are often complex, diverse and constantly changing. The successful conduct of these projects requires strong team management and effective project control. This training provides the tools to organize project goals, create realistic plans, and build and manage a competent team through each phase of the lifecycle. Software development projects are often complex, diverse and constantly changing. The successful conduct of these projects requires strong team management and effective project control. This training provides the tools to organize project goals, create realistic plans, and build and manage a competent team through each phase of the lifecycle.

The objective is to enable participants to assimilate and retain the "best practices" associated with project management and to be able to implement them quickly in the company. Directed workshop where the concepts and methods seen in the software engineering program are applied to the realization of a project. l Students will analyze a project, carry out its planning and implementation, carry out tests and measure the quality of the software produced. For each step the student will use the appropriate software tools.