

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: VKLJUČEVANJE JAVNOSTI V OKOLJSKE RAZISKAVE
Course title: INVOLVING THE PUBLIC IN ENVIRONMENTAL RESEARCH

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Varstvo okolja in ekotehnologije, 2. stopnja	/	2.	/
Environmental Protection and Eco-technologies, 2 nd level	/	2 nd	/

Vrsta predmeta / Course type Izbirni predmet / Optional course

Univerzitetna koda predmeta / University course code: VJOR

Predavanja Lectures	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
20	10	/	10	80	4

Nosilec predmeta / Lecturer: dr. Rok Novak

Jeziki / Languages:
Predavanja / Lectures: Slovenščina / Slovenian
Vaje / Tutorial: Slovenščina / Slovenian

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

- Pogojev ni.

Prerequisites:

- No formal prerequisites.

Vsebina:

Predmet obravnava vlogo občanske znanosti in participativnih pristopov pri okoljskih raziskavah in varovanju okolja. Študenti se seznanijo z načrtovanjem, izvajanjem in vrednotenjem projektov, ki vključujejo javnost v zbiranje, obdelavo in interpretacijo okoljskih podatkov. Poudarek je na praktičnem delu, kritični presoji kakovosti podatkov, etičnih in pravnih vidikih sodelovanja ter prenosu rezultatov v podporo odločanju in upravljanju okolja. V okviru predmeta študenti spoznajo proces razvoja projekta participativnega spremljanja okolja od zasnove do diseminacije.

Poglavitne teme:

- Vloga javnosti v okoljskih raziskavah in varovanju okolja;
- tipologije občanske znanosti in stopnje participacije;
- so-oblikovanje raziskovalnih vprašanj in projektnih ciljev;
- varstvo osebnih podatkov in fairifikacija;

Content (Syllabus outline):

The course deals with the role of citizen science and participatory approaches in environmental research and protection. Students learn about the planning, implementation, and evaluation of projects that involve the public in the collection, processing, and interpretation of environmental data. The emphasis is on practical work, critical assessment of data quality, ethical and legal aspects of cooperation, and the transfer of results to support decision-making and environmental management. Within the framework of the course, students learn about the process of developing a participatory environmental monitoring project from conception to dissemination.

Main topics:

- The role of the public in environmental research and protection;
- typologies of citizen science and levels of participation;
- co-creation of research questions and project objectives;

- kvalitativne in kvantitativne metode zbiranja participativnih okoljskih podatkov;
- uporaba senzorjev, prostorskih podatkov in distribuiranega vzorčenja;
- načrtovanje in izvedba zbiranja podatkov;
- harmonizacija, čiščenje in integracija heterogenih podatkov;
- presoja kakovosti podatkov, validacija in obvladovanje negotovosti;
- uporaba analitičnih orodij in umetne inteligence pri obdelavi podatkov;
- interpretacija rezultatov v sodelovanju z javnostjo;
- diseminacija rezultatov in vloga prostovoljcev

- personal data protection and fairification;
- qualitative and quantitative methods for collecting participatory environmental data;
- use of sensors, spatial data, and distributed sampling;
- planning and implementation of data collection;
- harmonization, cleaning, and integration of heterogeneous data;
- data quality assessment, validation, and uncertainty management;
- use of analytical tools and artificial intelligence in data processing;
- interpretation of results in collaboration with the public;
- dissemination of results and the role of volunteers.

Temeljna literatura in viri / Textbooks:

Obvezna / Required:

1. Fraisl D., Hager G., Bedessem B., Gold M., Hsing P.-Y., Danielsen F., Hitchcock C. B., Hulbert J. M., Piera J., Spiers H., Thiel M., Haklay M., 2022. Citizen science in environmental and ecological sciences. *Nature Reviews Methods Primers*, doi: 10.1038/s43586-022-00144-4.
2. Rubio M. A., Novak R., Hidalgo L., Litt J., Slater D., Kocman D., 2026. "Challenging but worth it!": the purpose of participatory research in urban health, an evaluation and derived framework. *Cities*, doi: 10.1016/j.cities.2025.106569.
3. Kunaver U., Muršič Z., Robinson J. A., Romih T., 2025. Občanska znanost v 5 korakih: Načrtovanje in oblikovanje projektov. Maribor, Univerzitetna založba Univerze v Mariboru.

