

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

<b>Predmet:</b>	Aplikativna geologija
<b>Course title:</b>	Applied Geology

<b>Študijski programi in stopnja</b>	<b>Študijska smer</b>	<b>Letnik</b>	<b>Semestri</b>
Geologija, druga stopnja, magistrski	Ni členitve (študijski program)	1. letnik	Zimski

**Univerzitetna koda predmeta/University course code:** 713

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samostojno delo	ECTS
75	0	60	0	15	150	10

**Nosilec predmeta/Lecturer:** Andrej Gosar, Karmen Fifer Bizjak, Mihael Brenčič

**Vrsta predmeta/Course type:** Obvezni / Compulsory

<b>Jeziki/Languages:</b>	<b>Predavanja/Lectures:</b>	Angleščina, Slovenščina
	<b>Vaje/Tutorial:</b>	Angleščina, Slovenščina

### Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Zaključen dodiplomski študij, osnovna računalniška pismenost.  
Obveznosti študenta: Študent mora redno obiskovati vaje.

### Prerequisites:

Bachelor degree.  
Basic skills in application of computer.  
Student obligations: Regular attendance to excercises.

### Vsebina:

**SPLOŠNO:**  
Osnove projektnega dela v aplikativni geologiji  
Inženirski pristop v geologiji.  
Pregled velikih posegov v prostor s stališča inženirske geologije  
Sodelovanje geologov z ostalimi inženirskimi strokami pri posegih v prostor.  
Preventivni pristopi s področja geologije pri načrtovanju in izvajanju posegov v prostor.  
Pregled zakonodaje s področja inženirskih dejavnosti in vplivov na okolje (podzemne vode, tla, geološka naravna dediščina)  
**INŽENIRSKA GEOLOGIJA:**  
Podrobna klasifikacije zemljine z uporabo različnih uveljavljenih standardov in metod (SIST EN)  
Podrobna klasifikacije hribine po postopkih RQD, RMR, SMR, Q in GIS.  
Podrobne terenske meritve inženirsko geoloških parametrov.  
Osnovne laboratorijske preiskave zemljine in hribine.  
Metode meritev deformacij in napetosti na plazovitih območjih.  
Metode meritev deformacij in napetosti v predorih.

### Content (Syllabus outline):

**GENERAL:**  
Basics of the project work in applied geology  
Engineering approach in geology.  
Inženiring geology for the large geotechnical structures  
Cooperation of geologists with other engineering disciplines for the spatial planning.  
A preventive approach of engineering geology for the spatial planning  
Review of legislation in the field of engineering activities and impacts on the environment (groundwater, soil, geological natural heritage)  
**ENGINEERING GEOLOGY:**  
Detailed soil and rock description according to the EU standards  
Detailed rock classification (RQD, RMR, SMR, Q and GIS)  
In-situ measurements for determining the geotechnical parameters of rocks  
Geotechnical laboratory testing for rocks  
A stress and deformation measurements of landslides  
A stress and deformation measurements of tunnels  
Engineering geology for monitoring large geotechnical structures  
Risk assessment of large deformations and failures of the

