## DESCRIPTION OF THE COURSE OF STUDY FOR EXCHANGE STUDENTS

| Name of the course in | English | Algebra and number theory |
| :---: | :---: | :---: |
|  | Polish | Algebra z teorią liczb |

## 1. LOCATION OF THE COURSE OF STUDY WITHIN THE SYSTEM OF STUDIES

| 1.1 Field of study | Mathematics |
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| 1.2 Level of study | Undergraduate (Bachelor) |

2. GENERAL CHARACTERISTICS OF THE COURSE OF STUDY

| 2.1 Language of instruction | English |
| :--- | :--- |
| 2.2 Semesters in which the course of study is offered | Spring |
| 2.3 ECTS credits | 7 |

3. DETAILED CHARACTERISTICS OF THE COURSE OF STUDY

| 3.1. Form of classes | Lecture, classes |
| :--- | :--- |
| 3.2. Form of assessment | Exam (lecture), assessment (classes) |

4. OBJECTIVES AND SYLLABUS CONTENT

### 4.1. Course objectives

C1. Introduction to basic knowledge of abstract algebra and number theory.
C2. Developing the ability to use basic notions and facts of group theory, ring theory, field theory and number theo-
ry.
C3. Making the habit of learning, improving one's own work technique.

### 4.2. Detailed syllabus

1. Category theory: category, isomorphisms, functors, natural transformation, product.
2. Groups, examples of groups, properties of the unity and of reverse elements.
3. Subgroups, normal subgroups, quotiens.
4. Cyclic groups, cyclic subgroups, order of elements.
5. Groups homomorphism, the first and the second theorems on homomorphism.
6. Commutative groups and product of groups.
7. Rings, subrings, zero divisors and reversible elements.
8. Homomorphisms of rings, ideals, quotient rings.
9. Fields, subfields, field characteristic.
10. Algebraically closed field, field of algebraic numbers, existence of transcendental numbers.
11. Rings of polinomials, degree of polinimials, division of polinomials with remainder.
12. Roots of polinimials, number of roots of polinomials.
13. Divisors of elements, reducible and irreducible elements, prime elements in rings.
14. Greatest common divisor of elements in rings, Euclidean algorithm.
15. Divisions in $\mathbf{Z}$, greatest common divisor of numbers, prime numbers and relatively prime numbers.
16. Congruences modulo $n$, properties of congruences, Chinese remainder theorem.
17. Euler function and Fermat's little theorem.
