

UNIVERSITY OF KRAGUJEVAC



Master academic studies

Computer Games Development

Study program Book of courses

Study program: MAS Computer Games Development
Course title: NARRATOLOGICAL AND SEMIOLOGICAL MODELS AND COMPUTER GAMES
Teacher(s): Bošković B. Dragan, Lojanica V. Marija, Bujanja M. Nikola, Nikolić Časlav
Course status: obligatory
No. of ECTS: 5
Prerequisite: /
<p>Course objective</p> <p>Acquiring, developing, expanding and applying theoretical and practical knowledge of narratological and semiological aspects of different media (literary, comics, cinematographic, digital) and genres (conventional fiction, fantasy, SF, cyberpunk, detective fiction, horror); introduction to particular narrative and semiological practices, narrative and symbolic nature of human identity, various ontological statuses of narrative worlds; developing theoretical knowledge of narrative/semiological models and story structure: from play, via literature, media, to computer game; developing theoretical knowledge of design and story: from conventional to digital design; mastering narratological and semiological analysis, interpretation and production of fictional and parafictional “text” (from literary to digital, from printed to electronic media).</p>
<p>Course outcome</p> <p>Practical and theoretical acquisition of narrative and semiological aspects of human discourse (from play and story, via film and cultural sign systems, to digital game) that would serve as the basis of understanding narrative aspect of computer games. Developing not only theoretical, social, analytical, but also creative competences. Acquiring skill sets necessary for creating and interpreting humanistic, as well as narrative and semiological identity of computer games. Developing the competences necessary for constructing a functional video game script and innovating narrative, semiological and genre patterns of digital texts. Gaining knowledge and skills necessary for exercising digital creativity and realizing trans-disciplinary projects.</p>
<p>Course content</p> <p><i>Theoretic lectures</i></p> <p>Problems and definitions of narration. Narrative technique – the most general type of “producing” visual (cinematographic, digital) stories. Narrative instances, narrative plans, narrative, diegesis, narrative perspectives, voices, points of view, focalization, focalizers. Narratological and semiological characteristics of literature, film, digital media, and computer games. Interactive storytelling and ludonarratology. Characteristics of ergodic literature. Trans-media, trans-narrative, and intertextual relationships informing the formation of digital culture. Computer game as an exponent of dominant ideological discourses on subjectivity and identity, or the space of their subversion. The influence of games on developing consumers' identity structures. Ontology of digital worlds. Ethical and ideological aspects of computer games. Digital games and communication, social interaction, “sport“, pleasure found in play. Literary and digital esthetics. Computer games and culture. Creating computer games – creating future (futurism and science fiction).</p> <p><i>Practical lectures</i></p> <p>Mastering the techniques of narrative and semiological interpretation and creation of a story. Analytical and creative conceptualization of a story, from plot (social, crime, war, futuristic), via narrative (who tells which story – (trans)human narratives, savior/heroic narratives, war, melodrama, apocalyptic mode) and story's symbolic system (onomastic, mythological, archaic, digital, hypertextual), to computer game script. Acquiring storytelling skill sets, as well as story visualization and design, interpreting the relationship between: story and image, story and film, and story and computer game. Critical tracing of social and humanistic aspects of a story, computer game, and digital worlds.</p>
<p>Literature</p> <ol style="list-style-type: none"> 1. H. Porter Abot, Uvod u teoriju proze, 2009. (H. Porter Abbott, The Cambridge Introduction to Narrative) 2. Shlomith Rimmon-Kenan, Narrative Fiction, London: Routledge, 1983. 3. G. P. Landow, Hypertext 2.0: The Convergence of Contemporary Critical Theory and Technology, 1992. 4. E. J. Aarseth, Cybertext: Perspectives on Ergodic Literature, 1997. 5. Marie-Laure Ryan, Avatars of Story, University Of Minnesota Press, 2006. 6. Marie-Laure Ryan, Narrative as Virtual Reality: Immersion and Interactivity in Literature and Electronic Media, Baltimore: Johns Hopkins University Press, 2001. 7. Looking Forward, Looking Back: Interactive Digital Storytelling and Hybrid Art Approaches, (ed.) Rebecca Rouse and Mara Dionisio, Carnegie Mellon University: ETC Press, Pittsburgh, PA, 2018.

