UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Okoljska in inženirska geofizika
Course title:	Environmental and Engineering Geophysics

Študijski programi in stopnja	**Študijska smer**	**Letnik**	**Semestri**
Geologija, druga stopnja, magistrski	Aplikativna geologija (modul)	2. letnik	Zimski

Univerzitetna koda predmeta/University course code: 846

Predavanja	**Seminar**	**Vaje**	**Klinične vaje**	**Druge oblike študija**	**Samostojno delo**	**ECTS**
30	30		0	15	75	5

Nosilec predmeta/Lecturer: Andrej Gosar

Vrsta predmeta/Course type: Obvezni / Compulsory

Jeziki/Languages:		
	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
opravljen izpit iz Geofizike (1. stopnja) opravljen izpit iz Aplikativne geologije (2. stopnja)	passed Geophysics exam (1st grade) passed Applied geology exam (2nd grade)

Vsebina:	**Content (Syllabus outline):**
Uvod: vloga geofizikalnih raziskav v okoljskih in inženirskih študijah, glavne metode okoljske in inženirske geofizike, specifičnost geofizikalnih raziskav plitvega podpovršja, ločljivost geofizikalnih podatkov Mikrogravimetrija: terenske meritve, korekcije podatkov, ločevanje polj, direktna in inverzna interpretacija Magnetometrija: meritve celotnega polja in gradientne meritve, magnetna susceptibilnost kamnin, časovne korekcije, ločevanje regionalnih in lokalnih anomalij, direktna in inverzna interpretacija Geoelektrične metode: električne lastnosti kamnin, lastni potencial, upornostne metode, električna tomografija, elektromagnetne metode, inducirana polarizacija Georadar: dielektrične lastnosti kamnin in hitrost EM valovanja, dušenje signala, načini meritev, ločljivost, Visokoločljiva refleksijska seizmika: seizmični viri za plitve raziskave, metoda skupne sredinske točke, specifičnost obdelave podatkov za dosego visoke ločljivosti, Refrakcijska seizmika: raziskave z longitudinalnimi (P) in transverzalnimi (S) valovi, generalizirana recipročna metoda Seizmične metode površinskih valov: večkanalna analiza površinskih valov (MASW), pasivne in aktivne meritve, inverzija disperzijske krivulje, uporaba v geotehniki in seizmologiji	Introduction: the role of geophysical investigations in environmental and engineering studies, the main methods of environmental and engineering geophysics, specifics of shallow geophysical investigations, resolution of geophysical data Microgravimetry: field data acquisition, data corrections, separations of potential fields, direct and inverse interpretation Magnetometry: total field and gradient measurements, magnetic susceptibility of rocks, temporal corrections, separation of regional and local anomalies, direct and inverse interpretation, Geoelectrical methods: electrical properties of rocks, self-potential, resistivity methods, electric tomography, electromagnetic methods, induced polarisation Ground Penetrating radar: dielectric properties of rocks and velocity of EM waves, signal attenuation, types of measurements, data resolution High-resolution reflection seismics: seismic sources for shallow investigations, Common-Mid-Point method, specific data processing to achieve high resolution Seismic refraction method: investigations with longitudinal (P) and transversal (S) waves, Generalized Reciprocal Method Seismic surface waves methods. Multichannel Analysis of

Seizmične meritve v vrtinah: down-hole, up-hole, cross-hole, seizmična tomografija Meritve vibracij zaradi miniranja (vibrometrija)	Surface Waves (MASW), passive and active measurements, inversion of dispersion curve, applications in geotechnics and seismology Seismic measurements in boreholes: down-hole, up-hole, cross-hole, seismic tomography Vibration measurements caused by blasting (vibrometry)

Temeljna literatura in viri/Readings:

GOSAR, A. 2011: Inženirska geofizika. UL-Naravoslovnotehniška fakulteta, 121 str.
REYNOLDS, J. M. 1997: An introduction to applied and environmental geophysics. John Wiley & Sons, 796 pp.
SHARMA, P. V. 1997: Environmental and engineering geophysics. Cambridge University Press, 475 pp.
VOGELSANG, D. 1995: Environmental geophysics. Springer, 173 pp.

Cilji in kompetence:	**Objectives and competences:**
CILJI: poznavanje osnov okoljske in inženirske geofizike, poznavanja metod raziskav v okoljski in inženirski geofiziki, povezovanje fizikalnih, geoloških in tehničnih znanj za razumevanje geofizikalnih metod in podatkov KOMPETENCE: sposobnost načrtovanja, izvajanja in interpretacije geofizikalnih raziskav sposobnost vključevanja geofizikalnih raziskav v okoljske, hidrogeološke, geotehnične in inženirskogeološke študije	OBJECTIVES: knowledge on principles of environmental and engineering geophysics, knowledge on research methods in environmental and engineering geophysics, integration of physical, geological and technical skills for understanding geophysical methods and data COMPETENCES: ability to plan, perform and interpret geophysical investigations ability to include geophysical investigations into environmental, hydrogeological, geotechnical and engineering geological studies

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje fizikalnega in geološkega ozadja geofizikalnih metod in podatkov, metod raziskav v okoljski in inženirski geofiziki.	Knowledge and understanding of physical and geological background of geophysical methods and data, of investigation methods in environmental and engineering geophysics.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja z uporabo prezentacij. Vaje potekajo delno kot vodene seminarske vaje (15 ur), delno kot vodene kabinetne vaje (15 ur). Terenske vaje obsegajo 3 dni dela na terenu.	Lessons using presentations. Exercises, partly as leaded seminar work (15 h) and partly as leaded class work (15 h). Field work comprises 3 days working in the field.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
naloge iz snovi vaj	40,00 %	exercises problems
teoretična vprašanja	60,00 %	theoretical questions
Za pozitivno oceno mora biti pravilno rešenih najmanj 50% nalog iz snovi vaj in hkrati najmanj 50% teoretičnih vprašanj. Ocenjevalna lestvica: 51-60% (6); 61-70% (7); 71-80% (8); 81-90% (9); 91-100% (10) ob upoštevanju Statuta UL in fakultetnih pravil.		For a positive mark at least 50% of exercises problems should be solved and at least 50% theoretical questions answered correctly. Grades: 51-60% (6); 61-70% (7); 71-80% (8); 81-90% (9); 91-100% (10), according to University Statute and Faculty Acts.

Reference nosilca/Lecturer's references:

GOSAR, Andrej 2005: Seismic reflection investigations for gas storage in aquifers (Mura Depression, NE Slovenia). Geologica Carpathica, 56/3, 285-294.
GOSAR, Andrej 2008: Gravity modelling along seismic reflection profiles in the Krško basin (SE Slovenia). Geologica Carpathica, 59/2, 147-158.

GOSAR, Andrej, Čeru T. 2016: Search for an artificial buried karst cave entrance using ground penetrating radar: a successful case of locating the S-19 Cave in the Mt. Kanin massif (NW Slovenia). International Journal of Speleology, 45/2, 135-147.
GOSAR, Andrej. 2017: Study on the applicability of the microtremor HVSR method to support seismic microzonation in the town of Idrija (W Slovenia). Natural Hazards and Earth System Sciences, 17, 925-937.