**Proposal**

**of the subjects for Erasmus+ student**

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| UDERGRADUATE STUDY | | ECTS |
| **Programming** | **Petro Pekh**, Ph.D., Associate Professor | **5** |
| **Linguistic promotion of automated management systems** | **Olena Surynovych**, Ph.D., Associate Professor | **5** |
| **Development and implementation of it products** | **Iurii Lukianchuk**, Ph.D., Associate Professor | **5** |
| **Theory of electric circuits and signals** | **Natalia Yakymchuk,** assistant | **5** |
| **Mathematical methods of optimization** | **Yurii Lapchenko**, Ph.D., Associate Professor | **5** |
| **Basic electronics** | **Mykola Khvyshchun**, Ph.D., Associate Professor | **5** |

**PROGRAMMING**

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| CLASS TYPE | Class |
| DEPARTMENT | Department of computer engineering and cyber security |
| ECTS POINTS | 5 ECTS |
| Effects of education process | Studying of basic C/C++ data types and basic language constructions. Studying methods of input and output of various types of data. Familiarization with the method of working with expressions and operations, operators, functions and pointers of the C/C++ language. Mastering the methods of algorithmization and programming of linear, branched, cyclic, combined and iterative processes. Studying the skills of working with one-dimensional and two-dimensional arrays, structures and associations, character and tape data. Mastering the technology of object-oriented programming due to the use of classes as a fundamental data type of the C/C++ language. Studying of issues of construction of basic and derived classes using the mechanism of friendly functions. Mastering the methods of working with sequential and direct access files. |
| LECTURE TOPIC | 1.STRUCTURE OF C/C++ LANGUAGE PROGRAMS AND STAGES OF ITS EXECUTION.  2. ELEMENTARY STRUCTURES AND DATA TYPES OF THE C/C++ LANGUAGE.  3. DATA INPUT AND OUTPUT USING C/C++ LANGUAGE.  4. C/C++ LANGUAGE EXPRESSIONS AND OPERATIONS.  5. C/C++ LANGUAGE OPERATORS.  6. C/C++ LANGUAGE FUNCTIONS.  7. POINTERS IN C/C++ LANGUAGE.  8. ARRAYS USING C/C++ LANGUAGE.  9. CHARACTERS AND STRINGS USING C/C++ LANGUAGE.  10. STRUCTURES AND COMBINATION USING THE C/C++ LANGUAGE.  11. CLASSES ARE A FUNDAMENTAL DATA TYPE OF THE C/C++ LANGUAGE. ENCASULATION.  12. CREATION OF CLASSES WITH DIFFERENT TYPES OF CONSTRUCTORS IN C/C++.  13. BASIC AND DERIVATIVE C/C++ LANGUAGE CLASSES. IMITATION.  14. INTERACTION OF CLASSES AND FRIENDLY FUNCTIONS. POLYMORPHISM.  15. SEQUENTIAL AND DIRECT ACCESS FILES BY C/C++ LANGUAGE TOOLS. |
| LITERATURE | 1. Deitel H.M., Deitel P.J. How to program in C++. – M.: M.: Bynom-Press LLC, 2016. – 1456 p.  Additional literature  2. Pekh P.A. Programming: Synopsis of lectures for students of the first (bachelor) level of the educational and professional program "Computer Engineering" in the field of knowledge 12 "Information Technologies" specialty 123 "Computer Engineering" full-time and correspondence forms of study - Lutsk: Lutsk NTU, 2020. - 146 p. |
| SUBJECT’S PASSING FORM | Exam |
| PROGRAMME AUTHOR / TEACHER | Petro Pekh, Ph.D., Associate Professor |

