Antenna Theory

Course developer
Jānis Trokšs

Credit points
2 (3 ECTS)

Volume (number of academic contact-hours per semester)
32 (16 – lectures, 16 – work in laboratory)

Assessment
Exam

Course prerequisites
Compulsory choice

Course group (required, compulsory choice or free choice)

Course objectives
The aim of this course is to provide students with theoretical and practical skills in different antennas, in computer-aided design and analysis of antennas and design of different types of antennas

Results
(1) Understanding the operation of dipole and loop antennas, principle of antenna arrays
(2) Understanding the basic parameters to specify antenna characteristics
(3) ability to design matching transformers, to design wire antennas and uniform antenna arrays
(4) ability to use computer aided design software for antennas

Course language
Latvian

Course abstract
The course “Antenna Theory” is developed for electronics undergraduate students and is composed of two parts – lectures and laboratory works. During lectures the basics of antenna theory has been discussed, different types of antennas and its properties have been explained. Laboratory works are foreseen to develop and sharpen skills in antenna design and antenna analysis

Course description-general outline
Lectures
1. Electromagnetic radiation - 2
2. Radiation fields of wire and loop antennas – 4
3. Broadband antennas – 4
4. Aperture and lens antennas – 2
5. Synthesis and computer-aided design of antennas - 4
Laboratories

1. Wire and loop antennas
2. Microstrip antennas
3. Broadband antennas
4. Reflecting antennas

Requirements for obtaining credit points

At least 4 laboratory experiments have to be carried out and assessed. All experiments are assessed with mark which form the total grade in the course - 50%
Exam - 50%

Suggested titles
compulsory reading


further reading

# Circuit Theory

(Ķēžu teorija)

<table>
<thead>
<tr>
<th>Course developer</th>
<th>Jānis Doniņš</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit points</td>
<td>6 (9 ECTS)</td>
</tr>
<tr>
<td>Volume (number of academic contact-hours per semester)</td>
<td>96 (64 – lectures, 32 – laboratory works)</td>
</tr>
<tr>
<td>Assessment</td>
<td>Exam after each semester</td>
</tr>
<tr>
<td>Course prerequisites</td>
<td>High school mathematics and physics</td>
</tr>
<tr>
<td>Course group (required, compulsory choice or free choice)</td>
<td>Required</td>
</tr>
<tr>
<td>Course objectives</td>
<td>Provide a picture of the electrical processes carried out in the electrical circuits as components of electrotechnics and electrical systems. Raise awareness of the electrical processes using mathematical and graphical techniques, as well as creating a different process models and examining student’s performance in practice.</td>
</tr>
<tr>
<td>Results</td>
<td>Understanding the processes of stationary linear circuits, the calculation methods used for DC and AC circuits including. Three-phase circuits four-pole and filter theory foundations, inductively-related elements, sinusoidal mode circuits, periodic non sinusoidal mode circuits as well as matrix and graph theory. Understanding the transition processes in linear electric circuits. Understanding methods of calculation for static and transition processes and, the transmission lines with distributed parameters, nonlinear circuits, their properties. Ability to apply mathematical and graphical methods for electrical engineering tasks. Ability to plan and carry out experiments in electrical engineering, process data, to evaluate the measurements and make conclusions. Ability to use measuring instruments. Ability to apply in practice and verify the theoretical relationships.</td>
</tr>
<tr>
<td>Course language</td>
<td>Latvian</td>
</tr>
</tbody>
</table>
**Course abstract**  
Course "Circuit Theory" for the electronics undergraduate programs for students and is composed of three parts - lectures, laboratory work and course work. During lectures the theoretical foundations of electrical - stationary processes in the linear chains and transition processes, long lines and nonlinear circuits are discussed and analyzed. Laboratory works for students are to develop practical work, handle and analyze the results. At a course work students independently carry out the task-solving model - direct current calculation methods, calculation of the complex AC circuit and estimate the transition process.

