Integrated Water Resources Management

MODULE TITLE	Integrated Water Resources Management
LECTURER(S)	Dr. A. Stamou, Dr. A. Galie and Dr. R. Kapor
ECTS VALUE	8
PREREQUISITES	Hydrology
COREQUISITES	Hydraulic Structures
DURATION OF MODULE	15 weeks

TOTAL STUDENT STUDY TIME

Overall, the module is expected to involve students in approximately 200 hours of learning: 12 5-hour lectures; 58 hours assignments; 78 hours private study; 4-hour examination.

WEB LINK http://www.water-msc.org/en/wrem303.htm

AIMS

This module aims to provide a basic knowledge of contemporary problems in integrated management of water for the practicing engineer. It also offers gaining practical experience in using water management modelling tools.

INTENDED LEARNING OUTCOMES

1. Subject Specific Knowledge, Understanding and Skills

By the end of this module, the students should:

a) have acquired understanding of water management system components, their characteristics and functioning of such systems;
b) have acquired basic knowledge of integrated water management problems;
c) be able to make appropriate and critical use of water management modelling and integrated water management principles.

2. Core Academic Skills

By the end of this module, the students should:

a) be able to identify, formulate and analyse a management problem in a given water management system;
b) be able to critically assess research results;
c) have acquired some practical experience of using water management modelling 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, problem sheets, tutorials.

ASSIGNMENTS

Two assessed coursework assignment (3,000 equivalent words including graphs and tables).
Problem sheets and computer based problem solving.

ASSESSMENT

Examination paper (60%), Course work (40%)
3-hour examination - use of notes and books allowed
2 assignments on practical application of modelling tools (20%, 6,000 totally equivalent words, including graphs and tables)

SYLLABUS PLAN

1. Introduction to IWRM

1.1. Concept and objectives of sustainable development.
1.2. Global environmental problems.
1.3. Integrated Water Resources Management (IWRM).
1.4. Introduction to the EU Water Policy.

2. Legislative and institutional framework-The WFD

2.1. Introduction.
2.2. Key points of the WFD.

3. Status of waters – Classes of water quality - Reference conditions, typology, and water bodies

3.1. Introduction.
3.2. Classes of water quality.
3.3. Integrated water quality monitoring.
3.4. Introduction.
3.5. Type-specific reference conditions.
3.6. Typology of streams.
3.7. Surface water bodies.
3.8. Heavily modified water bodies.
3.9. Artificial water bodies.
3.10. Water bodies at risk.

4. Analysis of the pressures and impacts on water bodies

4.1. The Aim of the Pressures and Impacts Analyse.
4.2. The objectives to be considered in the pressures and impacts analysis.
4.3. Key elements of a pressures and impacts analysis.
4.4. Assessment of the risk of non-compliance with WFD objectives.
4.5. Reporting the results of the analyses – The IMPRESS Report for each RBD.

5. Modelling and Decision Support Systems (DSS) in IWRM

5.1. Introduction.
5.2. Hydrological models.
5.3. Hydrodynamic models.
5.4. Water quality – biological models.
5.5. DSS.

6. Rivers-Estuaries: Water quality modelling

6.1. Introduction and principles.
6.2. Water quality modelling in rivers-estuaries.

6.3. Case studies.

7. Rivers-Estuaries: River restoration

7.1. Principles of river restoration
7.2. More space for the river". Longitudinal and lateral connectivity
7.3. Case studies

8. Lakes-Reservoirs: IWRM in lakes

8.1. Introduction and principles.
8.2. Water quality modelling in lakes.
8.3. The case study-Plastiras lake.

9. IWRM in urban areas

9.1. IDF curves. Design precipitation. Design flood. Short – term forecast of floods in urban areas.
9.2. Flood control in urban areas.
9.3. Water balance in urban areas.
9.4. Water quality in urban areas.
9.5. Mathematical modeling of urban fluxes.

10. Groundwater management

10.1. Identification, delineation and description of groundwater bodies.
10.2. Aquifer water balance.
10.3. Assessment of human impact on groundwater. Risk not fulfilling the environmental objectives according to WFD.
10.4. Mathematical modelling of groundwater management.

11. Economical analysis of water use

11.1. Scope of economical analysis. Principles.
11.2. Economic mechanisms in water resources field and in water supply and wastewater public services.

12. Presentation and analysis of a RBMP

12.1. Introduction and principles.
12.2. Case study.

INDICATIVE BASIC READING LIST

1. Chapra S. C., *Surface Water-Quality Modeling*, The McGraw-Hill Companies, 1997.
2. Koudstaal R., and al., 1992. *Water and Sustainable Development*. Proc. Int. Conf. on Water and the Environment. Dublin, 26-31 Jan.
3. Castelletti A. and Soncini-Sessa R. (2006). Topics on system analysis and integrated water resources management, 304 pages, Elsevier, ISBN-13: 978-0-08-044967-8
4. The EU Water Framework Directive - integrated river basin management for Europe, http://ec.europa.eu/environment/water/water-framework/index_en.html,http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2000:327:0001:0072:EN:PDF

EXTENDED READING LIST

1. Henderson-Sellers B. (1984).Engineering Limnology, Pitman Publishing Inc.
2. Bund W. (2002). Assigning water body types: an analysis of the refcond questionnaire results, European Commission, Joint Research Centre, Italy
3. Groot S. and Villass M. (1995). Monitoring water quality in the future. Delft Hydraulics.
4. Koudstaal R., and al. (1992). Water and Sustainable Development. Proc. Int. Conf. On Water and the Environment. Dublin, 26-31 Jan.

5. Nijland H., and Menke U. (2005). Flood Risk Management and Multifunctional Land Use in River Catchments. Conference Proceedings Mainz, Germany 17th – 19th Oct.
6. Staraş M. (1998). Fishery in relation with environment in the Danube Delta, Proceedings of the symposium Dealing with nature in deltas, Ed.H.J.Nijland, Lelystad, The Netherlands, 157-168.
7. Serban P. and Galie A. (2006). Managementul apelor - principii şi reglementări europene. TIPORED Edition.
8. Transboundary River Basin Management of the Körös/Crisuri River, a Tisza/Tisa sub-basin" Project. Guidelines and recommendations for the different steps of the planning process toward the preparation of river basin management plan in line with the water framework directive requirements
9. WFD and Hydromorphological Pressures – Technical Report – Case Studies – Potentially relevant to the improvement of ecological status/potential by restoration/mitigation measures; Separate Document of the Technical Report, November 2006.
10. Proceedings of the International Conference on Aspects of Conflicts in Reservoir Development & Management", City University, London, 3-5 September, 1996.
11. River Basin Management Planning, http://www.sepa.org.uk/wfd/rbmp/index.htm
12. Guidance on public participation in relation to the water framework directive active involvement, consultation, and public access to information. http://www.eau2015-rhin-meuse.fr/fr/ressources/documents/guide_participation-public.pdf
13. Water Framework Directive and monitoring, http://www.eea.europa.eu/themes/water/status-and-monitoring/water-framework-directive-and-monitoring

AUTHORS

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