**LINGUISTIC PROMOTION OF AUTOMATED MANAGEMENT SYSTEMS**

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| CLASS TYPE | Class |
| DEPARTMENT | Software Engineering Department |
| ECTS POINTS | 5 ECTS |
| Effects of education process | The course presents a general discussion of goals to strive for in designing software for use in linguistic analysis. It is intended primarily for researchers who require software for a research project, and programmers creating such software.  The course “Linguistic Promotion of Automated Management Systems” is an attempt to promote engaged discussion of just how linguistic software should be expected to perform, and how this can be achieved.  Main tasks of «Linguistic Promotion of Automated Management Systems»:  To know and use main conceptions and modeling methodologies of information processes.  To be able to analyze, evaluate and choose methods, modern software, instrumental and computing tools, technologies, algorithmic and programming decisions for effective implementation of special industrial tasks in software engineering.  To be able to develop and evaluate creation strategies of program tools; explain, analyze and evaluate management decisions which are made in terms of the quality of developed software product.  To know and use main conceptions and modeling methodologies of information processes.  To be able to choose paradigms and programming languages for decision applied tasks; apply system and special tools, component technologies (platforms) and integrated environment of software creation in the practice.  To know of the professional lexicon, business language for professional communication; main structure and language functions, which are important for oral and written communication in foreign language learning. |
| LECTURE TOPIC | Information languages ​​for the describing of the unite structure in the information base of AMS.  Management ​​and data manipulation languages (DML) of the AMS information base.  Language tools of information retrieval systems.  Language tools of AMS design automation.  Special purpose programming languages and other languages.  Change management during the technical communication.  Automated complex systems creation of management activities.  Glossary of Computer System Software Development and Automated Management Systems. |
| LITERATURE | 1. Bastian M, Heymann S, Jacomy M (2009) Gephi: an open source software for exploring and manipulating networks. Proceedings of the Third International ICWSM Conference (2009): 361–362. 2. Barceló-Coblijn L, Serna Salazar D, Isaza G, Castillo Ossa LF, Bedia MG (2017) Netlang: A software for the linguistic analysis of corpora by means of complex networks. PLoS ONE 12(8): e0181341. <https://doi.org/10.1371/journal.pone.0181341>. |
| SUBJECT’S PASSING FORM | Test |
| PROGRAMME AUTHOR / TEACHER | Olena Surynovych, Ph.D., Associate Professor |

**Development and implementation of IT products**

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| CLASS TYPE | Class |
| DEPARTMENT | Department of Computer Sciences |
| ECTS POINTS | 5 ECTS |
| Effects of education process | The purpose of teaching the course "Development and implementation of IT products" is to introduce students to the methods of development of IT products and their implementation in Ukraine and abroad.  After completing this course, you will learn how to create your own IT product, develop a competitive business model for it, organize work on its production and implement it on the markets of Ukraine and the world.  In addition, during the course of study, the student will acquire special knowledge and skills: the development of financial management of an IT product, its entry into the Ukrainian and international markets, the creation of unit economics for the project, attracting investments (fundraising), development of grants and other financial opportunities. |
| LECTURE TOPIC | Basic concepts of IT products. Methodology for the development of simple and complex IT systems. Project launch, main issues and challenges. Development of a competitive business model. IT product launch on the market, strategy and development. International markets for Ukrainian projects. Unit-economy of IT products. Fundraising, attraction of investments for a specific project. Grants and other financial opportunities for IT products. |
| LITERATURE | 1. Web Technologies. Lecture notes.  2. The world's largest web development site [Resource] – Resource access mode: https://www.w3schools.com/. |
| SUBJECT’S PASSING FORM | Exam |
| PROGRAMME AUTHOR / TEACHER | Iurii Lukianchuk, Ph.D., Associate Professor |

**THEORY OF ELECTRIC CIRCUITS AND SIGNALS**

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| CLASS TYPE | Class |
| DEPARTMENT | Department of Electronics and Telecommunications |
| ECTS POINTS | 5 ECTS |
| Effects of education process | The purpose of teaching the course "Theory of electric circuits and signals" is to study the physical characteristics of electromagnetic phenomena and processes, the laws to which they are subject; assimilation by students of modern methods of modeling electromagnetic processes, methods of analysis and calculation of electric circuits.  The task of the discipline is to master the methods of calculating electric circuits of direct, alternating and non-sinusoidal currents, methods of calculating transient processes in electric circuits and circuits with distributed parameters.  Having completed this course, you will learn to understand and use the basic methods, methods and means of receiving, transmitting, processing and storing information. |
| LECTURE TOPIC | Linear electric direct current and alternating current. Three-phase circuits. Quadripoles. Transient processes in linear electric circuits. Electric circuits of non-sinusoidal current. Electric circuits with distributed parameters.  Deterministic signals. Random signals. Discrete signals. Digital signals. Modulated signals. Sources of discrete messages. |
| LITERATURE | 1. Mayergoyz, I.D. Basic electric circuit theory: a one-semester text /I. Mayergoyz, W. Lawson: Academic Press, London, UK. – 454p. 2. [Murugesan Dhasagounde](https://www.researchgate.net/profile/Murugesan-Dhasagounder). Circuit theory. –<https://www.researchgate.net/publication/321586588_Circuit_theory>**.** 3. John Bird. Electrical Circuit Theory and Technology: Newnes An imprint of Elsevier Science Linacre House, Jordan Hill, Oxford, 2001. – 994p. |
| SUBJECT’S PASSING FORM | Exam |
| PROGRAMME AUTHOR / TEACHER | Natalia Yakymchuk, assistant |