Priporočena / Recommended:

1. Novak R., Kocman D., Robinson J. A., Kanduć T., Sarigiannis D., Horvat M., 2020. Comparing airborne particulate matter intake dose assessment models using low-cost portable sensor data. *Sensors*, doi: 10.3390/s20051406.
2. Kocman D., Števanec T., Novak R., Kranjec N., 2020. Citizen science as part of the primary school curriculum: a case study of a technical day on the topic of noise and health. *Sustainability*, doi: 10.3390/su122310213.
3. Novak R., Robinson J. A., Kanduć T., Sarigiannis D., Kocman D., 2023. Simulating the impact of particulate matter exposure on health-related behaviour: a comparative study of stochastic modelling and personal monitoring data. *Health & place*, doi: 10.1016/j.healthplace.2023.103111.

Cilji in kompetence:

Predmetno specifični cilji in kompetence:

- Sposobnost samostojnega načrtovanja, organizacije in izvajanja participativnih okoljskih raziskav z vključevanjem javnosti v vse faze projekta;
- sposobnost kritične presoje kakovosti, zanesljivosti in omejitev podatkov ter uporabe ustreznih analitičnih, validacijskih in digitalnih orodij pri njihovi obdelavi;
- sposobnost učinkovite interpretacije in komunikacije rezultatov ter njihovega prenosa v

Objectives and competences:

Specific competences:

- Ability to independently plan, organize, and implement participatory environmental research by involving the public in all phases of the project;
- Ability to critically assess the quality, reliability, and limitations of data and to use appropriate analytical, validation, and digital tools in their processing;
- Ability to effectively interpret and communicate results and transfer them into practice, in cooperation with local communities, decision-makers, and other stakeholders.

prakso, v sodelovanju z lokalnimi skupnostmi, odločevalci in drugimi deležniki.

Splošne kompetence:

- Sodelovalno delo, facilitacija skupinskih procesov in so-oblikovanje rešitev z različnimi deležniki;
- odgovorno ravnanje z osebnimi in drugimi podatki
- zbiranje, analiza, interpretacija in kritična presoja podatkov z uporabo sodobnih digitalnih in analitičnih orodij;
- učinkovita pisna, ustna in digitalna komunikacija strokovnih vsebin različnim ciljnim skupinam;
- načrtovanje, vodenje in trajnostni razvoj projektov v interdisciplinarnem okolju.

General competences:

- Collaborative work, facilitation of group processes, and co-creation of solutions with various stakeholders;
- Responsible handling of personal and other data
- Collection, analysis, interpretation, and critical assessment of data using modern digital and analytical tools
- Effective written, oral, and digital communication of professional content to various target groups
- planning, managing, and sustainable development of projects in an interdisciplinary environment.

Predvideni študijski rezultati:

Znanje in razumevanje:

Študent bo ob zaključku predmeta sposoben:

- razumeti vlogo občanske znanosti in participativnih pristopov pri varovanju okolja ter njihovo umeščenost v sodobne raziskovalne in upravljavske procese;
- razložiti metodološke in etične vidike vključevanja javnosti v okoljske raziskave;
- poznati kvalitativne in kvantitativne metode zbiranja, obdelave in validacije participativnih podatkov;
- razumeti omejitve, negotovosti in pristranskosti podatkov, pridobljenih z metodami občanske znanosti;
- razložiti vlogo participativnih raziskav pri oblikovanju politik in odločanju.

Prenosljive/ključne spretnosti in drugi atributi:

- Načrtovanje in izvajanje projektnega dela v interdisciplinarnem in sodelovalnem okolju;
- zbiranje, analiza in interpretacija podatkov iz različnih virov;
- učinkovita komunikacija strokovnih vsebin različnim ciljnim skupinam;
- delo v skupini, facilitacija razprav in upravljanje sodelovanja;
- odgovorno, etično in profesionalno ravnanje pri delu z ljudmi in podatki.

Intended learning outcomes:

Knowledge and understanding:

At the end of the subject, student will be able:

- understand the role of citizen science and participatory approaches in environmental protection and their place in contemporary research and management processes;
- explain the methodological and ethical aspects of public involvement in environmental research;
- be familiar with qualitative and quantitative methods of collecting, processing, and validating participatory data;
- understand the limitations, uncertainties, and biases of data obtained through citizen science methods;
- explain the role of participatory research in policy-making and decision-making.

Transferable/key skills and other attributes:

- Planning and implementing project work in an interdisciplinary and collaborative environment;
- Collecting, analyzing, and interpreting data from various sources;
- Effective communication of professional content to different target groups;
- Working in a group, facilitating discussions, and managing collaboration;
- Responsible, ethical, and professional conduct when working with people and data.

