



UNIVERSITY OF BELGRADE-
FACULTY OF MINING AND GEOLOGY (FMG)
 Republic of Serbia, Belgrade 11000, Djusina 7

Department : HYDROGEOLOGY

Level of Certified Studies: Master Study (MS in Hydrogeology)

Course: Characterization and Engineering of Karst Aquifers

Responsible Lecturers: Prof Dr Zoran Stevanovic, Dr Sasa Milanovic

Other lecturers: staff members of FMG, visiting professors, national and international experts

Course status: Optional

Offered: Spring Semester

Course structure: 2 hours lecture, 2 hours laboratory, and field work

ESTC (credits as per European system): 6 (out of 30 total required per semester)

Prerequisite(s): Undergraduate hydrogeology course

Grading: 10 (91-100 points), 9 (81-90), 8 (71-80), 7 (61-70), 6 (51-60), 5 (50 or less)

US equivalents: A (91-100), B (81-90), C (71-80), D (61-70) F (less than 60)

(Maxmum points 100)

Mid-exams and activities	Max. Points	Final Exam	Points
Lectures/Discussion	10	Test / Oral	50
Lab	20		
Colloquium / Seminars	20		

Course Objectives

After introduction to the historical development of karst science and engineering, and explanation of karst environment and processes, students will learn how to apply methods for the assessment and management of karst water resources, and how to design engineering structures for their sustainable use.

Course Outcome

After completing the course, students are ready for the challenges of working on karst water resources, dealing with sensitive character of karst environments, and managing their waters, geo-heritage sites and biodiversity by designing sustainable engineering projects.

Description / Content

Historical development of karstology and karst hydrogeology. Worldwide karst distribution, Dinaric karst and role of Jovan Cvijic. Carbonate and non-carbonate karst. Karstification process and its features. Permeability of karstic rocks. Groundwater circulation in karst: recharge, flow types and directions, discharge. Relationship with other aquifer systems and surface waters. Research methods in karst hydrogeology. Characterization of karst aquifers. Groundwater budget and catchment delineation. Specific regime of karstic groundwater (quantity, quality). Water extraction. Aquifer control in discharge zones and drainage areas. Problems related to construction of dams, reservoirs and other structures and buildings in karst. Safe yield and sustainable exploitation of karst waters. Conflicts and risks in karst water management. Vulnerability assessment and pollution of karst aquifers. Surface and subsurface karst features and landforms, dependent eco-systems, endemic species, geo-heritage sites. Sanitary protection zones, preventive and remediation measures for karst sources and waters. Groundwater monitoring in karst. Modeling of karst aquifers. Forecasting effects of karst waters utilization. Feasibility studies and engineering design. Practical examples and case studies.

Recommended Literature (in chronological order):

- Cvijic J.:** Karst, Belgrade, 1895
- Mijatovic B.:** Karst. Hydrogeology of karst aquifers. Geozavod, Belgrade, 1990
- Milanovic P.:** Geological Engineering in Karst, CRC, 2004
- Ford D. and Williams P.:** Karst hydrogeology and geomorphology. Wiley, 2007
- Goldschider & Drew:** Methods in Karst Hydrogeology, IAH, 2007
- Stevanovic Z.:** Management of groundwater resources, FMG, Belgrade, 2011
- Kresic N.:** Water in Karst, McGraw-Hill, 2013
- Other references, select projects and Internet resources