8. Ж. Вирилио, Машине визије, 1993. (J. Virilio, The Vision Machine)			
9. Žan Bодrijar, Simulakrumi i simulacija, Svetovi, Novi Sad, 1991. (J. Baudrillard, Simulacra and Simulation)			
10. П. Рикер, Сопство као други, 2004. (P. Ricoeur, Oneself as Another)			
Number of active teaching classes	Theory: 30		Practice: 30
Lecture delivery methods			
Verbal and textual, illustrative and demonstrative, interactive			
Knowledge evaluation (maximum number of points 100)			
Pre-exam activities	points	Final exam	points
In-class activity	20	written exam	40
practical lectures	40		
projects			

Study program: MAS Computer Games Development
Course title: SOFTWARE ENVIRONMENT FOR COMPUTER GAMES DEVELOPMENT 1
Teacher(s): Dalibor Nikolić
Industry lecturer: Adrian Djura
Course status: obligatory
No of ECTS: 5
Prerequisite: /
Course objective
Introducing students to the concepts and techniques of 3D video game development. During this course, it is planned to introduce students to the basic and advanced functions of the software tool "Unreal Engine" and its services. The course includes basic knowledge of computer video games, "Unreal Engine", scripting language "Blueprints", materials in video games, animation and user environment.
Course outcome
The students will develop the ability to understand and individually designed modern 3D video games based on the "Unreal Engine". In addition, it is expecting that students will develop the ability to understand programming in a graphical script language "Blueprints" developed for the "Unreal Engine". Students will gain knowledge and experience of independent development of 3D video games.
Course content
<i>Theoretic lectures</i>
Introduction to the basics of 3D video games and the basics of the "Unreal Engine" system. The process of making 3D games. Stages of development of 3D games. Composition of the game development team. Tools for developing 3D games. Modeling 3D objects: Surfaces, polygons, coloring 3D objects, maps and textures. Game development in game engine. Functionality of the game engine: creation of projects, scenes and objects. Stage composition and lighting. Programming - scripting. Player interface development. Animation and sound. Fundamentals of artificial intelligence in games.
<i>Practical lectures</i>
Exercises are performed in a computer classroom. Simple scenes, parts of 3D games in "Unreal Engine" are developed during the exercises. Project development - development of simple 3D games.
Literature
1. Aram Cookson, Ryan Dowling Soka, Clinton Crumpler, Unreal Engine 4 Game Development in 24 Hours, Sams Publishing, 2016. (ISBN- 9780134389103)
2. Marcos Romero; Brenden Sewell, Blueprints Visual Scripting for Unreal Engine, Packt Publishing Limited, 2019. (ISBN 9781789347067)
3. Joanna Lee, Learning Unreal Engine Game Development, Packt Publishing, 2016, (ISBN: 1784398152,9781784398156)
4. McCaffrey, Mitch, Unreal Engine VR Cookbook: Developing Virtual Reality with UE4, Pearson Education, 2017, (ISBN-13: 978-0-13-464917-7)
5. Alireza Tavakkoli, Game Development and Simulation with Unreal Technology, Second Edition, A K PETERS, 2018, (ISBN: 1138092193, 9781138092198)

6. Satheesh PV, Unreal Engine 4 Game Development Essentials: Master the basics of Unreal Engine 4 to build stunning video games, Packt Publishing, 2016 (ISBN: 978-1-78439-196-6) 7. Justin Plowman, 3D Game Design with Unreal Engine 4 and Blender, Packt Publishing, 2016 (ISBN: 1785881469,9781785881466) 8. Andrew Sanders, An Introduction to Unreal Engine 4 (Focal Press Game Design Workshops), CRC Press, 2016, (ISBN 13: 978-1-4987-6509-1)			
Number of active teaching classes	Theory: 30		Practice: 30
Lecture delivery methods			
Lectures, auditoriums and independent student work.			
Knowledge evaluation (maximum number of points 100)			
Pre-exam activities	points	Final exam	points
In-class activity	5	oral exam	30
practical lectures	15		
projects	50		

Study program: MAS Computer Games Development			
Course title: DIGITAL ANIMATION			
Teacher(s): Marina Ilić			
Course status: obligatory			
No of ECTS: 5			
Prerequisite: /			
Course objective			
To acquire knowledge to understand the key principles of digital animation. Application of specific techniques of digital animation in the production of computer games of different genres.			
Course outcome			
Students are able to apply the acquired knowledge and skills in the field of digital animation and pursue a professional career independently or in studies for the development of computer games.			
Course content			
<i>Theoretic lectures</i>			
Basic principles of animation, digital animation and software capabilities, keyframes, script animation, motion digitization and application on digital model (motion / performance capture), particle systems and fluid animation, special effects animation, animation of light parameters and virtual cameras, path animation.			
<i>Practical lectures</i>			
Introducing students to the software package Blender 2.82a or newer and Unreal Engine 4. Specific tasks in the form of exercises that cover each teaching unit			
Literature			
<ol style="list-style-type: none"> 1. Richard Williams: THE ANIMATOR'S SURVIVAL KIT, Faber & Faber, 2001. 2. Harold Whitaker and John Halas. Timing for Animation Second edition, Elsevier Ltd. 2009. 3. John M. Blain. The Complete Guide to Blender Graphics: Computer Modeling & Animation, Fifth Edition. CRC Press 2019. 4. Satheesh PV. Unreal Engine 4 Game Development Essentials. Packt Publishing 2016. 5. online documentation for Unreal Engine 4: https://docs.unrealengine.com/en-US/index.html 6. online documentation for 2.82: https://docs.blender.org/manual/en/latest/ 			
Number of active teaching classes	Theory: 30		Practice: 30
Lecture delivery methods			
Knowledge evaluation (maximum number of points 100)			
Pre-exam activities	50 points	Final exam	points
In-class activity	10	written exam	50

