האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

The Hebrew University of Jerusalem

Syllabus

Topological methods in free groups - 80605

Last update 18-09-2017

HU Credits: *2*

Degree/Cycle: *2nd degree (Master)*

Responsible Department: *mathematics*

Academic year: *0*

Semester: *1st Semester*

Teaching Languages: *Hebrew*

Campus: *E. Safra*

Course/Module Coordinator: *Chloe Perin*

Coordinator Email: *perin@math.huji.ac.il*

Coordinator Office Hours:

Teaching Staff:

Dr. Chloe Perin

Course/Module description:

The course gives a description of some basic but powerful topological tools for the study of the free group, essentially Stallings foldings and Whitehead graphs. In the last section of the course, we will also discuss Culler and Vogtmann's outer space, which has proved essential in understanding the automorphism group of the free group.

Course/Module aims:

Learning outcomes - On successful completion of this module, students should be able to:

The student should be able to confidently manipulate Stalling's foldings and Whitehead graphs, and understand the basic topology and properties of Outer space.

Attendance requirements(%):

Teaching arrangement and method of instruction:

Course/Module Content:

Free groups as fundamental groups of graphs.
Immersions, coverings, foldings.
Howson's theorem (the intersection of finitely generated subgroups of a free group is free).
Marshall Hall theorem (a finitely generated subgroup of a free group and an element not in it can be separated by a finite index subgroup).
Whitehead graphs. Proof of Whitehead's algorithm (which determines whether a subset of elements of the free group can be extended to a basis).
Automorphism group of the free groups. Nielsen generators.
Fixed subgroup of an automorphism has finite rank.
Outer automorphisms group. Outer space - definition, topological properties
Consequences of the contractibility of Outer space
(Depending on progress) Lipschitz metrics, train tracks, and a word about classification of automorphisms of the free group.

Required Reading:
None.

Additional Reading Material:

Course/Module evaluation:
End of year written/oral examination 0 %
Presentation 0 %
Participation in Tutorials 0 %
Project work 0 %
Assignments 100 %
Reports 0 %
Research project 0 %
Quizzes 0 %
Other 0 %

Additional information: