***Annex 1***

*Recommended template: “Course Description, Syllabus, Course Requirements”*

# course syllabus and course requirements 2022/2023 I.

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| --- | --- |
| Course title | Electronics 2. |
| **Course Code** | **IVB041AN** |
| **Hours/Week: le/pr/lab**  | **2/0/2** |
| **Credits** | **4** |
| **Degree Programme** | **Electrical Engineering BSc 3. s.** |
| **Study Mode (TVSZ-ben training schedule)** | **living education** |
| **Requirements** | **midsemester grade** |
| **Teaching Period** | **autumn** |
| **Prerequisites** | **Electronics 1.** |
| **Department(s)****Course Director** | **Department of Automation****Dr. Viktor Bagdán** |
| **Teaching Staff** |  |
| **Hours/Week: le/pr/lab**  |  |
|  |  |

# course description

*A short description of the course (max. 10 sentences).*

*Neptun: Instruction/Subjects/Subject Details/Basic data/Subject description*

The aim of this course is to provide an introduction to the fundamentals of analogue electronics, and base knowledge of digital electronics. The course is a continuation of Electronics 1.

# syllabus

*Neptun: Instruction/Subjects/Subject Details/Syllabus*

## **goals and objectives**

*Goals, student learning outcome.*

*Neptun: Instruction/Subjects/Subject Details/Syllabus/Goal of Instruction (ez szerepel a neptunban)*

SEMICONDUCTORS:

Diodes: Diodes, Silicon Rectifiers, Schottky Diodes, Small Signal Diodes, Zener Diodes, LEDs, Laser Diodes, Photodiodes, Testing Diodes

Bipolar Junction Transistors: Bipolar Junction Transistors, Making Transistors, How a BJT Works, BJT Video, Current Gain, Transistor Connections

Field Effect Transistors: Junction Field Effect Transistors, How a JFET Works, Enhancement MOSFET, Depletion MOSFET, Power MOSFETs, MOSFET Switches

Opto-Coupled Devices: Opto-Coupled Devices, Opto coupler Operation, Using Optocouplers, Audio Optocouplers, Opto Switches, Opto Triacs & Solid State Relays

Thyristors,Triacs & Diacs: Thyristors (SCRs), SCRs in DC Circuits, SCRs in AC Circuits, Triacs & Diacs, Triac Circuits, Thyristor Protection, Opto Triacs & Solid State Relays

Transistor Faults: Why Transistors Fail, Meters for Transistor Testing, Testing Transistors

AMPLIFIERS:

Amplifier Basics, Class A Amplifier Design, Multistage Amps & NFB, Amplifier Circuits, Power Amplifiers, Operational Amplifiers

OSCILLATORS:

Oscillator Basics, RF Sine Wave Oscillators, AF Sine Wave Oscillators, CR Relaxation Oscillators

POWER SUPPLIES:

Power Supply Basics, Regulated Power Supplies, Switched Mode Power Supplies

## **course content**

*Neptun: Instruction/Subjects/Subject Details/Syllabus/Subject content*

|  |  |
| --- | --- |
|  | TOPICS |
| LECTURE | 1. *Bipolar Junction Transistors: Bipolar Junction Transistors, Making Transistors, How a BJT Works, BJT Video*
2. *Current Gain, Transistor Connections, Field Effect Transistors: Junction Field Effect Transistors, How a JFET Works, Enhancement MOSFET*
3. *Depletion MOSFET, Power MOSFETs, MOSFET Switches, Opto-Coupled Devices: Opto-Coupled Devices, Opto coupler Operation*
4. *Using Optocouplers, Audio Optocouplers, Opto Switches, Opto Triacs & Solid State Relays, Thyristors,Triacs & Diacs: Thyristors (SCRs), SCRs in DC Circuits*
5. *SCRs in AC Circuits, Triacs & Diacs, Triac Circuits, Thyristor Protection, Opto Triacs & Solid State Relays*
6. *Transistor Faults: Why Transistors Fail, Meters for Transistor Testing, Testing Transistors*
7. *AMPLIFIERS: Amplifier Basics, Class A Amplifier Design, Multistage Amps & NFB*
8. *Amplifier Circuits, Power Amplifiers, Operational Amplifiers, OSCILLATORS: Oscillator Basics, RF Sine Wave Oscillators, AF Sine Wave Oscillators, CR Relaxation Oscillators*
9. *POWER SUPPLIES: Power Supply Basics, Regulated Power Supplies, Switched Mode Power Supplies*
 |
| PRACTICE | 1. *topic*
2. *topic*
3. *topic*
4. *etc.*
 |
| laboratory practice | 1. *Breadboard*
2. *Transistor as current generator*
3. *BJT Astable multivibrator*
4. *OpAmp astable multivibrator*
5. *Opamp applications*
6. *Regulated power supply with BJT*
7. *Counter circuit with display*
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### **DETAILED SYLLABUS AND COURSE SCHEDULE**