**Course description-general outline**

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>DC electrical circuits, basic concepts – 4</td>
</tr>
<tr>
<td>2.</td>
<td>Electrical circuit analysis and calculation methods - 6</td>
</tr>
<tr>
<td>3.</td>
<td>Topological methods of electrical circuits for calculation - 4</td>
</tr>
<tr>
<td>4.</td>
<td>AC circuit elements and characteristics – 4</td>
</tr>
<tr>
<td>5.</td>
<td>Sinusoidal mode calculation – 4</td>
</tr>
<tr>
<td>6.</td>
<td>Resonance phenomena – 4</td>
</tr>
<tr>
<td>7.</td>
<td>AC circuits with inductively related elements - 4</td>
</tr>
<tr>
<td>8.</td>
<td>Three-phase circuits – 6</td>
</tr>
<tr>
<td>9.</td>
<td>Periodic non sine form circuits – 4</td>
</tr>
<tr>
<td>10.</td>
<td>Four-pole and filter theory – 4</td>
</tr>
<tr>
<td>11.</td>
<td>Neither reciprocity electronic components in linearized mode – 4</td>
</tr>
<tr>
<td>12.</td>
<td>Transitional processes in electric circuits – 6</td>
</tr>
<tr>
<td>13.</td>
<td>Circuits with distributed parameters – 4</td>
</tr>
<tr>
<td>14.</td>
<td>Nonlinear electrical circuit – 6</td>
</tr>
</tbody>
</table>

Laboratory experiments (2 hours each work)

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Voltage regulation using rheostat.</td>
</tr>
<tr>
<td>2.</td>
<td>Interplay DC circuit</td>
</tr>
<tr>
<td>3.</td>
<td>Dc-line study.</td>
</tr>
<tr>
<td>4.</td>
<td>Active-two-pole study.</td>
</tr>
<tr>
<td>5.</td>
<td>AC circuits with active and reactive elements.</td>
</tr>
<tr>
<td>6.</td>
<td>The voltage resonance.</td>
</tr>
<tr>
<td>8.</td>
<td>AC circuit with inductively-related elements.</td>
</tr>
<tr>
<td>10.</td>
<td>Three-phase star (Y) circuit.</td>
</tr>
<tr>
<td>11.</td>
<td>Three-phase triangle (Δ) circuit.</td>
</tr>
<tr>
<td>12.</td>
<td>Symmetrical components off irregular three-phase system.</td>
</tr>
<tr>
<td>13.</td>
<td>Non sinusoidal periodic currents and voltages Study</td>
</tr>
<tr>
<td>15.</td>
<td>Diode rectifier study.</td>
</tr>
</tbody>
</table>
Requirements for obtaining credit points

- Developed and assessed eight laboratory work - 20%
- Estimated and presented two course works - 20%
- Exam - 60%

**Suggested titles compulsory reading**


**Further reading**

1. Татур Т.А., Татур В.Е. Установившиеся и переходные процессы в электрических цепях, Москва, Высшая школа, 2001, 407 стр
Digital Logic and Computer Architecture

Course Author
Gints Neimanis

Credit points
2

Volume (number of academic contact-hours per semester)
32 (16 – lectures, 16 – laboratory work)

Assessment
Exam

Course prerequisites
Basics of Digital Electronics
Compulsory choice

The course aims to give students a basic knowledge and skills of combinational and sequential circuits, computer architectures and operating principles.

Results (competencies to be acquired)
1) Ability to synthesize and analyse logical and sequential circuits, using logical elements and triggers
2) Ability to develop and use triggers, registrs, numerators, adders, encoders, decoders, multiplexors, demultiplexors
3) Understanding of computer basic components and computer operating principles

Course Language
latvian

Annotation
The course “Digital Logic and Computer Architecture” is developed for electronics undergraduate students and is composed of two parts – lectures and laboratory works. During lectures triggers, sequential circuits have been discussed and analyzed. Computer of von Neumann architecture has been analyzed. Theoretical knowledge is reinforced by practical work in the laboratory.

