**RĪGAS TEHNISKĀ**
**UNIVERSITĀTE**

## RTU Course "Adaptive Processing of the Signals"

### 33000 Faculty of Computer Science, Information Technology and Energy

*General data*

| | |
|---|---|
| Code | EEI500 |
| Course title | Adaptive Processing of the Signals |
| Course status in the programme | Compulsory/Courses of Limited Choice |
| Responsible instructor | Leonīds Ribickis |
| Academic staff | Mihails Gorobecs |
| Volume of the course: parts and credits points | 1 part, 4.5 credits |
| Language of instruction | LV, EN |
| Annotation | Acquisition of adaptive processing of the signals methods provides knowledge about linear and non-linear amplifiers, signal digitalization, linear filters, as well as adaptive and self-adaptive filters. Within the study course such elements are mastered: adaptive filter mathematics and modelling methods, including delta and delta-sigma modulation and adaptive signal processing in automatic regulation systems. |
| Goals and objectives of the course in terms of competences and skills | The goal of the study course is to introduce students with electrical signal adaptive processing interdisciplinary with usage in robotics, automatic systems, industrial electronics, power electronics and electro devices, as well as to develop skills how to use adaptive signal processing methods and devices in electrical device control systems.<br>The tasks of the study course are to provide an understanding of the definitions of adaptive signal processing, to develop skills to independently use various adaptive signal processing techniques in robotic equipment, industrial electronics, various applications of adaptronic systems. |
| Structure and tasks of independent studies | 4 practical laboratory works, which are carried out in groups of 4-5 students. Students must independently prepare theoretical foundation in fields of adaptive signal processing filters, infra-red processing signals, two-coordinate accelerated signal processing and electrical drive vibration measuring process. |
| Recommended literature | Obligātā/Obligatory:<br>1. Adaptive Signal Processing: Next Generation Solutions, Adali T., Haykin S.; John Wiley & Sons, 2010; ISBN 0470195177, 9780470195178; http://books.google.com/<br>2. Informatics in control, automation and robotics, Braz J., Araújo H, Vieira A.; Springer, 2006; ISBN 1402041365, 9781402041365; http://books.google.com/<br>Papildu/Additional:<br>3. Pulse Code Modulation Systems Design (1st ed.), Waggener B.; Boston, MA: Artech House, 1999; ISBN 0-89006-776-7. |
| Course prerequisites | Electric circuits, electronics, mathematics, basics of programming. |

*Course contents*

| Content | Full- and part-time intramural studies | | Part time extramural studies | |
|---|---|---|---|---|
| | Contact Hours | Indep. work | Contact Hours | Indep. work |
| History of adaptive signals processing, modern situation and context. | 2 | 2 | 0 | 0 |
| Control of initial knowledge – computer test. | 2 | 4 | 0 | 0 |
| Sources and types of signals. | 2 | 2 | 0 | 0 |
| Necessity and aim of the signals processing. | 2 | 2 | 0 | 0 |
| Linear and non-linear amplifiers. Dynamic range. Frequency bandwidth. | 2 | 4 | 0 | 0 |
| Digitalization of the signals. | 2 | 3 | 0 | 0 |
| Linear filters. | 2 | 3 | 0 | 0 |
| Adaptive and self-adaptive filters. | 3 | 2 | 0 | 0 |
| Mathematics of adaptive filters. | 6 | 2 | 0 | 0 |
| Software of adaptive filters modeling. | 4 | 2 | 0 | 0 |
| Delta un delta-sigma modulation. | 4 | 2 | 0 | 0 |
| Processing of adaptive signals in automatic control systems. | 2 | 2 | 0 | 0 |
| Adaptive signals processing – within the frames of selection. | 4 | 2 | 0 | 0 |
| 1.Lab.w. Review of adaptive signals processing (filters) in software application. | 3 | 2 | 0 | 0 |
| 2.Lab.w. Infrared signal processing. | 4 | 2 | 0 | 0 |
| 3.Lab.w. 2-coordinates acceleration meter signals processing. | 4 | 2 | 0 | 0 |
| 4.Lab.w. Modeling of electric drive vibration measurement process. | 6 | 4 | 0 | 0 |
| Laboratory work report approval. | 4 | 8 | 0 | 0 |
| Exam. | 2 | 10 | 0 | 0 |
| Total: | 60 | 60 | 0 | 0 |

## Learning outcomes and assessment

| Learning outcomes | Assessment methods |
|---|---|
| Is able to describe the types of signals processing in control systems. | Test. |
| Is able to calculate linear and non-linear amplifiers, their frequency bandwidth. Can apply methods of signals digitalization. | Test. |
| Is able to develop adaptive filters and apply software of adaptive filters modeling. | Test. |
| Is able to develop modules of adaptive signals processing in automatic control systems. | Passed exam. |

## Evaluation criteria of study results

| Criterion | % |
|---|---|
| Tests | 60 |
| Exam | 40 |
| Total: | 100 |

## Study subject structure

| Part | CP | Hours | | | Tests | | |
|---|---|---|---|---|---|---|---|
| | | Lectures | Practical | Lab. | Test | Exam | Work |
| 1. | 4.5 | 2.0 | 0.0 | 1.0 | | * | |