Introduction to River Flood Modelling						WSE/HI8 HIFRM
22 April- 11 May 2013						**5 ECTS Credit Points**

Mentor:	I. Popescu					
Tuition form & study load:	*Topic*	*Contact hours*			*Study load [hrs]*	*Examination/weight*
		Lec ture	*Exer cise*	*Work shop*		
	Application domains of Hydroinformatics: floods, urban systems and environment	4		2	14	
	Climate change and its impact on hydrology	4		2	14	Written exam 10%
	Environmental processes and water quality	4		2	14	
	Intro to modelling with 1D applications (for short course only)	4		2	14	
	Introduction to 1D2D, 2D modelling	2		2	8	Exercise report (50%)
	Flood analysis, river flood modelling and 1D flood routing	8	22		68	Oral exam (40%)
	New data sources to support flood modelling		2	2	6	
	(total contact hours 62)				Total 138	

Pre-requisites:	Basic knowledge of hydraulics and hydrology
Learning objectives:	On completion of this module the participants are able to: 1. Understand and explain the main flood management problems; 2. Understand and explain the governing processes of flood generation and propagation 3. Identify the proper modelling methodology for a given problem 4. Utilise their hands-on experience in the step-by-step modelling procedure (geometry, bathymetry, boundary conditions, forcing) needed to carry out a practical study with MIKE11, SOBEK 1D or HEC-RAS package; 5. Know how the river flood model may be used for structural and non-structural measures for flood mitigation
Content:	**Application domains of Hydroinformatics: floods, urban systems and environment, R. K. Price (IHE), Z. Vojinovic (IHE) and A. Mynett IHE)** Introduction to floods and flooding. Introduction to urban floods and urban water systems. Introduction to environmental systems. **Climate change and its impact on hydrology, P.D.A. Pathirana (IHE)** Climate change problematique. Global, regional and local climate models, development of climate change scenarios. Effects of climate variability on the hydrology that affects rainfall-runoff processes in river-basins. **Environmental processes and water quality, H. J. Lubberding (IHE)** Environmental processes. Water quality problems from a modelling point of view: outfalls, BOD-DO, eutrophication, toxic substances, best technical means approach, water quality objectives approach; Properties of the natural system from a modelling point of view, residence times, time scales of transport processes compared with those of water quality processes, spatial scales of phenomena, link between transport of substances and water quality processes.

	Introduction to 1D2D, 2D modelling, I. Popescu (IHE) Introduction to the basic principles of 1D2D and 2D modelling.
	Flood analysis, river flood modelling and 1D flood routing, R.K. Price (IHE), I. Popescu (IHE), B. Bhattacharya (IHE) Nature and characteristics of floods: flood analysis – e.g. flood probability - probability and return period analysis of hydrological events and design floods - and estimation of peak flows (using Flood Estimation Handbook (FEH and ReFH) methods, catchment characteristics method, storm hydrographs and unit hydrograph methods River Flooding Modelling: -The significance of overbank flow, floodplain behaviour and stage discharge prediction (using the Ackers Method and Conveyance Estimate System) -Modelling flood propagation - flood routing -hydrological methods – Muskingum, reservoir routing, HEC-HMS -1D hydraulic flood routing/modelling in rivers -The Conveyance Estimate System; modelling resistance for discharge estimation. -Introduction to 'HEC-RAS' software; -Discussion of sustainable flood alleviation methods
	New data sources to support flood modelling, G. Di Baldassarre (IHE) Introduction to new generations of data to support river flood modelling. Remote sensing: satellite and airborne flood imagery. Wireless sensors to assist inundation modelling. Freely and globally available space-borne data to monitor floods.
Course materials:	*Lecture notes on River flood management and flood routing* Presentation slides; Modelling packages with user manuals;
Didactics	Formal lectures; classroom exercises; home assignments; exercises & workshops in computer lab
Additional reading:	Papers and other material provided by the course lectures.