UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	VODE KOT HIDROGEOLOŠKI, EKOLOŠKI IN ANALIZNI SISTEM
Course Title:	WATER AS HYDROGEOLOGICAL, ECOLOGICAL, AND ANALYTICAL SYSTEM

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
MAG Kemija, 2. stopnja	**/**	**1.**	**1.**
USP Chemistry, 2nd Cycle	**/**	**1st**	**1st**

Vrsta predmeta / Course Type: izbirni strokovni / Elective Professional

Univerzitetna koda predmeta / University Course Code: K2I14

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individual Work	ECTS
30	**15**	**30 LV**	**/**	**/**	**75**	**5**

Nosilec predmeta / Lecturer: izr. prof. dr. Nataša Gros / Dr. Nataša Gros, Associate Professor

Jeziki / Languages:

Predavanja / Lectures:	**slovenski / Slovenian**
Vaje / Tutorial:	**slovenski / Slovenian**

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.	The course has to be assigned to the student.

Vsebina:	Content (Syllabus outline):
KAKOVOST VOD -karakterizacija vodnih virov -definicije povezane s kakovostjo vod -antropogeni vplivi na kakovost vod -polucija - izvori in poti - prostorske in časovne spremembe -ekonomski razvoj in kakovost vod STRATEGIJE OCENJEVANJA KAKOVOSTI VOD -proces ocenjevanja kakovosti vod -značilni primeri programov spremljanja kakovosti vod -načrtovanje programov ocenjevanja -implementacija programov ocenjevanja kakovosti vod -vrednotenje rezultatov -nadzor nad kakovostjo podatkov	WATER QUALITY - characterisation of water bodies - definitions related to water quality - anthropogenic impacts on water quality - pollutant sources and pathways - spatial and temporal variations - economic development and water quality STRATEGIES FOR WATER QUALITY ASSESSMENT - water quality assessment process - typical water quality monitoring programmes - design of assessment programmes - implementation of water quality assessment programmes - data processing

-interpretacija rezultatov IZBIRA SPREMENLJIVK KAKOVOSTI VOD -hidrološke spremenljivke -splošne spremenljivke -hranilne snovi -organska snov -prevladujoči ioni -druge anorganske spremenljivke -kovine -organski kontaminanti -mikrobiološki indikatorji -izbira spremenljivk PODTALNICA - značilnosti vodonosnikov - interakcije voda-prst-kamnina - vidiki kakovosti podtalnice - strategije ocenjevanja kakovosti - primeri ocenjevanj kakovosti podtalnice REKE -hidrološke značilnosti -kemijske značilnosti -biološke značilnosti -najpomembnejši vidiki kakovosti rek -strategije ocenjevanja kakovosti rečnih sistemov -pristopi k spremljanju in ocenjevanju kakovosti rečnih sistemov – študij primerov JEZERA -značilnosti in tipologija -vidiki kakovosti -strategije ocenjevanja kakovosti jezer -pristopi k ocenjevanju jezer – študij primerov ANALIZA IN INTERPRETACIJA PODATKOV O KAKOVOSTI VOD -Preverjanje zanesljivosti podatkov (anionsko-kationska bilanca, različna preverjanja, relativni odnosi med ioni) -Sklepanje na kamninski izvor -Grafične metode (»Stiff« diagram, Piper diagram) -Prepoznavanje reakcij v podtalnici	- data quality control - interpretation SELECTION OF WATER QUALITY VARIABLES - hydrological variables - general variables - nutrients - organic matter - major ions - other inorganic variables - metals - organic contaminants - microbiological indicators - selection of variables GROUNDWATER - characteristics of groundwater bodies - water-soil-rock interactions - ground water quality issues - assessment strategies - examples of ground water assessment RIVERS - hydrological characteristics - chemical characteristics - biological characteristics - major water quality issues in rivers - strategies for water quality assessment in river systems - approaches to river monitoring and assessment: case studies LAKES - characteristics and typology - water quality issues - assessment strategies - approaches to lake assessment: case studies ANALYSIS AND INTERPRETATION OF WATER QUALITY DATA - reliability of data (anion-cation balance, miscellaneous checks, relative amounts of ions reported) - source-rock deduction - graphical methods – “Stiff” diagram, Piper diagram - ground water reactions

Temeljna literatura in viri / Readings:

- Chapman, D. [Ed] 1996 *Water Quality Assesments – A Guide to Use of Biota, Sediments and Water in Environmental Monitoring – 2nd Edition*. UNESCO/WHO/UNEP, University press, Cambridge. 626 strani (Poglavja: 1-3, 6-7, 9-10 – skupaj 289 strani)

Dodatna literatura:

- Hounslow, A. W. 1995 *Water Quality Data – Analysis and Interpretation.* Lewis Publishers, Boca Raton, New York. (Poglavja: 1-4)

Cilji in kompetence:	**Objectives and Competences:**
Cilji: Študent se pri predmetu usposobi za načrtovanje in implementacijo programov spremljanja in ocenjevanja kakovosti različnih vodnih virov. *Kompetence:* Sposobnost vrednotenja tovrstnih rezultatov, suveren nadzor nad kakovostjo pridobljenih podatkov ter za interpretacijo rezultatov.	Objectives: Knowledge and understanding necessary for planning and implementing programmes for monitoring and evaluation of water quality. Competences: Ability to evaluate and interpret water quality data.