<p>Inženirsko geološka spremljava gradnje in sanacije geotehničnih objektov.  Ocenjevanje nevarnosti velikih deformacij ali porušitve geotehničnih objektov  Inženirska geologija pri gradnji cest in železnic.  HIDROGEOLOGIJA:  Pregled osnovnih kvantitativnih pristopov v hidrogeologiji (Darcyev zakon, Dupitova hipoteza)  Bilanca podzemne vode  Kvantitativna analiza kart gladin podzemne vode  Osnove hidrogeološkega kartiranja  Terenske hidrogeološke meritve  Onesnaževanje podzemne vode  Zaščita pred podzemno vodo pri posegih v prostor  Osnove zaščite podzemne vode  Osnove načrtovanja monitoringa podzemne vode  Osnovni elementi oskrbe s pitno vodo  GEOFIZIKA  Osnove geofizikalnih karotažnih meritev v vrtnah  Klasifikacija geofizikalnih karotažnih meritev  Meritve temperature  Meritve premera vrtnine (kaliper)  Lastni električni potencial  Upornostna karotaža  Gama karotaža in spektralna gama karotaža  Akustična karotaža  Gostotna karotaža in karotaža fotoelektričnega faktorja  Nevtronska karotaža  Dipmeter  Slikovna karotaža  Druge karotažne metode  VAJE  Računske vaje iz hidrogeologije.  Računske vaje iz inženirske geologije.  Računske vaje iz geofizike.  TERENSKO DELO:  terenske vaje s področja hidrogeologije: ogled hidrogeoloških objektov (npr. črpališča podzemne vode)  terenske vaje s področja inženirske geologije: ogled geotehničnega objekta (npr. plaz, vkop, predor)  terenske vaje s področja geofizike (ilustracija uporabe geofizikalnih metod na terenu).</p>	<p>geotechnical structures  Engineering geology in the construction of roads and railways  HYDROGEOLOGY:  Overview of basic qualitative approaches in hydrogeology (Darcy law, Dupit hypothesis).  Groundwater balance  Quantitative analysis of groundwater level maps.  Basics of hydrogeological mapping.  Hydrogeological in situ measurements.  Groundwater pollution.  Protection from groundwater influences in large spatial projects.  Groundwater protection principles.  Groundwater monitoring principles.  Drinking water supply from groundwater.  GEOPHYSICS:  Principles of well logging measurements in boreholes  Classification of well logging measurements  Temperature measurements  Borehole diameter measurements (caliper)  Self electrical potential  Resistivity well logging  Gamma and spectral gamma well logging  Acoustic well logging  Density well logging and photoelectric factor logging  Neutron well logging  Dipmeter  Image logs  Other well logging methods  EXERCISES:  Calculations in hydrogeology.  Calculations in engineering geology.  Calculations in geophysics.  FIELD WORK:  field work in hydrogeology; visit of hydrogeological facilities (e.g. pumping station for drinking water supply)  field work in engineering geology; visit of geotechnical facilities (e.g. landslide, tunnel, deep cuts)  field work in geophysics (demonstration of field geophysical methods).</p>
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### Temeljna literatura in viri/Readings:

Izbrana poglavja iz / Selected chapters from:  
DOMENICO, P.A. & SCHWARTZ, F.W, 1990: Physical and Chemical Hydrogeology. Wiley.  
SCHWARTZ, F.W. & ZHANG, H., Fundamentals of Ground Water. Wiley.  
FETTER, C.W., 1999: Contaminant hydrogeology. Prentice Hall.  
C.W.DUNCAN, 2004. Rock Slope Engineering and Civil Mining. Spon Press, London.  
E.HOEK, E.T.BROWN, 1996. Underground Excavation in Rock. E& FN Spon, London.  
J.P.HARRISON, J.A.HUDSON, 2000. Engineering Rock Mechanics. An Introduction to the principles. Pergamon, Amsterdam  
MUSSETT, A.E., KHAN, M.A. 2000: Looking into the Earth – an introduction to geological geophysics. Cambridge University Press., 470 str.  
REYNOLDS, J. M. 1997: An introduction to applied and environmental geophysics. Wiley, 796 str.  
GOSAR, A. 2010: Geofizikalna karotaža. UL-Naravoslovnotehniška fakulteta, 47. str.  
RIDER, M. 1996: The geological interpretation of well logs. Whittles, 280 pp.

**Cilji in kompetence:**

CILJI: Seznanitev študentov z osnovami inženirskega dela v geologiji in za potrebe drugih sorodnih inženirskih ved (gradbeništvo, rudarstvo, energetika, prostorsko planiranje in načrtovanje); seznanitev študentov z osnovami ocenami vplivov na okolje segmenta tla, podzemne vode in geološka naravna dediščina; usposobiti slušatelje za samostojno delo na področju inženirskih aplikacij na področju geologije in uporabe geologije pri posegih v prostor.

KOMPETENCE: Sposobnost samostojnega dela na področju aplikativne geologije in sposobnost sodelovanja z drugimi inženirskimi strokami pri posegih v prostor.

**Objectives and competences:**

OBJECTIVES: To acquaint students with the basics of engineering work in geology and in other related engineering disciplines (construction, mining, energetics, spatial planning and design); to acquaint students with the basics of environmental impact assessment of segments soil, groundwater and geological natural heritage; to train students to work independently in the field of engineering applications in the field of geology and application of geology in spatial planning applications.

