MATH 424

GALOIS THEORY OF COVERINGS AND LINEAR DIFFERENTIAL EQUATIONS

METU Credit & ECTS Credit: (3-0) 3 and 6.0

Prerequisites: Math 262, Math 349, Math 254 or Math 219, or Consent of the Instructor.

Instructor: Yıldray Ozan, M-217

Schedule: Monday 10:40-12:30 and Wednesday 09:40-10:30 as online Zoom Lecture. Recorded lectures will be posted on the internet.

Web Site: http://www.metu.edu.tr/~ozan

Office Hours: Wednesday between 12:40-13:30 via Zoom or by appointment.

Textbook: Galois' dream by Michio Kuga. A more advanced textbook on the subject is the book Introduction to Differential Galois Theory by J. Sauloy (Lecture Notes, available on the internet.)

Exams and Grading: There will be 2 midterm exams and a final exam. Each midterm exam will worth 35% and the final exam will worth 30% of the total grade. The midterms will be written exams, whereas the final exam will be an oral exam covering all the topics. Throughout the semester I will prepare several problems, mostly theoretical. The oral exam content will be from these problems and written exams questions.

Exam Dates: Midterm 1: April 26, 2021, Monday at 17:40.

Midterm 2: June 7, 2021, Monday at 17:40.

Tentative Weekly Syllabus:

1) Topological spaces and free groups
2) Fundamental groups of surfaces
3) Fundamental groups
4) Examples of fundamental groups
5) Coverings
6) Covering of surfaces and fundamental groups
7) Covering of surfaces and fundamental groups continued
8) The Group of covering transformations
9) The universal covering space
10) The correspondence between subgroups of the fundamental group and covering spaces (Galois Correspondence)
11) Continuous functions and function theory on covering surfaces
12) Differential Equations and elementary methods of solving differential equations
13) Regular Singularities
14) Differential equations of Fuchsian type