Metode poučevanja in učenja:

Oblike dela:

- predavanja
- seminarsko delo

Learning and teaching methods:

Forms of teaching:

- lectures
- seminar work

<ul style="list-style-type: none"> • projektno delo • terensko delo (praktični prikaz uporabe in implementacije participativnih orodij in pristopov) <p>Metode dela:</p> <ul style="list-style-type: none"> • problemsko učenje • študije primerov • praktične vaje • razprava in refleksija

<ul style="list-style-type: none"> • project work • field work (demonstration and implementation of participatory tools and approaches) <p>Teaching methods:</p> <ul style="list-style-type: none"> • problem-based learning • case studies • practical exercises • discussion and reflection
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Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
<p>Pogoj za pristop k izpitu: 80 % prisotnost na seminarskih vajah in 100 % prisotnost na terenskih vajah</p> <p>Končna ocena pri predmetu je sestavljena iz ocene projektne naloge, ustnega izpita v obliki zagovora projektne naloge, ter aktivne udeležbe na terenskih vajah:</p> <ul style="list-style-type: none"> - Terenske vaje - Projektna naloga - Ustni izpit <p>Ocenjevalna lestvica:</p> <ul style="list-style-type: none"> ▪ zadostno 6: 60–67 % ▪ dobro 7: 68–75 % ▪ prav dobro 8: 76–83 % ▪ prav dobro 9: 84–90 % ▪ odlično 10: 91–100 % 	<p>20 %</p> <p>40 %</p> <p>40 %</p>	<p>A prerequisite for access to the exam: 80% attendance at seminars and 100% attendance at field exercises</p> <p>Final evaluation consists of the grade for the project assignment, an oral exam in the form of a defence of the project assignment, and active participation in field exercises:</p> <ul style="list-style-type: none"> - Field exercises - Project assignment - Oral exam <p>Grading scale:</p> <ul style="list-style-type: none"> ▪ Sufficient D (6): 60–67% ▪ Good C (7): 68–75% ▪ Very good B (8): 76–83% ▪ Very good B+ (9): 84–90% ▪ Excellent A (10): 91–100%

<p>Materialni pogoji za izvedbo predmeta :</p> <ul style="list-style-type: none"> • Predavalnica z multimedijsko opremo.
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<p>Material conditions for subject realization:</p> <ul style="list-style-type: none"> • Classroom with multimedia equipment.

<p>Obveznosti študentov:</p> <ul style="list-style-type: none"> - Najmanj 80 % prisotnost na seminarskih vajah in 100 % prisotnost na terenskih vajah; - Priprava in oddaja projektne naloge, ki temelji na vsebini predavanj in vaj; - Uspešno opravljen izpit oziroma zaključna predstavitev projekta; - Odgovorna, transparentna in etična raba orodij generativne umetne inteligence (npr. ChatGPT, Copilot, Gemini) v skladu z navodili izvajalca predmeta.

<p>Student's commitments:</p> <ul style="list-style-type: none"> - At least 80% attendance at seminars and 100% attendance at field exercises; - Preparation and submission of a project assignment based on the content of lectures and exercises; - Successful completion of the exam or final project presentation; - Responsible, transparent, and ethical use of generative artificial intelligence tools (e.g., ChatGPT, Copilot, Gemini) in accordance with the course instructor's instructions.

<p>Reference nosilca predmeta:</p> <p>Pedagoško delo:</p> <ul style="list-style-type: none"> • So-oblikoval predmet <i>Občanska znanost in okoljsko zdravje</i> na Mednarodni podiplomski šoli Jožefa Stefana • So-mentor mladi raziskovalki
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<p>Lecturer's references:</p> <p>Pedagogic activities:</p> <ul style="list-style-type: none"> • Co-designed the course Civic Science and Environmental Health at the Jožef Stefan International Postgraduate School
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Znanstveno-raziskovalno delo:

- Raziskovalno delo na področju izpostavljenosti urbanim stresorjem, osebnega monitoringa in participativnega zbiranja podatkov v okviru številnih nacionalnih in mednarodnih raziskovalnih projektov;
- Razvoj in uporaba metod za integracijo, analizo in interpretacijo okoljskih, prostorskih in vedenjskih podatkov z uporabo naprednih analitičnih in modelnih pristopov;
- Sodelovanje pri razvoju in validaciji nizkocenovnih senzorjev ter metod za ocenjevanje kakovosti okoljskih podatkov.