Course
Lectures

1. Triggers - 2
2. Conversion of triggers - 2
3. Synthesis of sequential circuits - 2
4. Analysis of sequential circuits - 2
5. Von Neumann architecture - 2
6. Types of computer commands - 2
7. Logical and monitoring device - 2
8. Computer memory - 2
Laboratories

1. Triggers
2. Conversion of triggers
3. Synthesis of sequential circuits
4. Analysis of sequential circuits
5. Combinational circuits
6. Development of arithmetical device

Requirements for obtaining credits

Completed laboratory works
Attendance – 10%
Exam - 80%
Home assignments - 10%

Literature


Computer Aided Design

Course developer: Gatis Gaigals
Credit points: 2 (3,5 ECTS)
Volume (number of academic contact-hours per semester): 32 (32 – work in laboratory)
Assessment: Test
Course prerequisites: Standards and Technical Norms
Course group: Compulsory choice

Course objectives: The objective of this course is to provide the students with a basic knowledge of computer aided design of electronic circuits and printed circuit boards, sharpen skills of applying of computer design tools

Results:
(1) Increase students knowledge and understanding of technologies of printed circuit board design
(2) Ability to apply computer aided design tools for development of electronic circuits and printed circuit boards

Course language: Latvian

Course abstract: The course “Computer aided design” is developed for electronics undergraduate students. Course focuses on laboratory works and consists of two parts: tools for electronic circuit design and tools for printed circuit design. Techniques of computer aided design have been considered using CadStar program.

Course description - general outline

Lessons
1. Introduction to CadStar program
2. Symbols and connections
3. Development of hierarchic structure of the project
4. Development of new element from symbol
5. Project preparing for transfer to PCB
6. PCB project settings
7. Component placement
8. Manual layer creating
9. Using of trace option for layer creating
10. Text and dimension adding
11. Finishing of the project
12. Design of new elements from component
13-16. Semester work
Requirements for obtaining credit points

20 laboratory assignments have to be carried out and assessed. All assignments are assessed with mark which form the total grade in the course - 50%
Semester work - 50%

Suggested titles

Further reading


Further reading


Suggested periodicals and internet resources

Digital Signal Processors

Course developer: Gatis Gaigals
Credit points: 3 (4.5 ECTS)
Volume (number of academic contact-hours per semester): 48 (16 – lectures, 32 – work in laboratory)
Assessment: Exam

Course prerequisites:
Basics of digital electronics, Programming, Digital logics and computer architecture, Circuit Theory, Semiconductor electronics, Numerical methods, Microcontrollers and Embedded Systems

Course group (required, compulsory choice or free choice): Compulsory choice

Course objectives:
The objective of this course is to provide the students with a basic knowledge of digital signal processing, to select and apply digital signal processing tools.

Results:
1. Increase students knowledge and understanding of techniques of digital signal processing
2. Skills to apply microcontrollers digital signal processors depending on system requirements
3. Increase students skills to apply specific programs

Course language: Latvian

Course abstract:
The course “Digital Signal processors” is developed for electronics undergraduate students. During lectures basics of digital signal processing have been discussed. Course deals with digital transfer function, digital filters, using microcontrollers, digital signal processors and FPGA’s. Course focuses on laboratory works.

Course description-general outline

Lectures
1. Components of digital signal processing system
2. Transfer functions
3. Digital filters
4. Digital signal generators
5. Signal analysis
6. Signal synthesis
7. Applications of digital signal processing

Laboratory assignments
1. Digital filters for low and for high frequencies
2. Digital band filters
3. Digital signal generators for rectangular and saw form signals
4. Digital signal generators for sine and triangle form signals
5. Development of digital signal generators for rectangular and saw form signals
6. Development of digital signal generators for sine and triangle form signals
<table>
<thead>
<tr>
<th>Requirements for obtaining credit points</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 laboratory assignments have to be carried out and assessed. All assignments are assessed with mark which form the total grade in the course - 50% Exam - 50%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Suggested titles</th>
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<table>
<thead>
<tr>
<th>Compulsory reading</th>
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</table>

