

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Oblikovanje zvoka za videoigre in razširjeno resničnost
Course title: Video game and Extended Reality Audio Design

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Razvoj videoiger in razširjenih resničnosti, visokošolski strokovni študijski program prve stopnje	-	Drugi	Četrta
Game and Extended Reality Development, first cycle Professional Study Programme	-	Second	Fourth

Vrsta predmeta / Course type

Obvezni / Obligatory

Univerzitetna koda predmeta / University course code:

4-RVRR-VS-OZVRR-2025-02-27

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30	-	45	-	-	105	6

Nosilec predmeta / Lecturer:

Izr. prof. dr. Blaž Rodič, doc. dr. Tadej Droljc

Jeziki / Languages:

Predavanja / Lectures: Slovenski, angleški / Slovene, English

Vaje / Tutorial: Slovenski, angleški / Slovene, English

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

Študent/študentka pred vključitvijo v delo usvoji vsebine predmeta Akustika.

Študent/študentka mora imeti pred pristopom k izpitu pozitivno ocenjene vaje in seminarско nalogo.

Prerequisites:

Student studies the content of Acoustics course before starting work in this course.

Positively evaluated tutorial exercises and seminar paper are prerequisites for exam.

Vsebina:

- Procesiranje zvoka: analogni in digitalni signal, kvantizacijski šum, ojačitev in slabenje, analogno digitalna in digitalno analogna pretvorba, popačenja, filtriranje.
- Kategorije zvoka v videoigrah in razširjenih resničnostih; specifike zajema ter

Content (Syllabus outline):

- Sound processing: analog and digital signal, quantization noise, gain and loss, analogue to digital and digital to analogue conversion, distortion, filtering.
- Categories of sound in video games

obdelave (dialog, atmosfera, zvočni efekti (Foley in specialni efekti), glasba), 2D in 3D zvok.

- Snemanje zvoka - tehnologija: digitalno snemanje in predvajanje zvoka, snemalne in monitoring naprave, programska oprema (Adobe Creative Cloud: Audition, Steinberg Wavelab, Lexis).
- Snemanje zvoka - tehnika: nivoji in merjenje signala, stereofonski zvok, tehnike snemanja večkanalnega zvoka, akustične lastnosti prostora in predmetov pri zajemu zvoka, zvočniki in mikrofoni;
- Viri audio vsebin v videoigrah in razširjeni resničnosti: knjižnice zvočnih vzorcev/samplov (Freesound, Splice, Loopcloud, Loopmasters), programski in strojni sintetizatorji, lastni posnetki.
- Procesiranje in oblikovanje zvoka: naprave in programska oprema za sintezo, zajem, mešanje, izenačevanje, filtriranje, urejanje dinamike posnetka, efekti na osnovi zakasnitev, zmanjševanje šuma, diskretne naprave za procesiranje zvoka. Oscilatorji (osnovne oblike, FM sinteza, aditivna sinteza, vzorci, fizikalno modeliranje), ovojnice, modulacija zvoka.
- Zvokovna montaža in urejanje: strojna in programska oprema, ureditev delovnega prostora, orodja, efekti; programska oprema, kontrolerji (Blackmagic Fairlight)
- Programski standardi: vmesniki (VST, AU, AAX...), formati zapisov (WAV, FLAC, MP3, AAC, OGG).
- Produktivne metode: planiranje produkcije, produkcijsko osebje in oprema.
- Integracija zvoka v produkciji iger: cevovod produkcije iger, cevovod produkcije zvočnih vsebin, zvok v Unity in Unreal engine-ih, audio middleware (FMOD, Wwise).
- Specifike upravljanja intelektualne lastnine pri zvočnih vsebinah.

and extended reality; the specifics of capture and processing (dialogue, atmosphere, sound effects (Foley and hard sound effects), music), 2D and 3D sound.

- Sound recording - technology: digital recording and sound reproduction, recording and monitoring devices, software (Adobe Creative Cloud: Audition, Steinberg Wavelab, Lexis).
- Sound recording – technique: level and signal measurement, stereophonic sound, multichannel sound recording techniques, acoustic properties of space and objects when capturing sound, speakers and microphones;
- Sources of audio content in video games and extended reality: audio sample libraries (Freesound, Splice, Loopcloud, Loopmasters), software and hardware synthesizers, own recordings.
- Sound processing and design: devices and software for synthesizing, capturing, mixing, equalizing, filtering, editing audio dynamics, delay based effect, noise reduction, discrete sound processing devices. Oscillators (basic waveforms, FM synthesis, additive synthesis, samples, physical modelling), envelopes, audio modulation.
- Sound tracking and editing: software and hardware equipment, arrangement of work space, tools, effects, software, controllers (Blackmagic Fairlight);
- Program standards: interfaces (VST, AU, AAX ...), record formats (WAV, FLAC, MP3, AAC, OGG).
- Production methods: production planning, production staff and equipment.
- Sound integration in game production: game pipeline, game audio pipeline, audio in Unity and Unreal engines, audio middleware (FMOD, Wwise).
- Specifics of Intellectual Property Management in Sound Content.