practical lectures	10		
tests	15		
seminars	15		

Study program: MAS Computer Games Development		
Course title: SOUND AND MUSIC PRINCIPLES IN COMPUTER GAMES 1		
Teacher(s): Zoran Komadina		
Industry lecturer: Kristina Marković		
Course status: obligatory		
No of ECTS: 5		
Prerequisite: /		
Course objective Students are to get familiar with video game industry with special focus on the development and aesthetics of music and sound through computer generations. Students should learn about variety of types and roles of music and sound in video games. They should get a bigger picture about the organization of video game industry, especially audio team.		
Course outcome After completion of the course students should: - learn about the development of video game industry with special focus on music and sound - learn about types of interactive music and sound in video games - successfully apply acquired knowledge through critical observation and analysis of music and sound in video games - acquire basic knowledge of audio implementation software		
Course content <i>Theoretic lectures</i> 1) History of video games; predecessors of interactive music; progress and aesthetics of video game music through computer generations; surround sound technology; predecessors of contemporary interactive audio systems; video games for mobile consoles/telephones; online video games; VR (virtual reality); AR (augmented reality); contemporary audio production technologies in video games 2) Linear and nonlinear media; traditional media and art influence on video game development 3) Video game industry; team and project organization; audio team; video game creative process and production pipeline; documentation <i>Practical lectures</i> 1) Audio classification in video games; introduction to techniques of music and sound creation for video games; video games music and sound analysis; introduction to interactive audio systems (audio middleware); introduction to game development engine (Unity engine)		
Literature 1. Collins, Karen. Game sound: An introduction to the history, theory and practice of 2. video games music and sound design, Cambridge, Massachusetts, The MIT Press - 3. Cambridge, 2008. 4. Sweet, Michael. Writing Interactive Music for Video Games: A Composer's Guide. London: Pearson Press, 2014. 5. Marks, Aaron. The complete guide to game audio – For composers, musicians, sound 6. designers, and game developers, Oxford: Elsevier, Inc. 2009. 7. Manovich, Lev. The language of new media, London, Massachusetts, The MIT Press - 8. Cambridge, 2001. 9. Mott, Tony. 1001 Video Games You Must Play Before You Die, New York, Universe publishing, 2010.		
Number of active teaching classes	Theory: 30	Practice: 30
Lecture delivery methods Theory lessons include a lot of examples and analysis. Practical lessons include analysis too, but are mostly based on acquiring specialized software skills.		

Knowledge evaluation (maximum number of points 100)			
Pre-exam activities	points	Final exam	points
In-class activity	10	written exam	30
practical lectures	20	oral exam	20
seminars	20		

Study program: MAS Computer Games Development		
Course title: 3D MODELLING		
Teacher(s): Jelena Atanasijević, Igor Saveljić		
Course status: obligatory		
No of ECTS: 5		
Prerequisite: /		
Course objective		
<p>The subject is important from the aspect of studying 3D models and objects through two - dimensional and three - dimensional forms, perspective images and optical illusions. Through the geometric analysis of forms-objects-subassemblies, the basic settings in the segregation of 3D models are mastered.</p> <p>Within the course, the student learns the basics of design through (designing) the application of standard techniques / tools in the process of "development" of 3D models, materialization and visualization of the environment.</p>		
Course outcome		
<p>The student's training to create a clearly defined and aesthetically valuable composition based on the acquired task and knowledge according to the requirements of the project task and the content of the investor / user.</p> <p>Understanding the design of different compositions and forms with the implementation of the set requirements.</p> <p>Clear understanding of the theoretical basis and realization through concrete projects.</p>		
Course content		
<p><i>Theoretic lectures</i></p> <p>Elements of 3D / 2D composition; Models of space-spatial structures; Geometry / Form; Arranging visual elements through different levels of composition.</p> <p><i>Practical lectures</i></p> <p>Based on the project task and given parameters, the student "creates", ie models his 3D model-object</p>		
Literature		
<ol style="list-style-type: none"> 1. Wang Shaoqiang, Shapes: Geometric Forms in Graphic Design (Graphic Design Elements), Promopress, 2017. 2. James F. Eckler, Language of Space and Form: Generative Terms for Architecture, Publisher: Wiley, 2012. 3. Ginko Press, Geometric Graphics: A Visual Celebration of Simple Forms, Ginko Pr Inc, 2014. 4. Gavin Ambrose (Author), Paul Harris (Author), Nigel Ball (Author), The Fundamentals of Graphic Design, Paperback& Kindle Edition, 2019. 5. Beginner's Guide to Zbrush, 3D totalPublishing, 2017. 6. Morpho: Simplified Forms: Anatomy for Artists (Morpho: Anatomy for Artists), by Michel Lauricella (Author), Paperback, 2019. 		
Number of active teaching classes	Theory: 30	Practice: 30
Lecture delivery methods		
<p>Classical and modern methods are used for teaching through the application of computer equipment in the form of lectures, practical exercises and active participation in the implementation of assigned projects.</p> <p>CAD programs</p>		

