Integrated Flood Risk Management

MODULE TITLE	Integrated flood risk management
LECTURER(S)	Dr Jovanovic, Dr Drobot
ECTS VALUE	6
PREREQUISITES	Hydraulics - Hydrology
COREQUISITES	Quantitative Water Management
DURATION OF MODULE	15 weeks

TOTAL STUDENT STUDY TIME

Overall, the module is expected to involve students in approximately 150 hours of learning, including 24 hours lectures; 76 hours assignments; 50 hours private study.

WEB LINK	http://www.water-msc.org/en/wrem301.htm

AIMS

This module aims to provide a basic knowledge of structural and non-structural measures for flood control. It also offers hydrological and hydraulic background for floods generation and propagation. Finally, it provides practical experience in using modelling tools.

INTENDED LEARNING OUTCOMES

1. Subject Specific Knowledge, Understanding and Skills

By the end of this module, the students should:

a) have acquired basic knowledge of flood risk management;
b) have acquired understanding of the structural and non-structural measures for flood control, their characteristics and functioning;
c) be able to make appropriate and critical use of flood propagation and flood delineation modelling and flood risk management principles.

2. Core Academic Skills

By the end of this module, the students should:

a) be able to identify, formulate and analyse a flood risk management problem in a river basin or in an urban area;
b) be able to critically assess research results;
c) have acquired some practical experience of using flood control and flood delineation tools.

3. Personal and Key Skills

By the end of this module, the students should have:

a) improved further the necessary skills for independent learning;
b) enhanced report and presentation skills;
c) improved some IT skills.

LEARNING/TEACHING METHODS

Lectures, tutorials, literature and internet sources

ASSIGNMENTS

a) Three seminar papers from topics 1-12.
b) A HEC-RAS project, covering topics no. 4-5.

ASSESSMENT

a) Each seminar paper is evaluated and graded
b) Final exam (5 questions)

SYLLABUS PLAN (Lectures: 2h each)

1. Floods. Definitions. Flooding mechanisms. Flash floods and regional floods. Flood generating precipitations. Flood potential. Statistical characterization.

2. General problems of the inundations around the world. Outstanding floods. European projects for flood control. Flood mitigation problems.

3. Hydraulic analysis of flood propagation. Modelling of 1D and 2D flows. Model calibration. Limitations. Specific problems (flood encroachement, river bends etc.)

4. Implementation of theory by computer code Hec-Ras. Examples: steady flow flood floodway encroachment analysis, unsteady flow modelling.

5. Implementation of theory by computer code Hec-Ras. Examples: steady flow flood floodway encroachment analysis, unsteady flow modelling.

6. Flood risk. Definitions. Approximate methods for flood risk evaluation (Inondabilité, Swiss method etc).

7. Flood damage assessment. Uncertainties in flood damage estimation. Levee height design.

8. Flood risk mapping. Application of GIS and geodatabases in flood management.

9. Structural measures for flood control (dams, dikes, diversions).

10. Examples of complex schemes for integrated flood control.

11. Non-structural measures. Informational system of flood warning and forecasting. Up-dating the flood forecast. Flood management plans, and operation rules of the structural measures.

12. Post-inundation phase. Flood recovery measures and methods of damage compensation. Flood management policy, public awareness, socio-economics, land use. European Flood Directive

INDICATIVE BASIC READING LIST

1. Ashley, R., Garvin, S., Pasche, E., Vassilopoulos, A, Zevengergen, C. (editors), 2007. Advances in Urban Flood Management, Taylor&Francis, Balkema, London ISBN 978-0-415-43662-5.
2. Burrough P.A., McDonell R.A. 2000. Principles of Geographical Information Systems-Spatial Information Systems and Geostatistics, Oxford University Press N.Y
3. HEC-RAS River Analysis System V3.1, 2002, User's Manual, Hydraulic Reference Manual, Applications Guide, HEC-GeoRAs User's Manual.
4. USACE, 1996c, Risk-based Analysis for Flood Damage Reduction Studies, Manual, EM 1110-2-1619, Washington, D.C.
5. Water Management, Flood Modelling, 2006, Proceedings of the Institution of Civil Engineers, Vol., 159, Issue WM1, ISSN 17417589.

