

# Topology in Real Algebraic Geometry

## Syllabus

**Course description** This will be a broad introduction of INTERMEDIATE level to ALGEBRAIC GEOMETRY over the field of REAL numbers.

It is not incorrect to call this topology, because technically this is rather topology, than algebraic geometry. Real algebraic varieties are considered together with their complexifications, which are ambient complex algebraic varieties. In this environment, a real variety appears as the set of fixed point of an antiholomorphic involution. Therefore, the first layer of results belongs to the topology of involutions on manifolds, but the topology will be developed only as long as it helps to study algebraic varieties. They will be the main focus of the course.

It's a good time to enter to the real algebraic geometry - new directions have recently emerged (high dimensions and real algebraic knots).

The following topics are planned to be covered: topology of abstract curves, plane projective curves and restrictions on their topology, topological classification of nonsingular plane curves of low degrees, rigid isotopies, extra structures on the set of real points which come from the complexification, deformations of singularities, Vassiliev-Arnold invariants of plane rational curves, real toric surfaces, patchworking, tropical geometry and its real version, topological classification of non-singular surfaces of degree  $< 5$ , real K3 surfaces, real algebraic knots and their invariants. This list of topics is subject to change, depending on the interests of the audience.

This course may be interesting to students studying algebraic geometry and/or topology.

**Prerequisites:** basic algebraic topology (homology theory and duality). No background in algebraic geometry is required, but certainly may be useful.

**Professor:** Oleg Viro. E-mail: oleg AT stonybrook.edu

**Lectures:** Tuesday and Thursday 12:30pm - 1:50pm in Phy113.

### Student Accessibility Support Center (SASC) statement

If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Student Accessibility Support Center, Stony Brook Union Suite 107, (631) 632-6748 or at [sasc@Stonybrook.edu](mailto:sasc@Stonybrook.edu). They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential. Student Accessibility Support Center Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and SASC. For procedures and information go to the following website: Evacuation guide for people with physical disabilities.

### **Academic Integrity**

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instance of academic dishonesty to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at Academic Judiciary

### **Critical Incident Management**

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.