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**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Discipline’s code** | **Name of the course** | **Type** | **Number of hours per week** | | | | **Number of credits** | | **ECTS** |
| **Lecture** | **Practice** | | **Lab** |
| **OAU3215** | **Fundamentals of automation and control** | Basic | 2 | 0 | | 1 | 3 | | 5 |
| **Lecturer** | Karyukin Vladislav Igorevich | | | | Office hours | | | Scheduled | |
| **e-mail** | [vladislav.karyukin@gmail.com](mailto:vladislav.karyukin@gmail.com)  [vladislav.karyukin@kaznu.kz](mailto:vladislav.karyukin@kaznu.kz) | | | |
| **Phone number** | +77019405992 | | | | Room | | | 509 | |
| **Laboratory works** | Oralbekova Dina Orymbayevna | | | |  | | |  | |
| **e-mail** | dinaoral@mail.ru | | | |  | | |  | |
| **Phone number** | +77711310188 | | | | Room | | | 10Б-6 | |

|  |  |
| --- | --- |
| **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** | Programming, mathematical analysis, differential equations |
| **Postrequisites** | Nonlinear systems, Modeling systems in the oil and gas industry, Introduction to robotics |
| **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:**   1. Peter Corke. Robotics, Vision and Control: Fundamental Algorithms in MATLAB, 2011; 2. Kevin Linch. Modern Robotics: Mechanics, Planning, and Control, 2017.   **Internet resources:**  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 EMDC 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. The final scale is set according to the scale below. |

**Grading scale**

|  |  |  |  |
| --- | --- | --- | --- |
| **Letter grade** | **Grade Point Value** | **Percentage** | **Conventional Grade** |
| A | 4.0 | 95-100 | Excellent |
| A– | 3.67 | 90-94 |
| B+ | 3.33 | 85-89 | Good |
| B | 3.0 | 80-84 |
| B– | 2.67 | 75-79 |
| C+ | 2.33 | 70-74 |
| C | 2.0 | 65-69 | Satisfactory |
| C– | 1.67 | 60-64 |
| D+ | 1.33 | 55-59 |
| D– | 1.0 | 50-54 |
| FX | 0.5 | 25-49 | Failure |
| F | 0 | 0-24 |

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

|  |  |  |  |
| --- | --- | --- | --- |
| **Week** | **Topic title (lectures, laboratory works, students independent 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 |
| **SIWT 1**. Consultation. **SIW 1**. Designing an automation system. Questions on the topic. |  | 20 |
| 4 | **L4**. Modelling dynamic systems | 2 |  |
| **LW4**. Building a system of two moving cargos | 1 | 10 |
| 5 | **L5**. Simulating dynamic systems | 2 |  |
| **LW5**. A rigid flat plate in a flow of gas | 1 | 10 |
| **SIWT 2**. Defense. **SIW 1**. Designing an automation system. |  | 30 |
| **The Intermediate Control 1 (IC1)** |  | **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 |
| **SIWT 3**. Consultation. **SIW 2**. Designing an automation system. Questions on the topic. |  | 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 |
| **SIWT 4**. Defense. **SIW 2**. Designing an automation system. |  | 10 |
| 10 | **L10**. Working with signal groups | 2 |  |
| **LW10**. A material point in the gravitational field | 1 | 10 |
| **The Intermediate Control (MT)** |  | **100** |
| 11 | **L11**. Working with data | 2 |  |
| **LW11**. A long vertical cylindrical tube | 1 | 10 |
| **SIWT 5**. Consultation. **SIW 3**. The mini-project in automation. |  |  |
| 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 |
| **SIWT 6**. Control work. **SIW 3**. The mini-project in automation. |  | 10 |
| 14 | **L14**. Improving simulation performance and accuracy | 2 |  |
| **LW14**. Biological populations | 1 | 20 |
| 15 | **L15**. Analyzing simulation results | 2 |  |
| **LW15**. Analyzing laboratory works results | 1 | 10 |
| **SIWT 7**. Defense. **SIW 3**. The mini-project in automation. |  | 30 |
| **The Intermediate Control 2 (IC2)** |  | **100** |
|  | **Final Exam (FE)** |  | **100** |
|  | **Total (IC1+IC(MT)+IC2)/3\*0.6+FE\*0.4** |  | **100** |

|  |  |  |
| --- | --- | --- |
| Chairman of the methodical bureau |  | Gusmanova F. R. |
| Head of the chair |  | Mussiraliyeva Sh. Zh. |
| Lecturer |  | Karyukin V. I. |