

CIMPA-ICTP Research in Pairs 2022, Course Proposal

1 General Information

Name and address of the applicant:

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Title of Course:

Real and Complex Line Arrangements

Research Area:

Algebraic geometry#Algebraic topology#Combinatorics

MSC:

14N20# 52C30# 57R20

Keywords:

Line arrangements# Nets# Bounded negativity # Dirac-Motzkin conjecture

Number of hours: 8

2 Summary

The subject of line arrangements in the affine or projective plane is a fascinatingly rich topic, lying in the intersection of algebraic geometry, combinatorics and topology. In this course, we will focus on real and complex line arrangements, in particular problems related to their existence and various types of obstructions.

3 Lectures

- **Lecture 1:** Line arrangements in affine and projective planes over a field. Sylvester-Gallai theorem. De Bruijn-Erdős theorem. Melchior inequality. The Dirac-Motzkin

conjecture.

- **Lecture 2:** Results of Moser, Motzkin, Kelly-Moser and Csima-Sawyer towards the Dirac-Motzkin conjecture. Green-Tao theorem and the solution of the asymptotic version of the conjecture.
- **Lecture 3:** Special complex line arrangements due to Hesse, Klein and Wiman. Relation to complex reflection groups. Hirzebruch's inequality.
- **Lecture 4:** Nets, results of Libgober and Yuzvinsky. Obstruction to existence due to signature. The bounded negativity problem for algebraic surfaces.