Temeljni literatura in viri / Readings:

- Sinclair, J. (2020). Principles of game audio and sound design: Sound Design and Audio Implementation for Interactive and Immersive Media . Focal Press.
- Riviere, A. (2023). Game Audio mixing: Insights to Improve Your Mixing Performance. Focal Press.
- Huber, D. M., & Runstein, R. E. (2017). Modern recording techniques. Focal Press.
- Owsinski, B. (2017). The Recording Engineer's Handbook 4th Edition, BOMG Publishing.
- Phillips, W. (2017). A Composer's Guide to game Music. MIT Press.
- Marks, A. (2017). Aaron Marks' complete guide to game audio: For Composers, Sound Designers, Musicians, and Game Developers.
- Stevens, R. L., & Raybould, D. (2015). Game Audio Implementation. In Routledge eBooks.

Cilji in kompetence:

Cilj predmeta je spoznati fizikalne in matematične temelje zvoka, vidike procesiranja zvočnih signalov, tehnologije in tehnike snemanja, oblikovanja, urejanja in distribucije zvočnih vsebin za produkcijo videoiger in razširjenih resničnosti, ter standarde s področja zvočne produkcije in specifične upravljanja intelektualne lastnine. Učna enota prispeva k razvoju naslednjih splošnih in predmetno-specifičnih kompetenc:

Splošne kompetence:

- Sposobnost fleksibilne uporabe znanja v praksi.
- Raziskovanje, dokumentiranje, analiza in interpretacija razvojnih in oblikovnih konceptov v kontekstih videoiger in razširjenih resničnosti.
- Prepoznavanje in ocenitev aktualnih in nastajajočih tehnologij in sodobnih metod, veščin in tehnik s področij videoiger in razširjenih resničnosti ter ocenitev njihove uporabnosti za reševanje potreb uporabnikov
- Sposobnost interdisciplinarnega povezovanja in nadgradnje znanj iz drugih sorodnih kreativnih področij.
- Usposobljenost za skupinsko delo v vseh fazah razvoja in oblikovanja programske opreme.

Predmetno specifične kompetence:

- Obvladovanje tehnik snemanja zvoka v zunanjih in studijskih pogojih;
- Obvladovanje tehnike digitalne obdelave in montaže zvoka;

Objectives and competencies:

The aim of the course is to learn the physical and mathematical foundations of sound, the aspects of processing sound signals, technologies and techniques for recording, designing, editing and distributing sound contents for video games and extended reality production and standards in the field of sound production and the specifics of managing intellectual property.

The instructional unit contributes to the development of the following general and subject-specific competences:

General competences:

- Ability of flexible usage of knowledge in practice
- Research, documentation, analysis and interpretation of development and design concepts in the contexts of video games and extended reality.
- Identification and evaluation of current and emerging technologies and contemporary methods, skills and techniques in the fields of video games and extended reality, and assessment of their applicability to address user needs.
- Ability to interdisciplinarily integrate and build on knowledge from other related creative fields.
- Ability to work as part of a team in all phases of software development and design.

Course -specific competences:

- Mastering the sound recording techniques in field and studio conditions;

- Obvladovanje tehnik konceptualnega načrtovanja, sinteze in oblikovanja avdio vsebin v videoigrah in razširjeni resničnosti;
- Sposobnost razumevanja fenomena percepcije zvoka in zvočnih efektov v kontekstih produkcije videoiger in razširjenih resničnosti;
- Poznavanje problematike zaščite in varovanja intelektualne lastnine na področju zvočnih vsebin.

- Mastering the techniques of digital processing and assembly of sound;
- Mastering the techniques of conceptual planning and design of audio content for video games and extended reality;
- The ability to understand the phenomenon of sound perception and audio effects in the context of video games and extended reality production;
- Knowledge of issues in protecting intellectual property in the field of audio content.

Predvideni študijski rezultati:

Znanje in razumevanje:

Študent po zaključku predmeta:

- pozna fizikalne in matematične osnove zvoka,
- pozna tehnične karakteristike opreme v avdio produkciji,
- pozna in uporablja metode in tehnike snemanja, sinteze, obdelave in predvajanja zvočnih posnetkov,
- pozna inženirske principe digitalne zvočne produkcije,
- pokaže razumevanje različnih diskurzov, ki se nanašajo na interpretacijo zvoka in zvočnih učinkov v kontekstih videoiger in razširjenih resničnosti,
- je seznanjen s problematiko intelektualne lastnine na svojem področju.

Intended learning outcomes:

Knowledge and understanding:

After completing the course, the student:

- knows the physical and mathematical basics of sound,
- knows the technical characteristics of the equipment in audio production,
- knows and uses the methods and techniques for recording, processing and playing sound recordings,
- knows the engineering principles of digital sound production,
- demonstrates an understanding of the various discourses pertaining to the interpretation of sound and sound effects in the contexts of video games and extended reality,
- is aware of intellectual property issues in its field.