<table>
<thead>
<tr>
<th>Further reading</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Suggested periodicals and internet resources</th>
</tr>
</thead>
</table>

**Course developer**  
Jānis Doniņš

**Credit points**  
2 (3 ECTS)

**Volume (number of academic contact-hours per semester)**  
32 (8 – lectures, 24 – practical assignments)

**Assessment**  
Test

**Course prerequisites**  
Basics of Digital Electronics, Digital Logics and Computer Architecture

**Course group (required, compulsory choice or free choice)**  
Compulsory choice

**Course objectives**  
The aim of this course is to provide students with knowledge in electronics manufacturing technology and provide skills in electronic circuit design

**Results**  
1) Understanding of electronics manufacturing technology  
2) Understanding of electronics circuit projecting, testing, prototyping  
3) Ability to evaluate electronic circuit design, modeling and testing

**Course language**  
Latvian

**Course abstract**  
The course is developed for electronics undergraduate students and is composed of two parts – lectures and practical assignments. During lectures the review of electronic manufacturing technologies as well of electronic circuit design has been provided. Practical assignments are foreseen to develop experimental skills in electronic circuit design and simulation

**Course description-general outline**

**Lectures**

1. Introduction to development of electronics manufacturing technology  
2. Characterization of modern electronic plant  
3. Specific of electronic circuit design  
4. Computer programs and tools for electronic circuit design, simulation and prototyping

**Assignments**

Electronic circuit and PCB design, simulation, testing and prototyping
| Requirements for obtaining credit points | 4 assignments have to be assessed - 50% |
| Test - 50% |

| Suggested titles |
| compulsory reading |

| further reading |
| 2. Equipment Manuals |
Electrical measurements and instrumentation
(Elektriskie mērījumi un mērinstrumenti)

Course developer: Aigars Krauze
Credit points: 2
Volume (number of academic contact-hours per semester): 32 (24 – lectures, 8 – laboratory works)
Assessment: Test
Course prerequisites: Basics of Digital Electronics, Analog devices
Course group (required, compulsory choice or free choice): Compulsory choice
Course objective: Obtain knowledge about the principles and methods of measurement. Errors in measurement & its analysis, Standards. Classification of instruments, Characteristics & use of instruments.
Results: Knowledge and understanding the methods of measurement electric and non electric quantities, evaluating errors in measurement. Get experience and knowledge of working with main electronic measurement instruments.
Course language: Latvian
Course abstract: Course “Electrical measurements and instrumentation” designed for bachelor program students of electronics and consists of lectures and laboratory works. The theoretical aspects are covered in lectures – principles of measurement, measurement errors, analog and digital instruments, measuring of signal parameters, measuring of circuit elements. Practical and subject specific skills are acquired in laboratory – perform measurements, interpret results, evaluate errors, write a technical report.

Course description-general outline:

Lectures:
1. Principles of measurement, terminology, measurement systems - 2,
2. Measurement uncertainty and errors - 2
3. Electro mechanical measuring instruments – 2
4. Digital instruments, analog to digital conversion, ADC’s – 4
5. Voltage and Current measurement – 2
6. Signal wave form and spectra measurement, oscilloscope – 2
7. Time, frequency and phase measurement – 2
8. Power measurement – 2
9. Circuit element (R,L,C) measurement – 4
10. Non-electric quantities measurement – 2
Laboratory works:
5. Measuring with virtual instruments.

Two test works will be done during the course.