### *academic holidays included*

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| LECTURE  |
| week | **Topic** | **Compulsory reading; page number****(from … to …)** | **Required tasks (assignments, tests, etc.)** | **Completion date, due date** |
| 1. | Course description, goals and objectives | … | … | … |
| 2. | Bipolar Junction Transistors: Bipolar Junction Transistors, Making Transistors, How a BJT Works, BJT Video | <https://learnabout-electronics.org/Semiconductors/bjt_01.php> to <https://learnabout-electronics.org/Semiconductors/bjt_04.php> | learn, solve quiz questions | 3rd week |
| 3. | Current Gain, Transistor Connections, Field Effect Transistors: Junction Field Effect Transistors, How a JFET Works | <https://learnabout-electronics.org/Semiconductors/bjt_05.php> to <https://learnabout-electronics.org/Semiconductors/fet_02a.php> | learn, solve quiz questions | 4th week |
| 4. | Enhancement MOSFETDepletion MOSFET, Power MOSFETs, MOSFET Switches | <https://learnabout-electronics.org/Semiconductors/fet_03a.php> to <https://learnabout-electronics.org/Semiconductors/fet_06a.php> | learn, solve quiz questions | 5th week |
| 5. | Opto-Coupled Devices: Opto-Coupled Devices, Opto coupler Operation | <https://learnabout-electronics.org/Semiconductors/opto_50.php> to <https://learnabout-electronics.org/Semiconductors/opto_51.php> | learn, solve quiz questions | 6th week |
| 6. | Using Optocouplers, Audio Optocouplers, Opto Switches, Opto Triacs & Solid State Relays | <https://learnabout-electronics.org/Semiconductors/opto_52.php> to [https://learnabout-electronics.org/Semiconductors/opto\_55.phpű](https://learnabout-electronics.org/Semiconductors/opto_55.php%C5%B1) | learn, solve quiz questions | 7th week |
| 7. | First midterm test |  |  |  |
| 8. | Thyristors,Triacs & Diacs: Thyristors (SCRs), SCRs in DC CircuitsSCRs in AC Circuits | <https://learnabout-electronics.org/Semiconductors/thyristors_60.php> to <https://learnabout-electronics.org/Semiconductors/thyristors_62.php> | learn, solve quiz questions | 9th week |
| 9. | Transistor Faults: Why Transistors Fail, Meters for Transistor Testing, Testing TransistorsAMPLIFIERS: Amplifier Basics | <https://learnabout-electronics.org/Semiconductors/transistor_faults_01.php> to <https://learnabout-electronics.org/Amplifiers/amplifiers14.php> | learn, solve quiz questions | 10th week |
| 10. | Class A Amplifier Design, Multistage Amps & NFB | <https://learnabout-electronics.org/Amplifiers/amplifiers20.php> to <https://learnabout-electronics.org/Amplifiers/amplifiers34.php> | learn, solve quiz questions | 11th week |
| 11. | Amplifier Circuits, Power Amplifiers, Operational Amplifiers | <https://learnabout-electronics.org/Amplifiers/amplifiers40.php> to <https://learnabout-electronics.org/Amplifiers/amplifiers60.php> | learn, solve quiz questions | 12th week |
| 12. | OSCILLATORS: Oscillator Basics, RF Sine Wave Oscillators, AF Sine Wave Oscillators, CR Relaxation Oscillators | <https://learnabout-electronics.org/Oscillators/osc10.php> to <https://learnabout-electronics.org/Oscillators/osc46.php> | learn, solve quiz questions | 13th week |
| 13. | POWER SUPPLIES: Power Supply Basics, Regulated Power Supplies, Switched Mode Power Supplies | <https://learnabout-electronics.org/PSU/psu10.php> to <https://learnabout-electronics.org/PSU/psu34.php> | learn, solve quiz questions | 14th week |
| 14. | Second midterm test |  |  |  |
| 15. | Retake of midterm tests |  |  |  |

