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

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| **Course name: Advanced programming with soft computational techniques** | | |
| **Teacher or teachers:** [**Kisi S. Ozgur**](../P%209.3%20Knjiga%20Nastavnika%20DOS%20He/13.%20Ozgur%20S.%20Kisi,%20redovni%20profesor.xlsx) | | |
| **Course status:** Elective | | |
| **Number of ECTS:** 10 | | |
| **Precondition courses:** None | | |
| **Educational goal**  The purpose of this course is to provide the student the theory and application of the soft computational techniques (such as ANNs, fuzzy, neuro-fuzzy, fuzzy-genetic) based on MATLAB programming language and to develop students’ ability to solve hydrological problems. | | |
| **Educational outcomes**  The students acquire the abilities, know basic concepts of different soft computational techniques (SCT), and make up applications of SCT to solve hydrological problems. | | |
| **Course content**  Theory of soft computational techniques. Programming, application and comparison of different soft computational techniques (e.g., multi-layer perceptron, radial basis neural network, generalized regression neural networks, range dependent neural networks, Mamdani and Sugeno fuzzy systems, neuro-fuzzy, fuzzy-genetic, evolutionary neural networks) in MATLAB. | | |
| **Literature**  1. Graupe, D. (2007). Principles Of Artificial Neural Networks, 2nd Edition, World Scientific Publishing Co. Pte. Ltd., Singapure, USA, UK.  2. Krose, B., van der Smagt, P. (1996). An Introduction to Neural Networks, 8th edition, University of Armsterdam, Netherlands.  3. Freeman, J.A., Skapura, D.M. (1991). Neural Networks Algorithms, Applications, and Programming Techniques, Addison-Wesley Publishing Company, Inc.  4. Sivanandam, S.N., Sumathi, S., Deepa, S.N. (2007). Introduction to Fuzzy Logic using MATLAB, Springer-Verlag Berlin Heidelberg, New York, USA.  5. Ross, T.J. (2010). Fuzzy Logic with Engineering Applications, John Wiley & Sons, Ltd, UK.  6. MATLAB User’s Guide, Fuzzy Logic Toolbox, The MathWorks, Inc.  7. MATLAB User’s Guide, Neural Network Toolbox, The MathWorks, Inc.  8. MATLAB User’s Guide, Genetic Algorithm Toolbox, The MathWorks, Inc. | | |
| **Number of active teaching classes (weekly)** | Lectures: 4 | Study research work: 0 |
| **Teaching methods**  Lectures. Consultations with students. Homework. Preparation and defense of a term paper related to solution of a hydrological problem | | |
| **Knowledge evaluation (maximum 100 points)**  **Pre-examination obligations Points Final exam Points**  Lecture attendance **10**  Oral part of the exam **30**  Term paper **40**  Homework **20** | | |