MATHEMATICS FOR LIFE SCIENCES

**AMMODIT**

HORIZON 2020

Final AMMODIT Conference

# "Mathematics for Life Sciences"

Book of Abstracts

March 18 – 22, 2019
Kyiv, Ukraine

**Information on the conference:** This is the final conference in the series of events to be organized in the framework of the Marie Curie RISE project "Approximation Methods for Molecular Modelling and Diagnosis Tools" (AMMODIT). The previous conferences were in Rivne (September 2015), Hasenwinkel (March 2016), Kyiv (January 2017) and Lviv (March 2018).

The conference is devoted to recent research in life sciences based on applications of mathematics to biological and medical studies. It is a multidisciplinary meeting forum for researchers who develop and apply mathematical and computational tools to the study of phenomena in the broad fields of biology, ecology, medicine, bioengineering, environmental science, etc.

### Organizers and Partners:

- Institute of Applied Mathematics and Mechanics of the National Academy of Sciences of Ukraine

- Institute of Mathematics of the National Academy of Sciences of Ukraine

- National Technical University of Ukraine "Kyiv Polytechnic Institute", Faculty of Applied Mathematics

- Österreichische Akademie der Wissenschaften, Johann Radon Institute for Computational and Applied Mathematics

- Politecnico di Milano, Biomechanics Research Group

- Universität zu Lübeck, Institut für Mathematik

- Humboldt Club Ukraine

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**Dates:** March 18 – 22, 2019.

**Location:** Institute of Mathematics NAS Ukraine, Kyiv, Ukraine.

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# Equations with $L^1$-right-hand sides
# in mechanics of fluids

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We consider the Dirichlet problem for nonlinear second-order elliptic equations with anisotropic and degenerate (with respect to the independent variables) coefficients and $L^1$-right-hand sides.

One of the applications of $L^1$-theory is to simulate two stationary turbulent fluids coupled by boundary conditions on the interface. The mathematical model is a nonlinear system of partial differential equations with unknown velocities of fluids, their pressures, and their turbulent kinetic energies. This system is motivated by the coupling of two

turbulent fluids, such as in the framework ocean/atmosphere or in the case of two layers of a stratified fluid (see [1]). Equation for turbulent kinetic energy has right-hand sides only belong to $L^1$. In this case, it is taken in the entropy concept (see [2]).

In [3, 4] we proved the theorems of existence a unique entropy solution for nonlinear elliptic degenerate anisotropic equations.

[1] C. Bernardi, T. Chacón Rebollo, R. Lewandowski, F. Murat *Studies in Mathematics and its Applications* **31**, (2002), p. 69–102.

[2] Ph. Bénilan, L. Boccardo, T. Gallouët, R. Gariepy, M. Pierre, J.L. Vazquez *Ann. Scuola Norm. Sup. Pisa Cl. Sci. (4)* **22**, (1995), No. 2, p. 241–273.

[3] Yu. Gorban *Open Math.* **15**, (2017), p. 768–786.

[4] Yu. Gorban, *Mat. Stud.* **47**, (2017), No. 1, p. 59–70.