**MATHEMATICAL METHODS OF OPTIMIZATION**

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| CLASS TYPE | Class |
| DEPARTMENT | Department of Automation and Computer-integrated Technologies |
| ECTS POINTS | 5 ECTS |
| Effects of education process | The purpose of teaching the course «Mathematical methods of optimization» is to provide students with knowledge of mathematical methods of optimizing automatic control systems and to form students a systematic approach to solving problems of optimizing automatic control systems on the basis of modern computing tools.  Having completed this course, you will learn how to optimize the designs of systems, devices and components of micro- and nanosystem technology, as well as their manufacturing technologies. Build and research physical, mathematical and computer models of objects and processes of micro- and nanoelectronics.  In addition, in the process of learning, the student will not only acquire special knowledge and skills, but also plan and carry out scientific and applied research in the field of micro- and nanoelectronics, choose effective research methods, argue conclusions, present research results to specialists and non-specialists. |
| LECTURE TOPIC | Optimization methods. Mathematical formulation of the optimization problem. Problems of linear programming. Optimality conditions for nonlinear functions with constraints (convex programming problems). Combinatorial methods of optimizing the structure of the technological system. Numerical methods of parametric optimization of technological systems. Analytical methods of optimizing the structure of the technological system. |
| LITERATURE | 1. Mathematical methods of optimization. Lecture notes.  2. Stanford University https://web.stanford.edu/group/sisl/k12/optimization/#!index.md. |
| SUBJECT’S PASSING FORM | Exam |
| PROGRAMME AUTHOR / TEACHER | Yurii Lapchenko, Ph.D., Associate Professor |

**BASIC ELECTRONICS**

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| CLASS TYPE | Class |
| DEPARTMENT | Department of Electronics and Telecommunication |
| ECTS POINTS | 5 ECTS |
| Effects of education process | The purpose of teaching the course «Basic Electronics» is to analyse and design of electronics circuits.  Content of This Course  • Electric circuit (Passive Circuit ) analysis.  — Only containing Resistor (U), Capacitor (F), and Inductor (O).  — No signal amplification.  • Electronic circuit (Active Circuit ) analysis.  — Containing transistor.  — Single transistor circuit.  — Signal amplification.  • Operational amplifier and application. |
| LECTURE TOPIC | Introduction to Electronics: Signals, frequency Spectrum of Signals, Analog and Digital Signals, Linear Wave Shaping Circuits: RC LPF, Integrator, RC HPF, Differentiator. Properties of Semiconductors: Intrinsic, Extrinsic Semiconductors, Current Flow in Semiconductors, Diodes: p-n junction theory, Current-Voltage characteristics, Analysis of Diode circuits, Rectifiers, Clippers, Clampers, Special diodes.  Bipolar junction Transistor (BJTs): Physical Structures & Modes of Operation, Transistor Characteristics, DC analysis, Introduction to Small Signal Analysis, Transistor as an amplifier, The RC coupled amplifier, Introduction to Power Amplifiers, Transistor as switch. Field Effect Transistors (FETs): Physical Structures & Modes of Operation of MOSFETs, MOSFET Characteristics, DC Analysis. Feedback Amplifiers & Oscillators: General Principles, Different types of feedback amplifier (block diagram only), Properties of Negative Feedback, Barkhausen criteria for Oscillation. Operational Amplifiers (OP-Amps): Ideal OP-AMP, Inverting Amplifier, Non-Inverting Amplifier. Adder, Subtractor, Integrator, Differentiator.  Digital Fundamentals: Binary Numbers, Signed-binary numbers, Decimal-to-Binary & Binary-toDecimal Conversion, Binary Addition, Subtraction, Multiplication and Division, Hexadecimal Number Systems, Logic Gates, Boolean Algebra, De Morgan’s Theorems, Laws of Boolean Algebra, Basics of Flip flops, Shift Resistors, Counters.  Introduction to Electronic Instruments: CRO, Multimeter, Signal Generators. Principles of Communication: Fundamentals of AM & FM, Transmitters & Receivers |
| LITERATURE | TEXT BOOKS:  1.Microelectronics Circuits, A.S Sedra, K.C. Smith, Oxford University Press. Selected portions from chapters 1to 5, 8, 13. 2. Electronics Fundamentals and Applications, D Chattopadhyay and P.C. Rakshit, NewAge International Publications. Selected portions from chapters 4 to 14, 16 to 20.  REFERENCE BOOKS  1. Integrated Electronics, Millman and Halkias, Mc.Graw Hill Publications.  2. Electronic Devices & Circuit Theory, R.L Boylestad and L. Nashelsky, Pearson Education |
| SUBJECT’S PASSING FORM | Exam |
| PROGRAMME AUTHOR / TEACHER | Mykola Khvyshchun, Ph.D., Associate Professor |