Requirements for obtaining credit points:
Five laboratory works have to be carried out and assessed – 40%;
Two tests done – 60%;

Suggested titles:


Suggested Internet resources: http://www.facstaff.bucknell.edu/mastascu/InstrumentationCourse/InstrumentationIndex.htm
English for Electronics

<table>
<thead>
<tr>
<th><strong>Author</strong></th>
<th>Lecturer, Dr.paed., MBA Vita Balama</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course value</strong></td>
<td>4 KP (ECTS 6 points)</td>
</tr>
<tr>
<td><strong>Form of testing</strong></td>
<td>Term 1- test; Term 2- exam</td>
</tr>
<tr>
<td><strong>Preconditions</strong></td>
<td>Successfully acquired secondary education course (ISEC certificate)</td>
</tr>
<tr>
<td><strong>Course group</strong></td>
<td>Comprehensive course</td>
</tr>
</tbody>
</table>

**THE AIM**
The aim of the course is to give knowledge about the electronic technologies, the structure and development, as well as the applications. Consolidate the practical language skills of the precise use of terminology, improve the grammatical knowledge, and develop the skills of correct choice and use of grammatical forms and functions.

**ANNOTATION**
The course is intended to give the concept of electronics technologies, knowledge presentation, and different approaches to modifying knowledge, creating data basis, and formatting and applying it. The course is based on vocabulary enrichment and improvement of language skills. In the course there are used such forms of communicative learning as team-work, project elaboration and their presentation, performing in front of the audience, discussions, debates. The handout materials are designed so that they improve the students’ individual work. The forms of independent work are the use of special dictionaries, periodicals, Internet, and other information sources available in the VeUC library.

**REQUIREMENTS FOR CREDITS**
The attendance constitutes at least 75% of the total amount of classes, successfully passed all midterm tests, the final test at the end of Term 1, and final exam at the end of Term 2.

**LITERATURE**

2. Glendinning E. H., McEwan J. Oxford English for Information Technology,- OUP, 2001,
3. Glendinning E.H., McEwan J., Basic English for Computing,- OUP, 2000,
### Course Outline TERM 1

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Themes</th>
<th>Written work</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I. Introduction into Electronics</td>
<td>Self presenting essay</td>
</tr>
<tr>
<td>2-3-4-5-6-7-8</td>
<td>II. Electronic components</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.1. Component values</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.2. Batteries</td>
<td>Describing diagrams</td>
</tr>
<tr>
<td></td>
<td>2.3. Remote control</td>
<td>Describing a system</td>
</tr>
<tr>
<td></td>
<td>2.4. Alarm systems</td>
<td>Explanations</td>
</tr>
<tr>
<td></td>
<td>2.5. Transistor characteristics</td>
<td>Ordering components</td>
</tr>
<tr>
<td></td>
<td>2.6. Metal detector</td>
<td>Linking facts and ideas</td>
</tr>
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<td></td>
<td><strong>Midterm Test No 1</strong></td>
<td></td>
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<tr>
<td>9-10-11-12-13</td>
<td>III. Music gadgets</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.1 Music centre</td>
<td>Adding information</td>
</tr>
<tr>
<td></td>
<td>3.2. Drum machine</td>
<td>Business letter</td>
</tr>
<tr>
<td></td>
<td>3.2. Audio recording systems</td>
<td>Memo</td>
</tr>
<tr>
<td></td>
<td>3.3. CDs</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Midterm Test No 2</strong></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>IV. Test and repair instruments</td>
<td></td>
</tr>
<tr>
<td>15-16</td>
<td>V. Graphs</td>
<td>Describing graphs</td>
</tr>
<tr>
<td></td>
<td><strong>Midterm Test No 3</strong></td>
<td></td>
</tr>
</tbody>
</table>