COMPETENCES: Ability to work independently in the field of applied geology and the ability to collaborate with other engineering disciplines in large construction works.

**Predvideni študijski rezultati:**

Znanje in razumevanje:  
Pridobljeno poglobljeno znanje s področja aplikativne geologije.

Uporaba:  
Možnost uporabe geoloških znanj v vsakdanji inženirski praksi (npr. gradbeništvo, rudarstvu, planiranju, načrtovanju in upravljanju prostora).

Refleksija:  
Vloga in pomen aplikativne geologije v vsakdanji inženirski praksi.

Prenosljive spretnosti:  
Sposobnost izbire in uporabe ustrezne tuje in domače literature. Sposobnost komunikacije z drugimi strokami, sposobnost analize podatkov in sinteze. Uporaba različnih računalniških programov ter prehod iz kvalitativnega na kvantitativno obdelavo podatkov.

**Intended learning outcomes:**

Knowledge and understanding:  
Knowledge obtained in the field of applied geology

Application:  
Possibility of application of geological knowledge in engineering practice (e.g. civil engineering, mining, planning, design, spatial management).

Reflection:  
Meaning and role of applied geology in engineering practice.

Transferable skills:  
Ability to choose and use relevant domestic and foreign literature. The ability to communicate with other professions, the ability to analyze and synthesize information. Using a variety of computer programs, and the transition from qualitative to quantitative data processing.

**Metode poučevanja in učenja:**

Predavanja, terenske vaje in kabinetne vaje.

**Learning and teaching methods:**

Lectures, field and laboratory exercises.

**Načini ocenjevanja:****Delež/Weight****Assessment:**

Načini ocenjevanja:	Delež/Weight	Assessment:
snov predavanj	50,00 %	knowledge from the lectures
seminar	20,00 %	seminar
snov vaj	30,00 %	knowledge from exercises
Ocene: 6-10 (pozitivno) ob upoštevanju Statuta UL in fakultetnih pravil.		Marks: 6-10 (positive) according to the UL Statute and faculty rules.

**Reference nosilca/Lecturer's references:**

BRENČIČ, M., 2006: Groundwater and highways interaction: past and present experiences of highway construction in Slovenia. *Environmental Geology*, 49/6,804-813.

BRENČIČ, M., VREČA, P., 2006: Identification of sources and production processes of bottled waters by stable hydrogen and oxygen isotope ratios. *Rapid communication in mass spectrometry*, 20/21, 3205-3212.

VREČA, P., BRENČIČ, M., LEIS, A., 2007: Comparison of monthly and daily isotopic composition of precipitation in the coastal area of Slovenia. *Isotopes in environmental and health studies* 43, 307-321.

FIFER BIZJAK, K., PETKOVŠEK, B. Displacement analysis of tunnel support in soft rock around a shallow highway tunnel at Golovec. *Eng. geol.*, sep. 2004, vol. 75, no 1, str. 89-106.

LOGAR, J., FIFER BIZJAK, K., KOČEVAR, M., MIKOŠ, M., RIBIČIČ, M., MAJES, B. History and present state of the Slano Blato landslide. *Nat. hazards earth syst. sci. (Print)*, 2005, 5, str. [447]-457.

VRKLJAN, I., KAVUR, B., FIFER BIZJAK, K.. Dilatometerska ispitivanja u inženjerskoj mehanici stijena. *Građevinar*, 2006, br. 3, vol. 58, str. 187-197.; Zajc, M., Pogačnik, Ž.

GOSAR, A. 2014: Ground Penetrating Radar and structural geological mapping investigation of karst and tectonic features in flyschoid rocks as geological hazard for exploitation. *Int. Journal of Rock Mechanics and Mining Sciences*, 67, 78-87.

GOSAR, A. 2008: Gravity modelling along seismic reflection profiles in the Krško basin (SE Slovenia). *Geologica Carpathica*, 59/2, 147-158.

GOSAR, A., Martinec, M. 2009: Microtremor HVSR study of site effects in the Ilirska Bistrica town area (S. Slovenia). *Journal of Earthquake Engineering*, 13, 50-67.