

# Courses 2015-16

May 12 and 13, 2016, BCAM, 15:00 - 17:00h. May 16, 2016, BCAM, 9:30 - 11:30h.\*

BCAM Mazarredo 14, 48009 Bilbao, Basque Country, Spain

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## INTRODUCTION TO THE MATHEMATICAL THEORY OF THE NAVIER-STOKES EQUATIONS

- I. The Cauchy problem for the Navier-Stokes equations. Existence of solutions: mild solutions, weak Leray-Hopf solutions, strong solutions, Lemarie-Reissert solutions, other type of solutions.
- II. Regularity  $\mathcal{E}$ -theory: regularity, Caffarelli-Kohn-Nirenberg theorem, scale invariant quantities, type I blowups, Ladyzhenskaya-Prodi-Serrin condition,  $L_{3,\infty}$ -case, other scale invariant norms, ancient solutions and Liouville type theorems.
- III. Initial boundary value problems for the Navier-Stokes equations in half space. Local boundary regularity and bounded mild ancient solutions.

References:

- [1] Ladyzhenskaya, O. A. The mathematical theory of viscous incompressible flow. Second English edition, revised and enlarged. Translated from the Russian by Richard A. Silverman and John Chu. Mathematics and its Applications, Vol. 2 Gordon and Breach, Science Publishers, NewYork-London-Paris 1969 xviii+224 pp.
- [2] Lemarie-Rieusset, P. G., Recent developemnets in the Navier-Stokes problem, Chapman&Hall/CRC research notes in mathematics series, 431.
- [3] Seregin, G., Lecture notes on regularity theory for the Navier-Stokes equations. World Scientific Publishing Co. Pte. Ltd., Hackensack, NJ, 2015. x+258 pp. ISBN: 978-981-4623-40-71

\*(May 17 and 18, 2016, at UPV/EHU, Leioa, Basque Country, Spain 9:30 - 11:30h)