

Subject name	Numerical Modeling of Fluvial Processes	
Subject code	IS-NMF-16	
Department	Hydraulic Engineering and Geotechnics	
Faculty	Environmental Engineering and Land Surveying	
Subject supervisor/Lecturer	Leszek Książek Ph.D., Andrzej Strużyński Ph.D.	
General information	Teaching period	summer semester
	ECTS credit	6
	Lectures total	15
	Seminars	30
Objective and general description	The aim of the course is to model fluvial processes along a river reach within the influence of the back-water caused by a water reservoir as well as changes of river bed after flood events. The study are carried out using a set of the field measurements as well as computer simulations with CCHE2D model developed by the National Center for Computational Hydroscience and Engineering at the University of Mississippi. Involving numerical modeling to computation allows increase the efficiency of work.	
Lectures 15 hours	<ol style="list-style-type: none"> 1. Introduction; 1D, 2D and 3D models; applications, limitations of use, data verification. 2. Governing equations and numerical methods; models structure. 3. Data collecting, numerical model of terrain, boundary conditions. Examples. 4. Simulations, vizualizations of results, interpretations of results, errors correction. 5. Presentation and visualization of results. 	
computer Lab practicals 30 hours	<ol style="list-style-type: none"> 1. 1-8. Program HEC-RAS – 1D model of water flow on a sector of the river. 2. 8-20. CCHE2D model – modelling of fluvial processes on a mountain river: numerical model of terrain, mesh generator, boundary conditions, running a simulations, vizualization of results. 	
Literature	<ol style="list-style-type: none"> 1. Khan A.A., 2003, CCHE2D-GUI – Graphical User Interface for the CCHE2D Model, Zhang Y., and Jia Y., 2002, CCHE2D Mesh Generator 2. Szymkiewicz R., 2000, Modelowanie matematyczne przepływów w rzekach i kanałach, PWN 3. Wu W., Wang S.S.Y., and Jia Y., 2000, Nonuniform Sediment Transport in Alluvial Rivers, 4. Bartnik W., Książek L., Michalik A., Radecki-Pawlik A., Strużyński A., 2004, Modeling of fluvial processes along a reach of the Skawa River using CCHE2D model, 12th Inter. Conf. On „Transport and sedimentation of solid particles”, Zesz. Nauk. AR we Wrocławiu, ser. Konferencje XXXVII, Nr 481, 155-165 5. Bartnik W., Banasik K., Książek L., Radecki-Pawlik A., Strużyński A., 2005, Forecasting of Fluvial Processes on the Skawa River Within 	

- Back-Water Reach of the Świnna Poręba Water Reservoir, *Publs. Inst. Geophys. Pol. Acad. Sc.*, E-5 (387), 57-85
6. Książek L., 2006, Morfologia koryta rzeki Skawy w zasięgu cofki zbiornika Świnna Poręba, *Zesz. Nauk. Infrastruktura i Ekologia Terenów Wiejskich*, PAN, Oddz. W Krakowie, Komis. Tech. Inf. Wsi, Seria Monografie Nr 4/1, 249-267
7. Książek L., Bartnik W., Wyrębek M., 2008, Modelowanie numeryczne warunków przepływu wody w przepławce dla ryb, *Ochrona ichtiofauny w rzekach z zabudową hydrotechniczną*, Monografia pod redakcją Mokwy M. i Wiśniewolskiego W., Dolnośląskie Wydawnictwo Edukacyjne, Wrocław, s.156-164
8. Książek L., Radecki-Pawlik A., 2008, Modeling of Hydrodynamics Conditions Within the Outlet of a Sand-Gravel Upland River – The Raba River, Polish Carpathians, *Proc. Fourth Int. Conf. on Fluvial Hydraulics – River Flow 2008*, Altınakar, Kokpınar, Aydın, Cokgor & Kirkgoz (Eds), Vol. 2, 1399-1406
9. Strużyński A., M. Wyrębek, 2008, Evaluation of the Nida River main current below the perpendicular flood channel outlet, *Hydraulic Methods for Catastrophes: Floods, Droughts, Environmental Disasters*, Institute of Geophysics, Polish Academy of Sciences, Ser. Hydrology, E-10 (406), ISSN 0138-0133, 175-185
10. Strużyński A., M. Wyrębek, 2008, Modelowanie wpływu kanału ulgi ze zbiornika pińczowskiego na procesy hydromorfologiczne w uregulowanym odcinku rzeki Nidy, *Wydawnictwo UP Poznań*, w druku
11. Michalik A., Książek L., 2009, Dynamics of water flow on degraded sectors of mountain stream channels, Poland, *Polish Journal of Environmental Studies*, (w druku)