

Electronics laboratory

Teacher:

Tomislav Jurkić

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Office: S-05 (ground floor)

Location and time

Time: Tuesday from 9:00 am

Location: lab 123 (tower, 1st floor)

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Student's responsibilities

1. Regular attendance: it is allowed to be absent 2 times at most
2. Prepare yourself in advance for experiment and plan the measurements, get acquainted with theoretical background of the experiment and relevant physics (oral examination)
3. Regularly hand over the assignment reports, including data analysis and interpretation

Grades

- Oral exams 50 credits
- Assignment reports 50 credits

TOTAL

100 credits

Required minimum:

50 credits and all assignments passed, including reports for each of 8 assignments

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Oral exam

- Before and during assignments (exercises), student will be tested
- Exam include: theoretical knowledge of physics background and relevant physical phenomena, planning of the experiment and measurements, data analysis and interpretation, handling and knowledge of instruments and measuring methods
- If student does not pass the exam, he cannot continue with the assignment

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Oral exam

Grading is from 1 to 5:

1 – minimum requirements are not met, student cannot continue with the assignment

2 – minimum requirements are met

3 – good, but with noticeable faults

4 – average, with few faults

5 – above average, exceptional response

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Oral exam

- Number of credits is finally calculated by multiplying sum of all the grades for eight oral exams with 1.25

Assignment reports

- After the lab and after all the measurements have been obtained, student should analyse all acquired data
- Measurements should be analysed statistically and interpreted in written form as a lab report, for each assignment (exercise) separately
- If report does not meet minimum requirements, all measurements and assignment should be repeated
- The following is assessed: statistical data analysis, presentation of measurements (diagrams), interpretation of measurements and their relevance with the tested physical phenomena, conclusion drawn from measurements.

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Assignment report

- Report is assessed with grades from 1 to 5 (same as oral exam)
- Report from each assignment can be handed over **2 weeks at most** after the assignment (exercise)
- If report is handed over after 2 weeks, grade is lowered for one point for each extra delayed week
- Deadline for handing over the report: **6 weeks** after the assignment (exercise), but not later than **12th February 2019**.

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Final exam

- There is no final exam, all grades are given during the semester

Assignments (exercises)

1. Passive electronic filters
2. Characteristics of semiconductor diode and PN junction
3. Voltage rectifier and application of semiconductor diode
4. Characteristics of bipolar transistor
5. Low-signal transistor amplifier
6. Operational amplifier
7. Active electronic filters
8. Digital circuits

Literature

1. Instructions for assignments (exercises) can be found on web pages:
<http://www.phy.uniri.hr/hr/nastava/stranice-kolegija/469-praktikum-iz-elektronike-5-ects.html>
2. D.L. Eggleston: Basic electronics for scientists and engineers, Cambridge University Press, 2011.

Literature

Web page:

<http://www.phy.uniri.hr/hr/nastava/stranice-kolegija/469-praktikum-iz-elektronike-5-ects.html>

Instructions for lab assignment report

1. Abstract
2. Introduction
3. Objectives
4. Experimental setup and measurements methods
5. Results and discussion
6. Conclusion
7. References

Abstract

- Around 10 sentences
- Not longer than 1/5 A4 page

Instructions for lab assignment report

Introduction

- Short theoretical introduction
- Don't copy the book or instructions!

Objectives

- Overview of objectives and assignments

Instructions for lab assignment report

Experimental setup and measurement methods

- Description of measuring instruments, circuit schemes, description of measurement method and/or technique
- Discuss precision of instruments and measurements, describe and determine measurement error and/or uncertainty

Instructions for lab assignment report

Results and discussion

- Describe shortly what was measured and what setup was used
- **All results and measurements must be show with uncertainty/measurement error!**
- Use least square method whenever possible
- **Discuss obtained results and uncertainties**
- Compare obtained results with expected or theoretical value if possible, and discuss the difference

Instructions for lab assignment report

Results and discussion

- Use 3σ uncertainty intervals for comparison with expected values
- **Discuss and explain all shown diagrams**

Conclusion

- Overview of all final results and their general interpretation and significance in relation to the studied physical phenomena

Statistical data analysis

Least square method

- Use linearization of non-linear functions (dependencies)
- Determine uncertainties of coefficients in linear regression by LSM
- Pay attention to the value you measure ($y=f(x)$) and adjust (x)

Statistical data analysis

Direct measurements

- Average value and standard deviation of average value (measurement uncertainty)
- Maximal error
- Estimated uncertainty
- Presentation of results and measurements

Statistical data analysis

Indirect measurements

Consistent measurements

- All deviations of every measured value from the mean value are of the order of uncertainties of individual measurements

Statistical data analysis

Non-consistent measurements

- Deviations of measured values from the mean value are larger than uncertainties of individual measurements
- Uncertainties of individual measurements are disregarded and uncertainty of mean is used