27017 - Galois Theory

Información del Plan Docente

Academic Year	2016/17
Academic center	100 - Facultad de Ciencias
Degree	453 - Degree in Mathematics
ECTS	6.0
Course	3
Period	First semester
Subject Type	Compulsory
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

The problema of finding explicit expressions for the solutions of polynomial equations in terms of its coefficients in a way similar to the one used in basic algebra with the second degree equation attracted much effort from some of the best mathematicians during several centuries. After its solution for equations of degrees 3 and 4, the impossibility of a general solution started to be considered as a possibility. The solution of this problema gave rise in the hands of Evariste Galois to the theory that bears his name.

The solution of that problema was achieved by Galois through the study of some permutations of the roots of the polynomial, thus inaugurating ths theory of groups, and the important idea of studing mathematical objects throough its group of symmetries.

The aim of the curse is introducing the student to both the theory of (finite) groups, and the Galois' theory of fields.

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

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3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

There will be at least two written exams that will amount for a 90% of the final score. The remaining 10% will be obtained by evaluating the activity of the student during the class hours and proposed homework.

5.Activities and resources

5.1.General methodological presentation

The course will contain theoretical classes that will include examples and proposed exercises. The interaction between students and the teacher will be encouraged, so as to increase the students' capacity for abstract reasoning, and to improve their level of mathematical expression. In addition, some problems to be solved either individually or in small groupswill be proposedto the students, notwithstanding the fact that exams will be individual. Students will be attended by the teacher at the office hours.

5.2.Learning activities

During the lectures, the teacher will provide explanations on the subjects covered by the covered by the notes that will be available at the ADD. In addition, the solutions of the proposed problems, previously considered by the students either in their individual or collective work outside the class hours, will be discussed.

5.3.Program

- Groups: basic notions

- Groups of permutations

- Actions of groups

- Structure of finite groups

- Field extensions. Algebraic extensions

- Splitting extensions. Extensions of homomorphisms

- Normal extensions. The Galois group

- The Galois Theorem

- Solving equations by radicals

5.4.Planning and scheduling

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Four weekly lecture hours. Theoretical and practical parts will not be separated in advance. Some problems will be proposed to be solved in groups by the students which will have the opportunity of asking doubts during the office hours of attention to students. Those exercises will be similar to the ones that will be asked in the exams.

Office hours: they will be announced at the beginning of the course. After request, the students have also the option of meeting the teacher at times different from the ones scheduled to that purpose.
Please contact the teacher through e-mail for any further request or question.

5.5.Bibliography and recomended resources

Galois Theory textbooks

1.- J. Gaal, Classical Galois Theory. Chelsea Publishing Company, New York,

1971.

2.- P. M. J. McCarthy, Algebraic extensions of fields, Dover Publ. Inc., New

York, 1991

3.- G. Navarro, Un curso de álgebra. Publicaciones de la Universidad de Valencia, 2002

4.- P. Ribemboim, L'Arithmétique des corps, Hermann, Paris, 1972.

5.- J. Rotman, Galois Theory, Springer Verlag, New York, 1990.

6.- I. Stewart, Galois theory, Chapman and Hall, London, 1973.

General algebra textbooks

1.- N. Bourbaki, Elements of Mathematics, Algebra II. Springer Verlag, New

York, 1990.

1.- P. M. Cohn, Algebra, vols. 1 and 2, J. Wiley & sons, Chichester, 1989.

2.- T. W. Hungerford, Algebra Springer-Verlag, New York, 1974.

1.- N. Jacobson, Basic algebra, vols. I and II, Freeman and Co., San Francisco,

1985.

Additional reading

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1.- E. Artin, Galois theory, University of Notre Dame Press, London, 1985.

2.- E. Galois, Oeuvres Mathématiques. Publiées en 1846 dans le Journal de

Liouville, Editions Jacques Gabay, Paris, 1989.