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| PRACTICE, LABORATORY PRACTICE |
| week | **Topic** | **Compulsory reading; page number****(from … to …)** | **Required tasks (assignments, tests, etc.)** | **Completion date, due date** |
| 1. | Course description, goals and objectives, breadboard | Electronics 2 LAB 01 breadboard.pptx | learn | 2nd week |
| 2. | Breadboard | Electronics 2 LAB 01 breadboard.pptx | learn, test | 3rd week |
| 3. | Transistor as current generator | Electronics 2 LAB 02 transistor as current generator.pptx | learn, test | 5th week |
| 4. | Transistor as current generator | Electronics 2 LAB 02 transistor as current generator.pptx | learn, test | 5th week |
| 5. | BJT Astable multivibrator | Electronics 2 LAB 03 astable multivibrator\_v1\_2.pptx | learn, test | 6th week |
| 6. | OpAmp astable multivibrator | Electronics 2 LAB 04 opamp astable.pptx | learn, test | 7th week |
| 7. | First midterm test |  |  |  |
| 8. | Opamp applications | Electronics 2 LAB 05.pptx | learn, test | 9th week |
| 9. | Opamp applications | Electronics 2 LAB 05.pptx | learn, test | 9th week |
| 10. | Regulated power supply with BJT | Electronics 2 LAB 07.pptx | learn, test | 11th week |
| 11. | Regulated power supply with BJT | Electronics 2 LAB 07.pptx | learn, test | 11th week |
| 12. | Counter circuit with display | Electronics 2 LAB 10.pptx | learn, test | 13th week |
| 13. | Counter circuit with display | Electronics 2 LAB 10.pptx | learn, test | 13th week |
| 14. | Second midterm test |  |  |  |
| 15. | Retake of midterm tests |  |  |  |

## **assessment and evaluation**

*(Neptun: Instruction/Subjects/Subject Details/Syllabus/Examination and Evaluation System) így szerepel a neptunban*

##### **Attendance**

*In accordance with the Code of Studies and Examinations of the University of Pécs, Article 45 (2) and Annex 9. (Article 3) a student may be refused a grade or qualification in the given full-time course if the number of class absences exceeds 30% of the contact hours stipulated in the course description.*

***Method for monitoring attendance*** *(e.g.: attendance sheet / online test/ register, etc.)*

attendance sheet

##### **assessment**

*Cells of the appropriate type of requirement is to be filled out (course-units resulting in mid-term grade or examination). Cells of the other type can be deleted.*

Course resulting in mid-term grade (PTE TVSz 40§(3))

**Mid-term assessments, performance evaluation and their ratio in the final grade** (The samples in the table to be deleted.)

|  |  |  |
| --- | --- | --- |
| **Type** | **Assessment** | **Ratio in the final grade** |
| *Lecture midterm test 1* | *max 30 points* | *25 %* |
| *Lecture midterm test 2* | *max 30 points* | *25 %* |
| *Laboratory midterm test 1* | *max 30 points* | *25 %* |
| *Laboratory midterm test 2* | *max 30 points* | *25 %* |

**Opportunity and procedure for re-takes** (PTE TVSz 47§(4))

*The specific regulations for improving grades and resitting tests must be read and applied according to the general Code of Studies and Examinations. E.g.: all tests and assessment tasks can be repeated/improved at least once every semester, and the tests and home assignments can be repeated/improved at least once in the first two weeks of the examination period.*

Opportunity for retakes: 8th week (first tests), 15th week (second tests)

**Grade calculation as a percentage**

based on the aggregate performance according to the following table

|  |  |
| --- | --- |
| **Course grade** | **Performance in %**  |
| excellent (5) | 85 % … |
| good (4) | 70 % ... 85 % |
| satisfactory (3) | 55 % ... 70 % |
| pass (2) | 40 % ... 55 % |
| fail (1) | below 40 %  |

The lower limit given at each grade belongs to that grade.

## **Specified literature**

*In order of relevance. (In Neptun ES: Instruction/Subject/Subject details/Syllabus/Literature)*

##### **compulsory reading and availability**

1. Learnabout Electronics, https://learnabout-electronics.org

##### **recommended literature and availability**

2. Tony R. Kuphaldt: Lessons In Electric Circuits, Volume II – AC, 2007

3. Tony R. Kuphaldt: Lessons In Electric Circuits, Volume III – Semiconductors, 2009

4. U. Tiecze, Ch. Schenk: Analogue and digital electronic circuits, Springer, 2008, ISBN: 3540004297

5. Horowitz, Hill W: The Art of Electronics, Cambridge University Press, 1989, ISBN: 0521370957

6. Ian R. Sinclair, John Dunton: Practical Electronics Handbook, Elsevier, 2007

7. Ron Mancini (Ed): Op Amps for Everyone, Texas Instruments, 2002

8. B Carter, TR Brown: Handbook of Operational Amplifier Applications, TI, 2001