EXTENDED READING LIST

1. Apel, H., Thieken, A.H., Merz, B., Blöschl, G., 2004, Flood risk assessment and associated uncertainty, Natural Hazards and Earth System Sciences, European Geosciences Union, Vol.4, 295-308.
2. Babic-Mladenovic, M., Jovanovic, M., Knezevic, Z., "The Integrated Flood Management – The Karas River Case Study", River Restoration 2004, Principles, Processes & Practices, 3d ECRR International Conference on River Restoration in Europe, Zagreb, 2004..
3. Chung, T.J., Finite Element Analysis in Fluid Dynamics, 1978, McGraw-Hill, New York.
4. Cunge, J., Holly, F.M., Verwey, A., 1980. Practical Aspects of Computational River Hydraulics., Pitman, Boston, London, Melbourne
5. Davis, D., Burnham, M.W., 1994, Risk-based analysis for flood damage reduction, in: Risk-based decision making in water resources V*I*, Haimes, Y.Y., Moser. D.A., Stakhiv, E.Z., (Eds.), ASCE, 194-200.
6. Directive 2007/60/EC of the European Parlament and of the Council of 23 October 2007 on the assessement and management of flood risks, Official Journal of the European Union, L 288/27, 6.11. 2007.
7. Kron, W., 2003. Flood Catastrophes: causes-losses-prevention from an international re-insures's viewpoint, International Workshop Precautionary Flood Prevention in Europe, Bon.
8. Lai, Ch., Numerical Modelling of Unsteady Open-Channel Flow, Advances in Hydroscience, Ben Chie Yen (ed.), Volume 14-1986, Academic Press, New York.
9. Moser, D.A., 1994. Quantifying flood damage uncertainty, in: Risk-based decision making in water resources VI, Haimes, Y.Y., Moser. D.A., Stakhiv, E.Z., (Eds.), ASCE, 194-200.
10. National Research Council (NRC), 2000, Risk Analysis and Uncertainty in Flood Damage Reduction Studies, National Academy Press, Washington, D.C., 202 pp.
11. National SUDS Working Group, Interim Code of Practice for Sustainable Drainage Systems, 2004. ISBN 0-86017-904 (www.ciria.org/suds/).
12. Plate, E., 1998. Flood risk management: a strategy to cope with floods, in: The Odra/Oder flood in summer 1997: Proceedings of the European expert meeting in Potsdam, 18 May 1998, Bronstert, A., Ghazi, A., Hladny, J., Kundzewicz, Z., Menzel, L. (Eds.), Potsdam institute for climate impact research, Report No.48, 115-128.
13. Press, W.H. et al., 1998, 1992, 2002, 2007 (e-book), Numerical Recipes – The Art of Scientific Computing, Cambridge University Press, London, New York.
14. USACE, 1995c, Hydrologic Engineering Requirements for Flood Damage Reduction Studies, Manual, EM 1110-2-1419, Washington, D.C.
15. United States Geological Survey (USGS), 1997. Standards For Digital Elevation Models, Part 1: General, Part 2: Specifications, Part3: Quality Control. Department of the Interior, Washington, DC.
16. van der Vat, M., Hooijer, A., Kerssens, P., Li, Y., Zhang, J., 2001. Risk assessment as a basis for sustainable flood management, Proceedings of the XXIX IAHR Congress, Beijing, China.
17. Verwey, A., 2005. Hydroinformatics Support to Flood Forecasting and Flood Management, Keynote Lecture, Fourth Inter Celtic Colloquium on Hydrology and Management of Water Resources, Guimaraes, Portugal.

Relevant internet sites

- http://ec.europa.eu/environment/water/flood risk/index.htm
- http://www.wldelft.nl/issues/flood/approach/index.html
- http://www.floodsite.net/
- http://www.fema.gov

- http://www.usace.army.mil/inet/usace-docs/eng-manuals
- http://ncrweb.org/downloads/pub13.pdf
- www.ice.org.uk
- http://ec.europa.eu/environment/water/flood_risk/index.htm
- http://www.wldelft.nl/issues/flood/approach/index.html
- http://www.usda.gov/stream restoration
- http://unfccc.int/
- http://www.defra.gov.uk/environment/airquality/meda
- http://cifor.cgiar.org/acm/methods/toolbox9.html#top
- http://www.worboys.duckham.org
- http://www.ncrg.aston.ac.uk/~cornfosd/gis/index.html
- http://www.nr.usu.edu/Geography-Department/rsgis/GIS/Lectures/gislec.html
- http://www.wiley.com/go/longley
- http://www.engineering.usu.edu/cee/faculty/dtarb/hydrogis/italy1.ppt
- http://www.geomatics.ucalgary.ca/~nel-shei/lecture.htm
- http://en.wikipedia.org/
- http://www.nr.com

AUTHORS

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