

(faculty stamp)

COURSE DESCRIPTION

Z1-PU7

WYDANIE N1

Strona 1 z 3

| 1. Course title: INTRODUCTION TO MODULES AND CATEGORY THEORY | | 2. Course code | | |
|--|--|-----------------------|----------------------|----------------------------------|
| 3. Validity of course description: 2019/2020 | | | | |
| 4. Level of studies: 1 st cycle of higher education | | | | |
| 5. Mode of studies: intramural studies | | | | |
| 6. Field of study: MATHEMATICS | | | (FACULTY SYMBOL) RMS | |
| 7. Profile of studies: General | | | | |
| 8. Programme : All | | | | |
| 9. Semester: IV | | | | |
| 10. Faculty teaching the course: Institute of Mathematics | | | | |
| 11. Course instructor: dr Paweł Gładki | | | | |
| 12. Course classification: course of limited choice | | | | |
| 13. Course status: elective | | | | |
| 14. Language of instruction: English | | | | |
| 15. Pre-requisite qualifications: Intermediate level in English and standard course in abstract algebra | | | | |
| 16. Course objectives: To familiarize students with linear algebra over rings and use studied concepts to present basic notions in the category theory | | | | |
| 17. Description of learning outcomes: | | | | |
| Nr | Learning outcomes description | Method of assessment | Teaching methods | Learning outcomes reference code |
| 1. | Know basic definitions, theorems and examples of modules. Understand how they generalize familiar notions from linear algebra, abelian groups and ring theory. | Test, homework | Lectures, labs | K1A_W04 |
| 2. | Know basic definitions, theorems and examples of the category theory. Being able to recognize modules, abelian groups, vector spaces and rings as categories. | Test, homework | Lectures, labs | K1A_W05 |
| 3. | Know English language on the level making it possible to understand English-language textbooks | Test, homework | Lectures, labs | K1A_W10 |
| 4. | Being able to solve selected problems in algebra with the use of basic theorems in the category theory | Test, homework | Lectures, labs | K1A_U07 |
| 18. Teaching modes and hours | | | | |
| Lecture -30, Seminar -30 | | | | |
| 19. Syllabus description: | | | | |
| Lectures: | | | | |
| <ol style="list-style-type: none"> 1. Modules, submodules, submodules generated by sets. 2. Module homomorphisms, quotient modules, factorization theorem. 3. Exact sequences. 4. Products of groups. Products and coproducts of abelian groups. 5. Products and coproducts of modules. 6. Split exact sequences. 7. Free abelian groups. 8. Free modules. | | | | |

9. Projective modules.
10. Injective modules.
11. Hom functor and dualization
12. Introduction to category theory: products, coproducts, free objects.
13. Morphisms. Universal and couniversal objects, equalizers and coequalizers, kernels and cokernels.
14. Functors and natural transformations.
15. Adjoint functors.

Labs:

Topics to be covered during labs coincide with the lecture plan.

20. Examination: No

21. Primary sources:

1. T. Hungerford, Algebra, Springer, 1974
2. S. Mac Lane, Categories for the working mathematician, Springer, 1971

22. Secondary sources:

1. P. Aluffi, Algebra: Chapter 0, AMS, 2009

23. Total workload required to achieve learning outcomes

| Lp. | Teaching mode : | Contact hours / Student workload hours |
|-----|-----------------------|--|
| 1 | Lecture | 30/25 |
| 2 | Classes | 30/25 |
| 3 | Laboratory | / |
| 4 | Project | / |
| 5 | BA/ MA Seminar | / |
| 6 | Other | 20/20 |
| | Total number of hours | 80/70 |

24. Total hours:150

25. Number of ECTS credits: 5

26. Number of ECTS credits allocated for contact hours: 2.66

27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects):0

26. Comments: Final grade will be calculated based on tests, homeworks and class participation as follows:

1. Two 90 minutes tests, each with 30 points to the total of 60 points
2. Ten homework assignments, each worth 3 points to the total of 30 points.
3. Class participation worth maximum of 10 points.

0-59 points: 2.0

60-69 points: 3.0

70-74 points: 3.5

75-84 points: 4.0

85-89 points: 4.5

90-100 points: 5.0

Approved:

(date, Instructor's signature)

(date , the Director of the Faculty Unit signature)