Hydrodynamics equations in geophysical problems
- COURSE SYLLABUS

1.	**Course title:**	
	Hydrodynamics equations in geophysical problems.	
2.	**Lecturer:**	
	Prof. Grzegorz Łukaszewicz (MIMUW) and dr hab. Krzysztof Mizerski (IGF PAN)	
3.	**Field, type and level of studies, year of study:**	
	Theoretical fluid dynamics, all years	
4.	**Course character:**	
	monographic lecture	
5.	**Teaching method:**	
	Traditional – stationary, at the Faculty of Mathematics, Informatics and Mechanics UW, Banacha 2, Wednesdays: room 5450, 16:15-18:00 and Thursdays: room 5450, 10:15-12:00	
6.	**Language:**	*depending on the audience*
7.	**Course type and number of hours:**	
	lecture, 60h (30h G. Łukaszewicz and 30h K. Mizerski)	
8.	**Estimated load of student's independent work:**	*60h*
9.	**Total workload and number of ECTS points:**	*100 h, 6 ECTS*
10.	**Short description and main focus of the course:**	
	We shall consider hydrodynamics equations – equations of Navier-Stokes, Boussinesq and magnetohydrodynamics. We are interested in the analysis of solutions of these equations in the context of problems appearing in geophysics. In particular nonlinear problems and turbulence, also in the context of buoyancy driven flows will be considered.	
11.	**References:**	
	1. Ch. Doering, J. Gibbon, Applied Analysis of the Navier-Stokes Equations. (Cambridge Texts in Applied Mathematics), 2005. *2. C. Foias, O. Manley, R. Rosa, R. Temam, Navier-Stokes Equations and Turbulence, Cambridge University Press, 2001.* *3. P.Davidson, Turbulence. An Introduction for Scientists and Engineers, Oxford University Press, 2004.* *4. J. Pedlosky, Geophysical Fluid Dynamics, Springer-Verlag, New York, 1979.* *5. H. P. Greenspan, The Theory of Rotating Fluids, Cambridge University Press, New York, 1968.*	

12.	**Prerequisites:** *Good knowledge of mathematics, in particular the theory of differential equations is required.*	
13.	**Educational outcomes:**	**PQF level 8 codes:**
	Knowledge: *Student knows and understands:* - *the world's achievements relating to theoretical foundations, general and selected specific issues of geophysical fluid dynamics at a level enabling the revision of existing paradigms;* - *the main scientific developments in geophysical fluid dynamics;* - *the methodology of scientific research* - *rules for dissemination of scientific results*	*P8S_WG*
	Practical Skills: *Student is able to:* - *take advantage of the knowledge gained on the lecture to creatively identify, formulate and innovatively solve complex problems or perform research activities, in particular to define the aim and subject of the research, formulate a research hypothesis develop research methods, techniques and tools and use them creatively, draw conclusions on the basis of research results* - *perform critical analysis and evaluation of the results of scientific research;* - *transfer the results of research studies to the economic and social spheres*	*P8S_UW*
	Social Skills: *Student is ready to:* - *critically evaluate the achievements in the field of geophysical fluid dynamics;* - *critically evaluate one's contributions to the development of that field;* - *recognize the value of knowledge in solving cognitive and practical problems*	*P8S_KK*
14.	**Evaluation of the educational outcomes:** *oral exam and essay*	
15.	**Criteria to complete the course:** *final grade on the exam (depends on the evaluation of the essay)*	
16.	**Contact with the lecturer:** *kamiz@igf.edu.pl*	