al-Farabi Kazakh National University   
Faculty of Information Technologies  
Educational program in the specialty  
"6B070300 - Fundamentals of automation and control"

SYLLABUS  
"Fundamentals of automation and control"  
Fall semester 2019-2020 academic year  
  
Academic Course Presentation

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| Code of the course | Name of the course | Type | Number of hours per week | | | | Number of credits | | ECTS |
| Lec | Prac | | Lab |
| OS | Foundations of automation and control | Exam | 2 | 0 | | 1 | 3 | | 5 |
| Lecture | Karyukin Vladislav Igorevich | | | | Office hours | | | According to the schedule | |
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| Phone number | +77019405992 | | | | Room | | | 509 | |
| Laboratory works | Oralbekova Dina Orymbayevna | | | |  | | |  | |
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| Academic presentation of the course | **The purpose of the course:** is to build models of different systems and solve corresponding equations of these systems. Students are required to learn building blocks necessary to create right models.  **Learning outcomes:**   1. to build models in Simulink that can solve a huge variety of mathematical equations; 2. to construct complex schemes based on stateflow diagrams and integrate them in Simulink models; 3. to use MATLAB libraries to build such models of robots as a hand manipulator, trajectory moving robot, a robot that can avoid obstacles and other ones; 4. to analyze and apply models for concrete examples implemented in the industry; 5. be able to formulate a problem, goal, task, conclusions in research area; make decisions and draw conclusions |
| Prerequisites and corequisites | Programming, mathematical analysis, differential equations  Nonlinear systems, Modeling systems in the oil and gas industry |
| Literature and resources | **Basic:**   1. Modeling and Simulation of systems using Matlab and Simulink – Devendra K. Chaturvedi 2. Simulink. Simulation and Model-based design – using Simulink v.6   **Additional:**  Matlab – полный самоучитель, В.П.Дьяконов, Москва – 2012.  **Интернет-ресурсы:**  Additional training material, as well as documentation used to carry out homework and projects, will be available on your page on the website univer.kaznu.kz in the UMKD section (It is recommended to master the MOOC course on the subject of discipline). |
| Academic policy of the course in the context of university values | **Rules of academic conduct**: Mandatory attendance at classes, no lateness. Absence and being late for classes are estimated at 0 points. Mandatory observance of the deadlines for the completion and delivery of tasks (according to the CDS, mid-term controls, control, laboratory, design work, etc.), the final exam. In case of violation of the deadlines, the completed task is evaluated taking into account the deduction of penalty points. **Academic values**: Academic honesty and integrity: autonomy in completing all tasks; the inadmissibility of plagiarism, forgery, the use of cheat sheets, cheating at all stages of the control of knowledge, deceiving the teacher and disrespectful attitude to the teacher and students. Students with disabilities can receive counseling at the email address: [vladislav.karyukin@gmail.com](mailto:vladislav.karyukin@gmail.com) |
| Assessment and Certification Policy | **Criteria assessment**: During the acceptance of work performed and the final exam, the assimilation of theoretical material and the acquisition of theoretical and practical skills are checked in accordance with the descriptors (verification of the formation of competencies in midterm control and exams). **Summative assessment**: assessment of active work in the audience; assessment of the completed task. Points distribution: Examination - 12% Laboratory classes - 30% SSW - 18% Final exam - 40% |

**Schedule (graphic) of the educational course realization**

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| **Week** | **Name of the work** | **Number of hours** | **Maximum points** |
| 1 | **Lecture(L) 1.** Introduction to systems | 2 |  |
| **Laboratory work (LW) 1.** Simulink system of MATLAB | 1 | 10 |
| 2 | **L2.** Systems modelling | 2 |  |
| **LW2.** Creating subsystems | 1 | 10 |
| 3 | **L3.** Simulink tools | 2 |  |
| **LW3.** Building a system of two pendulums | 1 | 10 |
| **SSWT**. Designing an automation system |  | 10 |
| 4 | **L4**. Modelling dynamic systems | 2 |  |
| **LW4**. Building a system of two moving cargos | 1 | 10 |
|  | **Quiz 1** |  | 20 |
| 5 | **L5**. Simulating dynamic systems | 2 |  |
| **LW5**. A rigid flat plate in a flow of gas | 1 | 10 |
| **SSWT.** Solving equations in Simulink |  | 20 |
| **The boundary control 1** |  | **100** |
| 6 | **L6**. Algebraic loops | 2 |  |
| **LW6**. A system of bodies connected by springs | 1 | 10 |
| 7 | **L7**. Building a model | 2 |  |
| **LW7**. A vertical massless elastic rod | 1 | 10 |
| **SSWT.** Designing an automation system in Simulink |  | 20 |
| 8 | **L8**. Modelling control flow blocks | 2 |  |
| **LW8**. A cargo system | 1 | 10 |
| 9 | **L9**. Working with signals | 2 |  |
| **LW9**. A floating piece of cork | 1 | 10 |
| **SSWT.** Improving an automation system |  | 20 |
| **Quiz 2** |  | 10 |
| 10 | **L10**. Working with signal groups | 2 |  |
| **LW10**. A material point in the gravitational field | 1 | 10 |
| **The boundary control 2** |  | **100** |
| 11 | **L11**. Working with data | 2 |  |
| **LW11**. A long vertical cylindrical tube | 1 | 10 |
| **SSWT.** Define the problem for mini-project in automation |  | 10 |
| 12 | **L12**. Modelling equations | 2 |  |
| **LW12**. A single-cell model with absorption | 1 | 10 |
| 13 | **L13**. Running simulations | 2 |  |
| **LW13**. A two-compartment model | 1 | 10 |
| **SSWT.** Define the model of the mini-project |  | 10 |
| 14 | **L14**. Improving simulation performance and accuracy | 2 |  |
| **LW14**. Biological populations | 1 | 10 |
| **Quiz 3** |  | 10 |
| 15 | **L15**. Analyzing simulation results | 2 |  |
| **LW15**. Analyzing laboratory works results | 1 | 10 |
| **SSWT.** Realization of the project in Simulink |  | 30 |
| **The boundary control 3** |  | **100** |
|  | **Exam** |  | **100** |
|  | **Totally (BC1+BC2+BC3)\*0.3+Exam\*0.4** |  | **100** |

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| Head of the methodical Bureau |  | Gusmanova F. R. |
| Dean of the faculty |  | Urmashev B. A. |
| Head of the department |  | Mussiraliyeva Sh. Zh. |
| Lecturer |  | Karyukin V. I. |