### Course Outline TERM 2

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Themes</th>
<th>Written work</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2-3-4-5-6</td>
<td>I. Different equipment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.1. High definiton television</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.2. Video cassette recorder</td>
<td>Comparison and contrasting</td>
</tr>
<tr>
<td></td>
<td>1.3. Computers</td>
<td>Explaining a process control system</td>
</tr>
<tr>
<td></td>
<td>1.4. Digital watch</td>
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<td></td>
<td>1.5 Cellphones</td>
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<tr>
<td></td>
<td><strong>Midterm Test No1</strong></td>
<td></td>
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<tr>
<td>7-8-9</td>
<td>II. Data transmission</td>
<td>Describing transmission processes</td>
</tr>
<tr>
<td></td>
<td><strong>Midterm Test No 2</strong></td>
<td></td>
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<tr>
<td>10-11-12-13-14-15</td>
<td>III. Careers in electronics</td>
<td></td>
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<tr>
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<td>3.1. Sound engineer</td>
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<td></td>
<td>3.2. Technician</td>
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<td></td>
<td>3.3. Field engineer</td>
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<tr>
<td></td>
<td>3.4. Future career</td>
<td>CV and letter of application</td>
</tr>
<tr>
<td></td>
<td>3.5. Job ads</td>
<td>Job ads</td>
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<tr>
<td></td>
<td><strong>Midterm Test No 3</strong></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>English for Communication Skills</td>
<td>Consolidation</td>
</tr>
<tr>
<td></td>
<td><strong>Midterm Test No 3</strong></td>
<td></td>
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</tbody>
</table>
## Optics and Optoelectronics

### Course developer
Janis Harja

### Credit points
3 (4.5 ECTS)

### Volume (number of academic contact-hours per semester)
48 (24 – lectures, 24 – laboratory trainings)

### Assessment
Exam

### Course prerequisites
Electricity and magnetism

### Course group (required, compulsory choice or free choice)
required

### Course objectives
The aim of the course is to give student basic knowledge of ray and wave optics, physical optics phenomena, as well as raise understanding about the close connection between optics and electronics.

### Results
1. Understanding of ray and wave approximation used for description of optical phenomenon
2. Ability to solve problems in optics and optoelectronics using mathematical equations
3. Understanding of possibilities for applying optical techniques in electronics
4. Ability to plan and carry out optical experiments, analyze the results, estimate results error, formulate conclusions

### Course language
Latvian

### Course abstract
Course gives an insight into the basic optics. Optical phenomena and effects are examined in both the geometric and in wave optics approximations. In addition to the classical optical chapters of light refraction, reflection, interference, diffraction and of light interaction with the matter course contains topics in nonlinear optics, lasers and holography, in optoelectronic devices. The course includes exercises and training in laboratory.

### Course description-general outline

#### Lectures

5. Interference, Young’s double slit experiment, intensity in the interference pattern. Interference in thin films.

Laboratory experiments

1. Lenses and aberrations of lenses
2. Formation of images in optical systems
3. Light propagation in optical fibers
4. Interference of light in slits
5. Diffraction of light in slits and gratings
6. Polarization of light
7. Laser an its radiation properties
8. Measurement of light propagation speed

Requirements for obtaining credit points
At least 4 laboratory experiments have to be carried out. All experiments are assessed with mark which form the total grade in the course - 30%
Exam - 70%

Suggested titles

Compulsory reading

Further reading

Suggested periodicals and Internet resources
www.colorado.edu/physics/2000/waves_particles
4. Signatures of Contractors

Ventspils University College
Acting Rector Algars Krauze, or Vice Rector K. Kreižins

Academic person (contact person's name and surname)

(guardian)

(Student)

(guardian)

(Student)

2.lapa no 2
Programmable Logic Circuits

Course developer  Gatis Gaigals
Credit points  4 (6 ECTS)
Volume (number of academic contact-hours per semester)  64 (32 – lectures, 32 – work in laboratory)
Assessment  Exam after each semester
Basics of digital electronics, Programming, Digital electronics and computer architecture, Semiconductor electronics
Course prerequisites
Course group (required, compulsory choice or free choice)  required
Course objectives  The aim of this course is to provide the students with a knowledge of programmable logic circuits and its technologies, to develop skills for applying of its development tools
Results  (1) Increase students knowledge and understanding of modern programmable logic circuits, its functionality and characteristics  
(2) Understanding of technology development of programmable logic circuits  
Skills to programming microcontrollers using different programming languages  
(3) Increase student skills in applying of specific programming languages (VHDL, Verilog)
Course language  Latvian
Course abstract  The course “Programmable logic circuits” is developed for electronics undergraduate students and consist of two parts – lectures and laboratories. During lectures basics of programmable logic circuits as well as basics of VHDL programming language have been discussed. During laboratories practical skills for applying of programmable logic circuits have been developed.

