ŠIAULIAI UNIVERSITY FACULTY OF TECHNOLOGY

ŠIAULIAI UNIVERSITY FACULTY OF NATURAL SCIENCES

# ELECTRONICS ENGINEERING spring

| Course title | ECTS | Degree | Course code | Prerequisites | Subject area |
|---|---|---|---|---|---|
| **Signals and Systems** | 6 | Bachelor | T121B103 | Electronics, Circuit Theory | Electronics |
| **Analogical Devices** | 6 | Bachelor | T170B115 | Electronics, Circuit Theory | Electronics |
| **Digital Signal Processing** | 5 | Bachelor | T121B010 | Mathematics | Electronics |
| **Numerical Methods and Programming** | 6 | Bachelor | T121B177 | Mathematics | Electronics |
| **Microprocessors** | 6 | Bachelor | T170B114 | Electronics, Programming in C | Electronics |
| **Circuit Theory** | 6 | Bachelor | T170B101 | Physics | Electronics |

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Subject area: Electronics

| **Status** | Course code: T121B103<br>Course title: **Signals and Systems**<br>Taught by: Prof. Lauruška Vidas | | |
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| **Semester** | **ECTS credits** | **Languages** | **Duration** |
| Spring | 6 | English | 1 semester |
| **Study hours** | **Assessment** | **Prerequisites** | **Examination** |
| Lectures – 32 h<br>Seminars/Laboratory – 32 h<br>Self-study – 96 h | 10-point scale | Electronics, Circuit Theory | Mid-term examination – 20%<br>Seminars /laboratory works– 15%<br>Homework – 25%<br>Final examination – 40% |

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| **Subject content** | Linear time-invariant channel models; AM and FM modulation techniques; phase-locked Harmonic and periodic signals. Spectrum of aperiodic signals. Wave modulation and their spectrum. Probabilistic characteristics of signals. Computer modeling of signals and circuits. Systems with feedback. Stability of systems. Approximation of nonlinear characteristics. Signal digitizing and transfer. AM, FM, PM modulators and detectors. |
| **Learning Outcomes** | Understand signals and systems theoretical basics. Understand analysis methods of linear systems in time domain and know how them use. Understand spectral analysis of periodic signals and know how calculate Fourier series. Know how to use Fourier integral for aperiodic signals. Understand and know how use method of correlation analysis. Know parameters of noises and know how to use methods of noises calculation in linear systems. Know parameters of amplitude modulated oscillations in time and frequency domains and know how them calculate. Know frequency modulated oscillations and oscillations spectrum. Know principles of signals sampling and spectrum of sampling signal. Understand passage of signals through the coaster chains,Know principles of harmonic oscillation generators. |
| **Literature** | 1. Alan Oppenheim, Alan Wilsky, with Hamid. Signals and Systems: Pearson New International Edition. ISBN13: 9781292025902, 2013, 944pages.<br>2. Edward Kamen, Bonnie Heck.. Fundamentals of Signals and Systems Using the Web and MATLAB: Pearson New International Edition, 2013, 648 pages.<br>3. A Nagoor Kani. Signals and Systems. McGraw Hill Education (India) Pvt Ltd. 2007,768 pages |

Subject area: **Electronics**

| **Status** | Course code: T170B115<br>Course title: **Analogical Devices**<br>Taught by: Prof. Laurutis Vincas | | |
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| **Semester** | **ECTS credits** | **Languages** | **Duration** |
| Spring | 6 | English | 1 semester |
| **Study hours** | **Assessment** | **Prerequisites** | **Examination** |
| Lectures – *32 h*<br>Laboratory – *32 h*<br>Self-study – *96 h* | 10-point scale | | *Mid-term examination – 25%*<br>*Laboratory – 25%*<br>*Final examination – 50%* |

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| **Subject content** | Characteristics and parameters of the analogical devices. Structure and parameters of the amplifiers built on bipolar transistors. Structure and parameters of the amplifiers built on field transistors. Feed-back circuits in the amplifiers. Amplifiers of the continuous current. Differential amplifiers. Operational amplifiers and its application. Power amplifiers. Amplifiers with modulation and demodulation. Comparators. Multipliers. Digital-analog converters and analog-digital converters. Generators. |
| **Learning Outcomes** | Students learn to construct the circuits of large variety of amplifiers and calculate relationship between parameters and elements of the amplifiers. |
| **Literature** | Sedra A. C., Smith K. C. Microelectronic Circuits. 6th edition. Oxford University Press. ISBN 0195323033<br>2. Moris John C. Analogue Electronics. Arnold. 1999. 240 p. |

Subject area: **Electronics**

| **Status** | Course code: T121B010<br>Course title: **Digital Signal Processing**<br>Taught by: Prof. Gintautas Daunys | | |
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| **Semester** | **ECTS credits** | **Languages** | **Duration** |
| Spring | 5 | English | 1 semester |
| **Study hours** | **Assessment** | **Prerequisites** | **Examination** |
| Lectures – *32 h*<br>Laboratory – *32 h*<br>Self-study – *69 h* | 10-point scale | *Mathematics* | *Mid-term examination – 25%*<br>*Laboratory – 25%*<br>*Final examination – 50%* |