Metode poučevanja in učenja:

- predavanja z aktivno udeležbo študentov
- druge oblike študija: delavnice z uveljavljenimi strokovnjaki na področju avdio produkcije
- laboratorijske vaje

Learning and teaching methods:

- lectures with the active participation of students
- other forms of study: workshops with established audio production professionals
- laboratory exercises

Delež (v %) /

Weight (in %)

Načini ocenjevanja:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):

- pisni izpit
- empirična seminarska naloga in poročila z vaj

50

50

Assessment:

Type (examination, oral, coursework, project):

- written examination
- empirical seminar work and reports from exercises

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Reference nosilca / Lecturer's references:

RODIČ, Blaž

- RODIČ, Blaž. Issues of e-collaboration and knowledge management in media industries. V: LUGMAYR, Artur (ur.), et al. Information systems and management in media and entertainment industries, (International series on computer entertainment and media technology (Online), ISSN 2364-9488). Cham: Springer. cop. 2016.
- BARTOL, Tomaž, DOLNIČAR, Danica, BOH PODGORNİK, Bojana, RODIČ, Blaž, ZORANOVIČ, Tihomir. A comparative study of information literacy skill performance of students in agricultural sciences. Journal of academic librarianship, ISSN 0099- 1333. [Print ed.], 2018, iss. 3, vol. 44, str. 374-382, doi: 10.1016/j.acalib.2018.03.004.
- BOH PODGORNİK, Bojana, DOLNIČAR, Danica, ŠORGO, Andrej, BARTOL, Tomaž, GLAŽAR, Saša A. (sodelavec pri raziskavi), FERK SAVEC, Vesna (sodelavec pri raziskavi), JURIŠEVIČ, Mojca (sodelavec pri raziskavi), SAJOVIC, Irena (sodelavec pri raziskavi), VRTAČNIK, Margareta (sodelavec pri raziskavi), BAGGIA, Alenka (sodelavec pri raziskavi), KLJAJIČ BORŠTNAR, Mirjana (sodelavec pri raziskavi), PUCIHAR, Andreja (sodelavec pri raziskavi), RODIČ, Blaž (sodelavec pri raziskavi). Evaluation of information literacy of Slovenian university students. V: KURBANOGLU, Serap (ur.). Information literacy : moving toward sustainability : third European conference, ECIL 2015, Tallinn, Estonia, october 19-22, 2015 : revised selected papers, (Communications in Computer and Information Science, ISSN 1865-0929, Vol. 552). Cham [etc.]: Springer. 2015, str. 499-508, doi: 10.1007/978-3-319-28197- 1_50.
- RODIČ, Blaž, VUKOVIČ, Goran, ZAVRŠNIK, Bruno, MIGLIČ, Gozdana. Issues in introducing training needs analysis in Slovenia's public administration. Transylvanian review of administrative sciences, ISSN 1842-2845, 2012, no. 37 E, str. 155-171, ilustr. <http://rtsa.ro/en/files/TRAS-37E-2012-10RODIC,%20VUKOVIC,%20BZAVRSNIK,%20MIGLIC.pdf>. [COBISS.SI-ID 2048002835
- RODIČ, Blaž. Izzivi sodelovanja v virtualnem okolju = Collaboration challenges in virtual environment. V: OREL, Mojca (ur.), JURJEVIČIČ, Stanislav (ur.). Nova vizija tehnologij prihodnosti = The new vision of future technologies, Mednarodna konferenca InfoKomTeh 2012, Ljubljana, 25. oktober 2012 = International Conference InfoKomTeh 2012, 25th October 2012.
- RODIČ, Blaž. Issues of collaboration in a virtual environment. V: LEVNAJIČ, Zoran (ur.). Facing ICT challenges in the era of social media. Frankfurt am Main: PL Academic Research. 2014, str. 11-22, graf. prikazi, tabele.

DROLJC, Tadej

- Snemanje zvoka v zunanjih in studijskih pogojih, montaža in digitalno procesiranje kot sestavni del lastne umetniške prakse, od 2005 dalje za terensko snemanje in od 2008 dalje za studijsko snemanje
- Delo na radiu kot tonski tehnik, 2013
- Delo za televiziji kot tonski tehnik, 2012
- Zvočni dizajn za video ter miks in mastering. Primer: <https://vimeo.com/83703241>, 2009 - 2014
- Na Univerzi v Huddersfieldu (VB) učil predmeta Computer Composition 1 (4 leta) ter Desktop Music Production (1 leto), avdio produkcija del kurikuluma, 2015 -2019

- Vodil in pripravljaj oddajo Glasbeno Drobovje, ki se je med drugim posvečala avdioprodukciji in gostil številna imena slovenske avdio produkcije: Gregor Zemljič, Janez Križaj, Jernej Černologar, Peter Penko, Umek itn., 2012 - 2014
- Vodil številne avdio produkcijske delavnice, 2011 - 2014
- prispevek Avdio produkcija in postprodukcija v priročniku Multimedijško ustvarjanje. http://stara.pina.si/wp-content/uploads/2015/04/prirocnik_mu.pdf
- Doktoriral na oddelku za raziskovanje novih glasb (CeReNeM), Univerza v Huddersfieldu (VB), avdio produkcija je del njegovega doktorskega portfolia; 2019