Course description-general outline
Lectures
1. Logical families
2. Programmable logic circuits
3. Introduction into VHDL
4. Modeling of operator circuits
5. Modeling of sequential circuits
6. VHDL date types: simple models
7. VHDL date types: complex models
8. Subprograms
Laboratories
1. Problems of realization of combinatory circuits
2. Applying of programmable logic for development of combinatory circuits
3. Introduction into VHDL
4. Development of signal generators and tests using VHDL
5. Development of arithmetic circuits and testing using VHDL
6. Development of function generators with 3 variables and 8 functions using VHDL
7. Tuning of VHDL and applying of output operator
8. Development of sequential circuits using VHDL

Requirements for obtaining credit points
At least 8 laboratory experiments have to be carried out and assessed. All experiments are assessed with mark which form the total grade in the course - 50%
Exam - 50%

Suggested titles

compulsory reading

further reading

Suggested periodicals and internet resources
1. VHDL and FPGA Resources on the Web: http://equipe.nce.ufrj.br/gabriel/vhdlfpga.html
2. VHDL and FPGA: http://www.dcc.ufrj.br/~gabriel/links.html
3. The Hamburg VHDL Archive: http://tams-www.informatik.uni-hamburg.de/research/vlsi/vhdl/
4. Opencores: http://opencores.org/
5. VHDL online: http://esd.cs.ucr.edu/labs/tutorial/VHDL_Page.html
## Computer Programming

**Course developer**  Dace Briede  
**Credit points**  2 (3 ECTS)  
**Volume (number of academic contact-hours per semester)**  32 (16 – lectures, 16 – practical trainings)  
**Assessment**  Exam  
**Course prerequisites**  Foundations of Computer Science  
**Course group (required, compulsory choice or free choice)**  required  
**Course objectives**  The principal aim of this course is to obtain theoretical and practical C language programming skills  
**Results**  Understanding of programming languages  
Understanding the C programming language syntax and standard libraries  
Ability to use the C programming language for practical tasks.  
Understanding of basic algorithms and data structures  
**Course language**  Latvian  
**Course abstract**  Course "Programming" is foreseen for electronics undergraduate program students and is composed of two parts - lectures and practical trainings. Lectures are being dealt with programming and C programming language. In the practical part students in groups have to develop short programs in C programming language.  

### Course description-general outline

#### Lectures

1. Introduction. Numerical programming and engineering applications, computer programming languages, C language, its history, the ANSI C/C90 - 2
2. C programming language - an overview, a simple example of the program - 2
3. C programming language - the data and their types - 2
4. C programming language - the operators - 2
5. C programming language – functions - 2
7. Date structures and algorithms - 4

### Requirements for obtaining credit points

At least 5 practical assignments have to be carried out and assessed before exam - 40%

Exam - 60%

### Suggested titles

#### compulsory reading

- Stephen G. Kochan. Programming in C, A complete
introduction to the C programming language, Third edition, Sams Publishing, 800, East 96th Street, Indianapolis, Indiana 46240

further reading

1. Bradley L. Jones, Peter Aitken. Teach yourself C in 21 days (Sams Teach Yourself), Sams; 6th edition.
Signal theory and signal processing

Course developer
Janis Trokss

Credit points
4 (6 ECTS)

Volume (number of academic contact-hours per semester)
64 (32 – lectures, 32 – work in laboratory)

Assessment
Exam after each semester

Course prerequisites
Mathematical analysis, Linear Algebra and Analytic Geometry

Course group (required, compulsory choice or free choice)
required

Course objectives
The objective of this course is to provide students with theoretical and practical knowledge in different signals, mathematical techniques of signal processing, filter characteristics, time and frequency analysis, analogue-digital converters, algorithms of digital signal processing

Results
(1) Understanding of mathematical treatment of signals
(2) Understanding of mathematical treatment of periodical and random signals, signal transforms and signal filtering
(3) Increase students skills to apply techniques for analogue – digital signal conversation
(4) Sharpen students experimental skills of applying of signal processing in audio, video and telecommunication areas
(5) Increase students skills to plan and carry out experiments using modern signal detection and processing equipment

Course language
Latvian

Course abstract
The course “Signal theory and signal processing” is developed for electronics undergraduate students and is composed of two parts – lectures and laboratory works. During lectures the basics of signal theory has been discussed as well as techniques for signal transform, signal filtering and processing. Laboratory works are foreseen to develop experimental skills, to obtain, process and analyze the results.