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| **Subject content** | Linear discrete-time systems and signals. Pulse and frequency responses. System function. Signal-flow diagrams. Discrete Fourier transform. Design of IIR and FIR digital filters according to the frequency response. Quantization effects. Applications of digital filters. |
| **Learning Outcomes** | Knowledge about signals analysis in time and frequency domain, design of digital filters, filtering. Abilities to design digital filters, to use them for signal filtering, abilities to wok with engineering software. |
| **Literature** | 1. Smith S. S. The Scientist and Engineer's Guide to Digital Signal Processing. Available online http://www.dspguide.com/.<br>2. Owen M. Practical Signal Processing. Cambridge University Press. ISBN 9780521854788. |

Subject area: **Electronics**

| **Status** | Course code: T121B177<br>Course title: **Numerical Methods and Programming**<br>Taught by: Assoc. Prof. Nerijus Ramanauskas | | |
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| **Semester** | **ECTS credits** | **Languages** | **Duration** |
| Spring | 6 | English | 1 semester |
| **Study hours** | **Assessment** | **Prerequisites** | **Examination** |
| Lectures – *32 h*<br>Laboratory – *32 h*<br>Self-study – *96 h* | 10-point scale | *Mathematics* | *Mid-term examination – 25%*<br>*Laboratory – 25%*<br>*Final examination – 50%* |

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| **Subject content** | Embedded system programming by high and intermediate level languages. C language elements: variables, arrays, user defined types and structures, operators and program flow control. Functions. Numeric methods of integration, differentiation, interpolation and extrapolation. |
| **Learning Outcomes** | Knowledge about high level and intermediate level programming languages, C language syntax. Abilities to design a program algorithm, to develop program code. |
| **Literature** | 1. Kochan S. G. Programming in C (4th Edition). ISBN 0321776410, 2014.<br>2. Numerical Recipes (3rd Edition). ISBN 0521880688, 2007. |

| Subject area: **Electronics** | | | |
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| **Status** | Course code: **T170B114**<br>Course title: **Microprocessors**<br>Taught by: Assoc. Prof. Ramanauskas Nerijus | | |
| **Semester** | **ECTS credits** | **Languages** | **Duration** |
| Autumn / Spring | 6 | English | 1 semester |
| **Study hours** | **Assessment** | **Prerequisites** | **Examination** |
| Lectures – 32 h<br>Laboratory – 32 h<br>Self-study – 96 h | *10-point scale* | *Electronics*<br>*Programming in C* | *Laboratory – 20%*<br>*Individual project – 30%*<br>*Final examination – 50%* |

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| **Subject content** | Microcontrollers Basics; Microcontroller Components; Processor Core; Memory; Digital I/O; Analog I/O; Interrupt System; Timers; CCP modules; Comunication modules; Peripheral devices; Software Development. |
| **Learning Outcomes** | Knowledge about microcontrollers architecture; Knowledge about microcontrollers programming; Knowledge about microcontrolers progress; Can project systems with microcontrollers and can select the microcontroller for specific task. The ability to experiment with various parts of microcontroller architecture using various sources of literature. The ability to choose the rigth development software. |
| **Literature** | 1. Jonathan W Valvano. Embedded Systems: Introduction to Arm® Cortex(TM)-M Microcontrollers (Volume 1) ISBN-13: 978-1477508992, 2012<br>2. Milan Verle. PIC Microcontrollers. mikroElektronika 2008;<br>2. Milan Verle. PIC Microcontrollers - Programming in C. mikroElektronika 2009. |

| Subject area: **Electronics** | | | |
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| **Status** | Course code : T170B101<br>Course title: **Circuit Theory**<br>Taught by: Lecturer dr. Balbonas Dainius | | |
| **Semester** | **ECTS credits** | **Languages** | **Duration** |
| Autumn/Spring | 6 | English | 1 semester |
| **Study hours** | **Assessment** | **Prerequisites** | **Examination** |
| Lectures – 32 h<br>Seminars/<br>Laboratory – 32 h<br>Self-study – 96 h | 10-point scale | | Mid-term examination – 20%<br>Seminars/Laboratory – 20%<br>Homework – 20%<br>Final examination – 40% |

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| **Subject content** | Fundamental electrical quantities(current, voltage, power); basic circuit laws; circuit elements; DC and AC circuits; circuit analysis techniques; transient response and it's examination; transmission lines; transmission lines parameters and characteristics; smith chart. |
| **Learning Outcomes** | Knowledge and application of mathematical apparatus required for electronic circuit analysis; knowledge and application of the laws of circuit theory; ability to calculate the circuit parameters using mathematical knowledge, laws and analysis methods of circuit theory; understanding of electronic circuits and knowledge how to draw electronic circuits. According to circuit parameters is able to choose circuit elements; ability to use laboratory equipment. Ability to monitor and evaluate the electrical phenomena in the circuits; theoretical knowledge effectively applied in practice, for selection circuit elements and calculation parameters of circuits**.** |
| **Literature** | 1. Electronics Tutorials. http://www.electronics-tutorials.ws/<br>2. Circuit Magic inc. http://www.circuit-magic.com/laws.htm<br>3. The University of Texas at Austin. http://utwired.engr.utexas.edu/rgd1/index.cfm<br>4. School of Physics. http://www.animations.physics.unsw.edu.au/jw/AC.html |