

SYLLABUS
LOGIC IN COMPUTER SCIENCE
COMPUTER SCIENCE BSC
2017/2018 academic year, semester 1

Basic data

Course codes: INBPA0101E, INBPA0101G
Subject title: Logic in computer science
Semester: 1
Type: Lecture + seminar (2+2/week)
Credit: 6
Assessment: Exam
Lecturer: Tamás Mihálydeák

Topics for each week

1. Introduction examples. Exploring the logical structure of statements. Formalization in propositional logic.
2. The language of propositional logic, its alphabet. Inductive definition of propositional formulas. The basic element of syntax: degree, (immediate) subformula, precedence of connectives, scope of connectives in a formula.
3. Unary and binary logical operations, truth table. Concepts of semantics: interpretation, truth valuation in interpretations.
4. Satisfiability and validity. Equivalent formulas.
5. Consequences in propositional logic. Natural language reasoning.
6. First-order logic languages. Examples. Inductive definition of terms and formulas. Syntax and semantics. Formalization in first-order logic.
7. Free and bound occurrence of variables. Renaming bound variables, congruent formulas.
8. Interpretations, variable assignment. Term and formula valuation.
9. Satisfiable and valid first-order formulas and the contradiction.
10. Equivalent first-order formulas.
11. Conjunctive and disjunctive normal forms. Prenex form.
12. First-order consequences. Checking the correctness of reasoning.
13. Logical calculus (e.g. sequent calculus), soundness and completeness. Derivations in calculus.
14. First-order logic languages and the programming languages: parallelism, applications, outlook.

Compulsory/recommended readings:

- Mordechai Ben-Ari: *Mathematical Logic for Computer Science*, 3rd ed., Springer, 2012. ISBN 978-1-4471-4128-0.
- Michael Huth, Mark Ryan: *Logic in Computer Science*, Cambridge University Press, 2002. ISBN 0-521-54310-X.

Requirements:

Seminars (practical part)

The signature proves that the student successfully fulfills both requirements, listed below:

1. ATTENDANCE. The student has to participate in the lectures and seminars weekly. No more than **3 absences are allowed**.
2. TESTS. There will be **10 tests** in the seminars during the semester. Each one takes at most 15 minutes at the beginning of the seminars. The first test will take place in the week beginning with September 25. **At least 70%** of the sum of the possible maximum points of each test must be achieved in total. The tests contain questions about definitions and practical exercises.

If one cannot achieve 70% in total, it is permitted to retake the tests in the last week of the seminar period or in the 2nd week of the examination period. The retake test takes 120 minutes, and the pass rate is also 70%.

The test results can be followed in the NEPTUN system. Signature is received only if the student passes both of the above requirements.

Lectures (theoretical part)

Conditions of taking the exam: receiving practice signature. The exam consists of both a theoretical and a practical part and contains questions for 100 points.

Points reached	Grade
86 – 100	Excellent, Very good
71 – 85	Good
61 – 70	Satisfactory, Acceptable
51 – 60	Pass
0 – 50	Fail