Strokovno delo in izbrane strokovne publikacije:

- Priprava strokovnih poročil, projektnih vsebin in analitičnih gradiv za nacionalne in mednarodne projekte;
- Podelovanje pri znanstveni diseminaciji in prenosu znanja v prakso (delavnice, predavanja, javne razprave);
- Razvoj komunikacijskih vsebin za podporo odločanju in ozaveščanju.
- Avtorstvo strokovnih in poljudnoznanstvenih člankov na temo okoljskih izpostavljenosti, podatkovnih analiz in participativnih raziskav, med drugim:
 - NOVAK, R., 2022. Cena klimatske krize. Alternator: misliti znanost, št. 17, 3 str. DOI: [10.3986/alternator.2022.17](https://doi.org/10.3986/alternator.2022.17)
 - NOVAK, R., 2022. Hot in the city: urbani toplotni otok. Alternator: misliti znanost, št. 27, 3 str. DOI: [10.3986/alternator.2022.27](https://doi.org/10.3986/alternator.2022.27)

- Co-mentor to a young researcher

Scientific and research work:

- Research work in the field of exposure to urban stressors, personal monitoring, and participatory data collection within the framework of numerous national and international research projects;
- Development and application of methods for the integration, analysis, and interpretation of environmental, spatial, and behavioral data using advanced analytical and modeling approaches;
- Participation in the development and validation of low-cost sensors and methods for assessing the quality of environmental data.

Professional work and selected professional publications:

- Preparation of expert reports, project content, and analytical materials for national and international projects;
- Participation in scientific dissemination and transfer of knowledge into practice (workshops, lectures, public debates);
- Developing communication content to support decision-making and raise awareness.
- Authoring expert and popular science articles on environmental exposure, data analysis, and participatory research, including:
 - NOVAK, R., 2022. Cena klimatske krize. Alternator: misliti znanost, št. 17, 3 str. DOI: [10.3986/alternator.2022.17](https://doi.org/10.3986/alternator.2022.17)
 - NOVAK, R., 2022. Hot in the city: urbani toplotni otok. Alternator: misliti znanost, št. 27, 3 str. DOI: [10.3986/alternator.2022.27](https://doi.org/10.3986/alternator.2022.27)

Izbrani znanstveni članki / Selected scientific papers:

- Novak R.**, Robinson J. A., Kanduć T., Sarigiannis D., Kocman D., 2023. Simulating the impact of particulate matter exposure on health-related behaviour: a comparative study of stochastic modelling and personal monitoring data. *Health & place*, doi: 10.1016/j.healthplace.2023.103111.
- Novak R.**, Robinson J. A., Kanduć T., Sarigiannis D., Kocman D., 2022. Assessment of individual-level exposure to airborne particulate matter during periods of atmospheric thermal inversion. *Sensors*, doi: 10.3390/s22197116.
- Novak R.**, Kocman D., Kanduć T., et al., 2021. Harmonization and visualization of data from a transnational multi-sensor personal exposure campaign. *International journal of environmental research and public health*, doi: 10.3390/ijerph18211614.
- Robinson J. A., **Novak R.**, Kanduć T., Kocman D., et al., 2021. User-centred design of a final results report for participants in multi-sensor personal air pollution exposure monitoring campaigns. *International journal of environmental research and public health*, doi: 10.3390/ijerph182312544.
- Novak R.**, Robinson J. A., Kanduć T., Sarigiannis D., Džeroski S., Kocman D., 2023. Empowering participatory research in urban health: wearable biometric and environmental sensors for activity recognition. *Sensors*, doi: 10.3390/s23249890.
- Novak R.**, Robinson J. A., Frantzidis C., Sejdullahu I., Persico M. G., Kontić D., Sarigiannis D., Kocman D., 2023. Integrated assessment of personal monitor applications for evaluating exposure to urban stressors: a scoping review. *Environmental research*, doi: 10.1016/j.envres.2023.115685.
- Novak R.**, Robinson J. A., Kanduć T., Sarigiannis D., Kocman D., 2024. Personal airborne particulate matter exposure and intake dose, indoor air quality, biometric, and activity dataset from the city of Ljubljana, Slovenia. *Data in brief*, doi: 10.1016/j.dib.2023.109877.
- Kocman D., Kanduć T., **Novak R.**, Robinson J. A., Horvat M., et al., 2022. Multi-sensor data collection for personal exposure monitoring: Icarus experience. *Fresenius environmental bulletin*.
- Rubio M. A., **Novak R.**, Snoj Tratnik J., Kontić D., Bučar G., Kocman D., 2025. Urban Cycling Lab: a citizen science protocol for assessing and reducing exposure to environmental stressors among bike commuters. *MethodsX*, doi: 10.1016/j.mex.2025.103657.

Rubio M. A., **Novak R.**, Hidalgo L., Litt J., Slater D., Kocman D., 2026. "Challenging but worth it!": the purpose of participatory research in urban health, an evaluation and derived framework. *Cities*, doi: 10.1016/j.cities.2025.106569.