Course description-general outline

Lectures
1. Classification of signals - 2
2. Mathematical treatment of signals, periodical signals, random signals – 2
3. Mathematical treatment of systems, linear systems, convolution – 2
4. Correlation, power spectrum – 2
5. Signal modulation - 2
6. Random signals – 2
7. Fourier series, Fourier transforms – 2  
8. Laplace transforms – 2  
10. Signal filtering, frequency characteristics, ideal filters, passive filters, active filters, digital filtering – 2  
11. Time-frequency domain analysis, Short time Fourier transforms, Wigner-Ville distribution, wavelet analysis – 2  
12. Fast Fourier Transform (FFT) - 2  
13. Analogue-digital signal transform – 2  
16. Audio signal processing, image processing, signals in telecommunications – 2

Laboratory works

1. Mathematical techniques in signal processing  
2. Applications of Fourier, Laplace, Z-transforms  
3. Basics of signal modulation techniques  
4. Basics of signal filtering  
5. Analogue-digital signal converters  
6. Digital signal filtering

Requirements for obtaining credit points

At least 6 laboratory experiments have to be carried out and assessed. All experiments are assessed with mark which form the total grade in the course - 30%
Exam - 70%

Suggested titles  
compulsory reading


further reading


Suggested periodicals and internet resources

http://www.sp4comm.org/docs/sp4comm.pdf
Semiconductor electronics
(Pusvadītāju elektronika)

Course developer: Aigars Krauze
Credit points: 3
Volume (number of academic contact-hours per semester): 48 (32 – lectures, 16 – laboratory works)
Assessment: Exam
Course prerequisites: High school mathematics and physics
Course group (required, compulsory choice or free choice): Required
Course objective: Extend knowledge of the theory and characteristics of semiconductor materials; operation and using of semiconductor devices (diodes, transistors, etc.)
Results: Knowledge and understanding electric charge behavior in solid state materials, electric current in semiconductors. Understanding structure, operation and usage of semiconductor electronic devices (semiconductor diodes, transistors, optoelectric devices, thyristors). Practical skills of carrying out experiments with real devices, measurement of parameters, interpret results.
Course language: latvian
Course abstract: Course “Semiconductor electronics” designed for bachelor program students of electronics and consists of lectures and laboratory works. The theoretical aspects are covered in lectures – electric charge carrying in solid state materials, electric current in semiconductors, structure and operation of semiconductor devices. Practical and subject specific skills are acquired in laboratory – assembly electrical scheme, perform measurements, interpret results, write a technical report.

Course description-general outline:

Lectures:
1. Physical basis of semiconductor devices - 4,
2. Electric current in semiconductors - 2
3. Contact phenomenon in semiconductors – 2
4. p-n junction characteristics – 2
5. Semiconductor diode – 4
6. Bipolar junction transistors – 4
7. BJT connections, operation modes – 4
8. BJT biasing circuits, quiescent point - 2
9. Field Effect Transistors – 4
10. Optoelectronic devices – 2
11. Thyristors – 2

Laboratory works:
1. Semiconductor diode.
2. Zener diode, voltage stabilizer.
3. BJT in common emitter configuration.
4. BJT in common collector configuration.
5. FET in common source configuration.

Two test works will be done during the course.

Requirements for obtaining credit points:
- Five laboratory works have to be carried out and assessed – 20%;
- Two tests done – 20%;
- Exam - 60%

Suggested titles:


Further reading:

Suggested Internet resources:
1. http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html