COURSE DESCRIPTION CARD - SYLLABUS

Course name
Introduction to logic and set theory [S1MNT1>WdLiTM]

Course

Field of study
Mathematics of Modern Technologies

Year/Semester
1/1

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

3,00

Coordinators

dr Lidia Typańska-Czajka
lidia.typanska-czajka@put.poznan.pl

Lecturers

Prerequisites

Basic mathematical knowledge from secondary school

Course objective

The aim of this course is to acquaint students with basic topics of mathematical logic and set theory.

Course-related learning outcomes

Knowledge:
• studentknowsthelawsofpropositionalcalkulusandthelawsofpredicatecalculus[K_W01(P6S_WG)];
• student knows the principle of mathematical logic and other methods of proving theorems i.e.: indirect proof, proof by contrapositive [K_W01(P6S_WG)];
• student knows the concept of relation and the basic types of relations [K_W01(P6S_WG)].

Skills:
• student has the ability to understand the structure of mathematical theories [K_U01(P6S_UW)];
• student has the ability to perform correctly logical reasoning [K_U01(P6S_UW)];
• student has the ability to use logical formalism to describe, built and analyse the models in engineering

sciences [K_U02(P6S_UW)].

Social competences:
• student understands the need of systematic learning and developing of skills [K_K01(P6S_KK)].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures: written exam; pass treshold 50% of points;
Tutorials: two tests (2 x 50 points, in the middle and at the end of the semester), additional points for activity; pass treshold: 50 points.

Programme content

Propositional calculus
Predicate calculus
Set theory
Mathematical induction and methods of proving theorems
Relations

Course topics

Lectures:
Propositional calculus (propostion, truth value, logical operators, converse, contrapositive, logical equivalences, disjunctive normal form, conjunctive normal form, tautologies, rules of inference, application examples).
Predicate calculus (predicate, n-ary predicate, universal quantifier, existential quantifier, truth value of quantified statements, negation of quantification, boud and free variables, scope of the quantifier, quantifier laws, rules of inference, application examples).
Mathematical induction. Proofs (direct proof, proof by contradiction, proof by contrapositive, proof by cases).
Set theory (union, internection, complement, difference, simmetric difference, laws of set theory, Venn diagram, Cartesian product, n-fold Cartesian product, indexed family of sets, finite sets, infinite sets, cardinality, equipotent sets, countable/uncoutable sets).
Relations (reflexive, symmetric, antisymmetric, transitive, equivalence relation, equivalence classes).

Tutorials:
Propositional calculus (determining the logical value of proposition, writing propositions using logical connectives, writing the converse and the contrapositive of the sentence, showing that the statement is a tautology, simplifying propostions, converting statements to conjunctive/disjunctive normal form, applying propositional laws to the list of premises, giving counterexamples)
Predicate calculus (determining the logical value of formulas containing quantifiers, expressing statements using quantifiers, logical connectives and predicates, showing the logical equivalency between statements, writitng the negation of the sentence, proving the laws of predicate calculus)
Proofs (proving theorems using: proof by induction, direct proof, proof by contradiction, proof by contrapositive, proof by cases)
Set theory (proving the laws of set theory, drawing Venn diagrams, giving conterexamples, proving the inclusion of sets, showing that the sets are equipotent)
Relations (examples, properties of relations, equivalence relations, identification of equivalence classes)

Teaching methods

Lectures: traditional lecture on the board or multimedia presentation;
Tutorials: solving examples, discussions.

Bibliography

Basic:
• J. Słupecki, K. Hałkowska, K. Piróg-Rzepecka; Logika matematyczna;
• H. Rasiowa; Wstęp do matematyki współczesnej.

Additional:

• R. Murawski, K. Świrydowicz; Podstawy logiki i teorii mnogości.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	32	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	43	1,50