

BRAIDS, CONFIGURATION SPACES AND KNOTS

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Description of the lectures

Lecture 1

1. Systems of n curves in three-dimensional space and braid groups.
2. Configuration spaces and braid groups.
3. Braid groups as automorphism groups of free groups.

Lecture 2

1. Definition and general properties of knots and links.
2. Digression: polyhedra and piecewise linear maps.
3. Knot equivalences. Knot diagrams.

Lecture 3

1. Algebraic properties of braids.
 - a) Word problem.
 - b) Conjugation problem. Work of Garside.
 - c) Ordering of braids. Work of Dehornoy.
2. Representations of braids.

Lecture 4

Invariants of knots and links.

- a) Linking number.
- b) Seifert surface and genus of a knot.
- c) Knot group.
- d) Alexander Polynomial.

Lecture 5

1. Connections between braids and knots.
 - a) Alexander Theorem.
 - b) Markov Theorem.
2. Jones polynomial and HOMFLY-PT polynomial.

REFERENCES

- [1] *G. Burde; H. Zieschang*, Knots. Second edition. de Gruyter Studies in Mathematics, 5. Walter de Gruyter & Co., Berlin, 2003. xii+559 pp.
- [2] *Ch. Kassel; V. Turaev*, Braid groups. With the graphical assistance of Olivier Dodane. Graduate Texts in Mathematics, 247. Springer, New York, 2008. xii+340 pp.
- [3] *V. V. Vershinin*, Braid groups, their Properties and Generalizations. Handbook of Algebra, vol. 4, Elzseier, Amsterdam a.o. 2006, p. 427-465.