Course Unit Descriptor

Study Programme: JOINT MASTER ACADEMIC STUDIES

Sustainable Agriculture, Food Production and Food Technology in the Danube Region

Course Unit Title: WATER RESOURCES SYSTEMS ANALYSIS TECHNIQUES

Course Unit Code:

Name of Lecturer(s): Zorica Srđević, Bojan Srđević

Type and Level of Studies: Master studies

Course Status (compulsory/elective): elective

Semester (winter/summer): winter

Language of instruction: English

Mode of course unit delivery (face-to-face/distance learning): face-to-face

Number of ECTS Allocated: 6

Prerequisites: None

Course Aims:

This subject aims to provide an introduction to modern approaches, methodologies and computer oriented tools of advanced systems analysis. By the end of this subject, the students should:

a) have acquired knowledge of general problem solving methods, modern heuristics, numerical modeling, simulation and optimization techniques and tools;
b) use systems analysis approach and tools to assess and solve problems associated with agricultural water management systems.
c) be able to identify and formulate a problem (e.g. in terms of decision variables, objectives and constraints) and subsequently select an appropriate mathematical technique to solve it;
d) d) improved further the necessary skills for independent learning, reporting and presentation.

Learning Outcomes:

On successful completion of this subject, the students should:

a) have acquired understanding of systems analysis approach to modeling of agricultural water systems;
b) develop skills to understand and use modern approaches and methods of systems analysis in water resources planning, development and management on different spatial and temporal scales.
c) improve IT skills.

Syllabus:

Theory

1. Introduction to water resources systems analysis; Systems definitions; General problem solving (understanding, planning, applying, revising); Systems Analysis and Thinking (Problem identification, boundaries, components, interactions and flows). 2. Water resources parameters analysis: -Supplies (Rainfall, Runoff, Groundwater), -Demands (in Agriculture), -Spatial and Temporal Distributions, -Legal Requirements, -Environmental Requirements, -Political Situation. 3. Catchment modeling and conveyance systems simulation; Simulation and optimization methods (deterministic and probabilistic); System performance indicators: risk (reliability), resiliency, and vulnerability. 4. Conflict Resolution; Multi Criteria Decision Analysis (MCDA); Modern heuristics and search engines (algorithms). 5. Applications of systems analysis; Simulation and optimization techniques.

Practice

Examples of: Systems Analysis and Thinking (Problem identification, boundaries, components, interactions and flows). Catchment modeling and conveyance systems simulation; Simulation and optimization methods (deterministic and probabilistic); System performance indicators: risk (reliability), resiliency, and vulnerability

Required Reading:

Srdjevic Z., Srdjevic B.: An extension of the sustainability index definition in water resources planning and management. Water Resources Management 31 (5): 1695-1712, 2017.

Srđević B. Systems Analysis Methods in Engineering With Extensions in Environmental Engineering, Federal University of Bahia, Salvador, Brazil. (Lecturing Notes), 2003.

Simonović S. Managing Water Resources. Methods and Tools for a Systems Approach, UNESCO Publishing, 2009.

Weekly Contact Hours:	**Lectures:**	**Practical work:**

Teaching Methods:

Lectures, problem sheets, tutorials; Forms of assessment: Examination, Assignments.

Course materials: Textbooks; Materials will be given at the beginning of each section; Material available on web

Knowledge Assessment (maximum of 100 points):

Pre-exam obligations	points	**Final exam**	points
Active class participation		written exam	40
Practical work		oral exam	
Preliminary exam(s)		…….	
Seminar(s)	60		

The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.