

**SELECTED TOPICS ON RIEMANNIAN GEOMETRY COURSE:
CURVATURE AND TOPOLOGY.**

LECTURER: RAFAEL TORRES

1. LOGISTICS:

- **Days/Time:** Tuesdays - Thursdays: 10 am - 12 pm.
- **Room:** See course webpage for details.
- **Grading:** Seminar on a topic and on a date to be chosen within the first two weeks.
- **E-mail:** rtorres@sissa.it
- **Office number:** 711 (Please do send me a line to double-check I'm available before dropping by).

2. SYLLABUS: A BLUEPRINT OF TOPICS TO BE COVERED

- (1) Surfaces as a motivation for the topics of the course.
 - (1.1) Constructions of surfaces.
 - (1.2) Topological classification.
 - (1.3) Uniformization of surfaces.
 - (1.4) Gauss-Bonnet theorem.
- (2) Review of some concepts.
 - (2.1) - (2.3) Sectional/Ricci/scalar curvature.
 - (2.4) Hierarchy of curvatures.
 - (2.5) Riemannian submanifolds: second fundamental form and mean curvature.
 - (2.6) Classification of simply connected 5-manifolds with torsion-free homology.
- (3) Nonpositive curvature
 - (3.1) Metrics of negative scalar and negative Ricci curvature.
 - (3.2) Nonpositive sectional curvature and asphericity.
- (4) Nonnegative sectional curvature
 - (4.1) Cheeger-Gromov's soul theorem
 - (4.2) Compact examples: some constructions and curvature formulas.
 - (4.3) Survey on structure theorems of nonnegatively curved manifolds
 - (4.2) Obstructions results to positive sectional curvature
 - (4.3) Positively curved examples.
- (5) Nonnegative and positive scalar curvature
 - (5.1) Constructions of manifolds of positive scalar curvature and prescribed fundamental group
 - (5.2) Deformations of metrics with lower curvature bounds
 - (5.3) Survey on obstructions to positive scalar curvature.