

WROCLAW UNIVERSITY OF TECHNOLOGY – PHD STUDIES

FACULTY OF PURE AND APPLIED MATHEMATICS
SUBJECT CARD
Course name in Polish: Algebra Abstrakcyjna
Course name in English: Abstract Algebra
Course language: English
University-wide general course type: 1) basic course (mathematics, physics, chemistry, other) 2) humanity course 3) managerial skills 4) English language 5) other modern language Departmental course developing professional skills: 1) <u>specialized course</u> 2) interdisciplinary course 3) seminar (interdisciplinary, specialized, departmental)
Type of course (obligatory, <u>optional</u>)
Educational effects according to ZW 26/2017 regulations: P8S_WG, P8S_UW, P8S_KK, P8S_KR
Subject code: MAT1312

*delete as applicable

	Lecture
Number of hours of organized classes in University (ZZU)	30
Number of hours of total student workload (CNPS)	90
Form of crediting	Exam
Number of ECTS points	3
including number of ECTS points for practical (P) classes	
including number of ECTS points for direct teacher-student contact (BK) classes	2

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of basic notions in linear algebra and group theory.
2. Competence in reaching complementary areas of expertise.

SUBJECT OBJECTIVES

C1	The student will learn selected results on abstract algebra.
C2	The student will acquire the ability to use methods of abstract algebra.
C3	The student will acquire the skills of oral and written presentation of results of scientific work in a form accessible for non-specialists in the field related to the present issue

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SUBJECT EDUCATIONAL EFFECTS

Relating to knowledge:

PEK_W01 – Student has knowledge of methods of abstract algebra.

PEK_W02 – Student knows applications of abstract algebra.

Relating to skills:

PEK_U01 – Student gains skills needed to perform his/her research.

PEK_U02 – Student is able to conduct his/her research.

Relating to social competences:

PEK_K01 – Student is aware of the role of cooperation, including an international cooperation.

PEK_K02 – Student is aware of the importance of the original research activity.

PROGRAM CONTENTS

PROGRAM CONTENTS		
Form of classes – lecture		Number of hours
Lec 1	Z-modules.	2
Lec 2	Classes of algebras defined by identities.	2
Lec 3	Congruences. Quotient algebras.	2
Lec 4	Free algebras.	2
Lec5	Retracts and reducts of algebras. Clones of operations.	2
Lec6	Algebras derived from groups and semigroups.	2
Lec7	Representations of algebras. Rebane Theorem.	2
Lec8	Elements of lattice theory.	2
Lec9	Generalizations of groups. Semigroups of operators.	2
Lec10	Hosszu-Gluskin Theorem.	2
Lec11	Classes of quasigroups and algebraic loops.	2
Lec12	Latin squares and their applications.	2
Lec13	Isotopies, antiisotopies and parastrophes of quasigroups.	2
Lec14	Indicators.	2
Lec15	Fuzzy sets and intuitionistic fuzzy sets.	2
Total hours		30

TEACHING TOOLS USED

N1	lecture
N2	consultations
N3	written assignments: problem solutions

EVALUATION OF ACHIEVED SUBJECT EDUCATIONAL EFFECTS

Evaluation:	Educational effect number	Way of evaluating achievement of educational effects
F – forming (partial)		
C – concluding		

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F1	PEK_W01, PEK_W02	participation in the course
F2	PEK_W01, PEK_W02, PEK_U01, PEK_U02, PEK_K01, PEK_K02	solutions of the problems
$C = 0.5 \cdot F1 + 0.5 \cdot F2$		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] P. M.Cohn, Universal algebra, Dordrecht, 1981.
- [2] G. Gratzner, General lattice theory, Basel, 1998.
- [3] D. Keedwell, J. Denes, Latin squares and their applications, Elsevier, 2015.
- [4] V. Shcherbacov, Elements of quasigroup theory and applications, Chapman & Hall, 2017.
- [5] A. Walendziak, Podstawy algebry ogólnej i teorii krat, PWN, 2009.

SECONDARY LITERATURE:

- [1] I. Chajda, K. Głazek, A basic course on general algebra, Zielona Góra, 2000.
- [2] W.A. Dudek, V.S. Trokhimenko, Algebras of multiplace functions, De Gruyter, 2012
- [3] J. Gałaszka, Algebraiczne metody w matematyce dyskretnej, EXIT, Warszawa, 2011.
- [4] J. Mordeson, K.Bhutani, A. Rosenfeld, Fuzzy group theory, Springer, 2005.
- [5] J.D.H. Smith, Topics in advanced algebra, Warszawa, 2013.

SUBJECT SUPERVISOR

(NAME AND SURNAME, E-MAIL ADDRESS)

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS

FOR SUBJECT

ABSTRACT ALGEBRA

AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY

Doctoral studies at Faculty of Pure and Applied Mathematics

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)**	Subject objectives***	Programme content***	Teaching tool number***
(knowledge) PEK_W01	P8S_WG	C1, C2	Lec1-15	N1, N2, N3
PEK_W02	P8S_WG	C1, C2	Lec1-15	N1, N2, N3
(skills) PEK_U01	P8S_UW	C2	Lec1-15	N2, N3
PEK_U02	P8S_UW	C2, C3	Lec1-15	N2, N3
(competences) PEK_K01	P8S_KK	C3	Lec1-15	N2, N3
PEK_K02	P8S_KR	C3	Lec1-15	N2, N3

** - enter symbols for main-field-of-study/specialization educational effects

*** - from table above