Math 80440 : Introduction to Contact Topology

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CLASS: MWF 11:30–12:20 in PASQ 116.

These days contact topology is quite a popular subject. It has roots in differential equations and optics, but today is fundamental to low dimensional topology and gives rise to interesting dynamical systems. This course will cover the basic notions and contact 3-manifolds in more detail. Time permitting we'll talk about some other developments such as contact nonsqueezing or Reeb dynamics.

SYLLABUS:
1. Introduction.
Contact structures, Legendrian curves, Gray's stability theorem. Relations to symplectic geometry, optics and differential equations.
2. Contact 3-manifolds.
Invariants of Legendrian curves, tight and overtwisted contact structures, classification theorems.
3. Other topics.

BOOKS:
The book by Geiges will be the basic reference for sections 1 and 2. The papers are possible references for section 3.

H. Geiges, An introduction to contact topology. Cambridge Studies in Advanced Mathematics, 109. Cambridge, 2008.
Y. Eliashberg, S. S. Kim, L. Polterovich, Geometry of contact transformations and domains: orderability versus squeezing, Geom. Topol. 10 (2006), 1635–1747.
S. Sandon, Contact homology, capacity and non-squeezing in $\mathbb{R}^{2n} \times S^1$ via generating functions. Ann. Inst. Fourier (Grenoble) 61 (2011), 145-185.
H. Hofer, Holomorphic curves and real three-dimensional dynamics, Geom. Funct. Anal. 2000, Special Volume, Part II, 674–704.

GRADING:
This will be based on class participation and occasional homework assignments.