Predvideni študijski rezultati:	**Intended Learning Outcomes:**
Znanje in razumevanje Študent zna spremljati in ocenjevati kakovost različnih vodnih virov.	Knowledge and Comprehension Student develops knowledge and comprehension necessary for monitoring and evaluation of water quality of different water bodies.
Uporaba Uporaba pridobljenih rezultatov za suveren nadzor nad kakovostjo vodnih virov.	Application Student develops ability of using analytical data for water quality evaluation.
Refleksija Študent ima kritičen odnos do kakovosti vodnih virov.	Analysis Student adopts critical attitude towards quality of different water bodies.
Prenosljive spretnosti - sintetično analitično, ustvarjalno mišljenje in reševanje problemov - fleksibilna uporaba znanja v praksi - iniciativnost/ ambicioznost, - osebna odgovornost in odgovornost do skupine, - vrednota stalnega osebnega strokovnega napredovanja	Skill-transference Ability Student fosters: - abilities of data analysis and synthesis, innovative thinking and problem solving - abilities of using knowledge flexibly in practice situations - initiative/ambition - personal responsibility and responsibility towards a group of peers - skills of monitoring personal professional development.

Metode poučevanja in učenja:	**Learning and Teaching Methods:**
Predavanja in seminar z aktivno udeležbo študentov (razlaga, vodeni razgovor, diskusija, študij primerov, reševanje problemov); Seminar: skupinsko in individualno delo povezano s pripravo izhodišč, postavitvijo hipoteze in določitvijo strategije odvzema vzorcev za projektno delo in pisanje z njim povezane seminarske naloge »Ocena kakovosti reke/jezera X in pritokov«, ustna predstavitev izhodišč seminarske naloge. Terenska vaja s prevzemanjem vlog, pri kateri se študenteje praktično usposobijo za odvzem vzorcev vod in dejavnosti na mestu odvzema; Individualni odvzem vzorcev vod v zvezi s seminarsko nalogo. Laboratorijske vaje: analiza vzorcev vod, ki so jih študentje odvzeli individualno in so povezani z njihovimi seminarskimi nalogami (za doseganje višje analizne učinkovitosti in razvijanje osebne odgovornosti in odgovornosti do skupine študentje celotno skupino vzorcev vod analizirajo timsko z delitvijo posamezni zadolžitev). Skupinsko in individualno vrednotenje analiznih rezultatov. Pisanje seminarske naloge, interpretacija rezultatov v povezavi spostavljeno hipotezo in predhodno poznanimi podatki.	Lectures and seminar with active participation of students: explanations, guided discussions, discussions, case studies and problem solving. Seminar: students by individual and group work study the context and define the hypotheses of their project entitled “Evaluation of water quality of a selected water body - river/lake X”. They design sampling strategies and suggest sampling points and prepare an oral presentation. Development of skills necessary for water sampling and on-spot measurements. Water sampling performed individually for the purpose of the project. Laboratory practical: analyses of water samples which students sampled in the context of their project. For higher laboratory efficiency and developing responsibility towards a group of peers students analyse all water samples by sharing tasks. They evaluate data quality and interpret analytical results in relation to their expectations and hypotheses, and write a project report.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
A) Seminarska naloga 40 % B) Izvedba projekta in predstavitev projektne zasnove 40 % C) Ustni izpit 20 % Skupna ocena mora biti 6 ali več (uspešno).		

Reference nosilca / Lecturer's references:

- GROS, Nataša, GORENC, Bogomil. Performance of ion chromatography in the determination of anions and cations in various natural waters with elevated mineralization. *J. chromatogr.*, 1997, vol. 770, str. 119-124.
- GROS, Nataša. The comparison between Slovene and Central European mineral and thermal waters *Acta chim. slov.*, 2003, letn. 50, št. 1, str. 57-66.
- GROS, Nataša, NEMARNIK, Andrej. Accurately determining hydrogen carbonate in water in the presence of or simultaneously with the anions of carboxylic acids. *Acta chim. slov*, 2007, vol. 54,

no. 1, str. 210-215.