Annex to the “visiting professors” programme

Proponent from WUT	
Title and degree	DSc PhD Eng
Name and surname	Agnieszka Dąbska
Faculty	Building Services, Hydro and Environmental Engineering
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The person proposed as a visiting professor	
Title and degree	Prof., Ing., CSc.
Name and surname	Jaromir Riha
Exact affiliation	Brno University of Technology, Faculty of Civil Engineering, Czech Republic
E-mail address	Jaromir.Riha@vutbr.cz
Description of achievements (1/2-1 page)	PUBLICATIONS: author or co-author of: - more than 70 professional and scientific papers in journals, 44 indexed in Scopus (h index = 12), 38 in WOS (h index = 10) - 26 monographs, textbooks and guidelines - more than 200 conference papers and contributions PROJECTS author or co-author of: - more than 150 research (basic and applied) reports - about 60 technical studies and designs EXPERT ASSESSMENTS author or co-author of: - more than 600 expert assessments - 51 forensic judgements MEMBERSHIPS - International Association for Hydro-Environment Engineering and Research (IAHR) - International Committee on Large Dams (ICOLD) - Czech Committee on Large Dams (ICOLD) FACULTY POSTS - member of scientific committee (since 2005) - member of curriculum committee (2004 - 2010) - member of faculty scientific board (2004 - 2008) - member of committee for Ph.D. (since 2002, in 2004-2014 chairperson) TEACHING (since 1987) - more 60 diploma graduates in BSc and MSc degrees - supervisor of 12 finished Ph.D. students

Code of the course	4606-VP-ES-00017	Name of the course	Polish	**Modelowanie matematyczne w hydrotechnice**
			English	**Mathematical modelling in hydraulic engineering**
Type of the course	Speciality subject			
Course coordinator	Prof. Jaromir Riha		Course teacher	Prof. Jaromir Riha
Implementing unit	Faculty of Building Services, Hydro and Environmental Engineering	Scientific discipline / disciplines*	Architecture and urban planning Civil engineering and transport Environmental engineering, mining and energy Mathematics	

Level of education	Doctoral School	Semester	Summer (online) 27-30.V.2025 and 3-6.VI.2025		
Language of the course	English				
Type of assessment	Pass or Fail	Number of hours in a semester	30	ECTS credits	2
Minimum number of participants	12	Maximum number of participants	100	Available for students (BSc, MSc)	Yes

Type of classes		Lecture	Auditory classes	Project classes	Laboratory	Seminar
Number of hours	in a week	-	-	-	-	-
	in a semester	30	-	-	-	-

* does not apply to the Researcher's Workshop

1. Prerequisites

1. Knowledge:
- in mathematics, hydraulics
- some knowledge in water management and continnum mechanics.
2. Skills:
- good command of English in speaking and understanding,
- use of computers, modelling.

2. Course objectives

1. Provide the students with the types of models in hydraulic engineering.
2. Introduce the philosophy of mathematical modelling.
3. Demonstrate various mathematical models.
4. Provide explanation of modelling domain, boundary and initial conditions.
5. Demonstrate practical examples of modelling.

3. Course content (separate for each type of classes)

Lecture

1. Introduction, definitons and terminology in modelling in water engineering.
2. Basics of open channel and floodplain modelling, 1D, 2D models.
3. Modelling of flow of hydraulic structures, bridges, weirs, spillways, etc.
4. Modelling the stability of concrete and soil structures.
5. Modelling groundwater flow (1D, 2D).
6. Modelling pollution transports in open channels (1D).
7. Dam break modelling – internal erosion, overtopping.
8. Introduction to statistical modelling.
9. Demonstration of individual methods, practical examples, case studies.

Laboratory
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4. Learning outcomes			
Type of learning outcomes	Learning outcomes description	Reference to the learning outcomes of the WUT DS	Learning outcomes verification methods*
Knowledge			
K01	Acquisition of knowledge about the terminology and definitions in mathematical modelling at water management.	SD_W1, SD_W2, SD_W3	Active participation during classes
K02	Acquisition of knowledge about modelling principles, conceptual models, mathematical and numerical models.	SD_W1, SD_W2, SD_W3	Active participation during classes
K03	Acquisition of knowledge about individual selected models.	SD_W1, SD_W2, SD_W3	Active participation during classes
Skills			
S01	Ability of formulating the mathematical model	SD_U1, SD_U2, SD_U3,	Active participation during classes
S02	Ability of the proposal of governing equations a, boundary and initial conditions.	SD_U4	Active participation during classes
S03	Ability to interpret and implement modelling results.	SD_U1, SD_U2, SD_U3,	Active participation during classes
Social competences			
SC01	Ability to work in a team and international collaboration. Ready to think and act in a creative and entrepreneurial way to use various mathematical models in hydraulic engineering.	SD_K2, SD_K4	Active participation during classes

*Allowed learning outcomes verification methods: exam; oral exam; oral test; project evaluation; report evaluation; presentation evaluation; active participation during classes; homework; tests

5. Assessment criteria
Grading (pass or not) based upon presence on the classes and oral examination (interview).

6. Literature
Primary references:
[1] JAIN, SC. 2000. Open Channel Flow. John Wiley 7 sons, New Yourk, 328 p.
[2] VREUGDENHIL, CB. 1988. Numerical methods for shallow water flow. Kluwer Academic Publishers.
[3] BEAR, J., VERRUIJT, A. 1992. Modeling Groundwater Flow and Pollution, D.Reidel Publishing Comp., 1992, 414 p.
[4] ŘÍHA, J. Groundwater Flow Problems and Their Modelling (2020) Springer Water, pp. 175 - 199, DOI: 10.1007/978-3-030-18363-9_8.
[5] ŘÍHA, J. Stream Water Quality Modelling Techniques (2020) Springer Water, pp. 107 - 131, DOI: 10.1007/978-3-030-18359-2_5.
[6] BROWN, LC. - BARNWELL, TO. 1987. The Enhanced Stream Water Quality Models, QUAL2E, QUAL2E - UNCAS - Documentation and User Manual, Athens, USA, 1987, 188 p.
Secondary references:
[1] Slope stability. 2003. Engineering and design. USACE. EM 1110-2-1902, Washington DC, 205 p.
[2] Ruggeri et al. 2004. Working Group on Uplift Pressures under Concrete Dams. Final report, Icold EWG.
[3] Ruggeri et al. 2004. Working Group on Sliding Safety of Existing Gravity Dams. Final report, Icold EWG.

7. PhD student's workload necessary to achieve the learning outcomes**		
No.	Description	Number of hours
1	Hours of scheduled instruction given by the academic teacher in the classroom	30
2	Hours of consultations with the academic teacher, exams, tests, etc.	10
3	Amount of time devoted to the preparation for classes, preparation of presentations, reports, projects, homework	15
4	Amount of time devoted to the preparation for exams, test, assessments	5
	Total number of hours	**60**
	ECTS credits	**2**

** 1 ECTS = 25-30 hours of the PhD students work (2 ECTS = 60 hours; 4 ECTS = 110 hours, etc.)

8. Additional information	
Number of ECTS credits for classes requiring direct participation of academic teachers	2
Number of ECTS credits earned by a student in a practical course	-