**Table 5.1** Course specification to doctoral study programs

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| **Course name: Water resources systems analysis** | | |
| **Teacher or teachers:** [**Milićević B. Dragan**](../P%209.3%20Knjiga%20Nastavnika%20DOS%20He/59.%20Dragan%20B.%20Milicevic,%20docent.xlsx)**,** [**Potić V. Olivera**](../P%209.3%20Knjiga%20Nastavnika%20DOS%20He/28.%20Olivera%20V.%20Potic,%20redovni%20profesor.xlsx) | | |
| **Course status:** Elective | | |
| **Number of ECTS:** 10 | | |
| **Precondition courses:** None | | |
| **Educational goal**  Building student capacity for independent professional, research and scientific work in the area of analysis of water resources systems. | | |
| **Educational outcomes**  Active usage of knowledge in field of analysis, planning and management of multi-component systems of water resources in the catchment area. | | |
| **Course content**   1. Systems and system analysis (4)   Definition and types of systems; Systemic approach; System analysis   1. The role of system analysis in water resources management (4)   Water resources system modeling; Challenges in modeling of water resources systems; Development of water resources systems modeling   1. System analysis methods in water resources management (8)   Simulation; System dynamics simulation; Optimization; Fuzzy optimization; Multi-criterion optimization; Combination of simulation and optimization; Data-Based methods of system analysis: Neural networks, genetic algorithm, genetic programming; Data Mining   1. Model sensitivity and uncertainty analysis (8)   Questions, problems and terminology; Variability and uncertainty in model results; Model sensitivity and uncertainty analysis   1. Economic factors in water resources planning (8)   Economic analysis;  Cost Benefit cost analysis; Design optimal conditions; Economic analysis of alternate solutions;  Economic models   1. System analysis in development of alternate solutions (8)   Formulation and selection of plan; Selection of modeling method; Model development; Modeling project management   1. Criterion functions and decision making (8)   Decision making; Definition of alternatives; Selection and quantification of criteria; Multi-criterion analysis; Decision making support systems   1. Application of the system analysis in catchment area water resources (12)   Catchment area management; Ground water modeling; Management of the water course-reservoir system. Water quality management; Analysis of hydro power systems; Analysis and water consumption management; Drought management | | |
| **Literature**  1. Karamouz M., Szidarovszky F., Zahraie B.: Water Resources Systems Analysis, Lewis Publishers, USA, 2003.  2. Loucks D.P. and van Beek E. with contributions from Stedinger J.R., Dijkman J.P.M., Villars M.T.: Water Resources Systems Planning and Management - An Introduction to Methods, Models and Applications, UNESCO and WL | Delft Hydraulics, 2005.  3. Simonović S.: Managing water resources - Methods and tools for a systems approach, UNESCO, 2009 | | |
| **Number of active teaching classes (weekly)** | Lectures: 4 | Study research work: 0 |
| **Teaching methods**  Lectures, mentor work, consultations, research work in laboratory and in the field, term paper. | | |
| **Knowledge evaluation (maximum 100 points)**  **Pre-examination obligations Points Final exam Points**  Term paper **55** Оral part of the exam **45** | | |