Knowledge evaluation (maximum number of points 100)			
Pre-exam activities	points	Final exam	points
In-class activity	10	Written exam/project	70
practical lectures	20		

Study program: MAS Computer Games Development			
Course title: VISUAL CONCEPT ELEMENTS			
Teacher(s): Marina Ilić, Igor Saveljić			
Course status: obligatory			
No of ECTS: 5			
Prerequisite: /			
Course objective			
To develop basic knowledge and skills within the domain of art direction in video game production process. To get students familiar with process of making creative concepts, storyboards, styles, visual standards, graphical elements and user interfaces. To point out connection and mutual dependability of concept, usability and esthetic.			
Course outcome			
Student will be able to create graphic solution for simple video game. This ability will be based on knowledge about creative concepts, usability and esthetic rules. Student will have the basics for work, further development or specialization in field of video game production.			
Course contents			
<i>Theoretic lectures</i>			
Introduction to art direction and visual concept. Graphic and technical specifications. Similarities and differences between screen and print design. Elements of visual identity and esthetic standards. Storyboarding and presentation. Design of a screen. Elements of user interface.			
<i>Practical lectures</i>			
All theoretical lessons are followed by tasks that will require practical use of gain knowledge. For example: Creating concepts and storyboards. Defining visual standards (styles, illustration, colors, typography). Design of key screens. Design of user interface. Presentation of a graphical solution.			
Literature			
<ol style="list-style-type: none"> 1. Фрухт Мирослав, Ракић Милан, Ракић Ивица (2003) Креација за тржиште Београд. 2. James Pannafino (2012). Interdisciplinary Interaction Design: A Visual Guide to Basic Theories, Models and Ideas for Thinking and Designing for Interactive Web Design and Digital Device Experiences 3. Ellen Lupton (Author), Maryland Institute College of Art (2014). Type on Screen: A Critical Guide for Designers, Writers, Developers, and Students. 4. Rajesh Lal (2013). Digital Design Essentials: 100 Ways to Design Better Desktop, Web, and Mobile Interfaces Software 			
Adobe package as a basis: Adobe Illustrator, Adobe Photoshop, Adobe XD...			
with possibility for students to use additional software in line with their needs and preferences: Cinema 3d, 3D Studio MAX, ZBrush, Procreate...			
Number of active teaching classes	Theory: 30		Practice: 30
Lecture delivery methods			
Illustrative-demonstrative with the accent on practical teaching.			
Knowledge evaluation (maximum number of points 100)			
Pre-exam activities	points	Final exam	points
In-class activity		Presentation of final work	60
practical lectures	40		

projects			
----------	--	--	--

Study program: MAS Computer Games Development			
Course name: ENGLISH IN INFORMATION TECHNOLOGIES			
Teacher(s): Neda Vidanović Miletić			
Course status: Obligatory			
No. of ECTS: 5			
Prerequisites: /			
Course objective: The overall objective of the course is further improvement and work on productive and receptive language skills. The specific objectives of the course include mastering more complex forms of the general academic register, as well as the English for specific purposes (ESP) in this field. Acquisition of professional terminology, training of students to use professional literature, as well as mastering the academic register in writing and speech.			
Course outcomes: Students are trained for written and spoken professional communication, independent use of professional literature in English, as well as further training in the field of information technology. Through the preparation of seminar papers, they mastered professional terminology and novelties in using familiar words and expressions in a specific register.			
Course contents: <i>Theory</i> Lectures are based on interactive communicative approach. Materials are analyzed related to information and communication technologies, software development, human-computer interaction, artificial intelligence, etc. <i>Practice</i> <i>Analysis of specific grammar units. Seminar papers writing related to the topic of information and communication technologies and computer games. Oral discussions to the topics from profession and academic lives of students and their interests and plans. Team work and participation in mini-debates and argumentation.</i>			
Literature: Eric H. Glendinning, John McEwan: <i>Oxford English for Information Technology</i> , 2 nd edition, Oxford University Press, 2011. David Hill: <i>English for Information Technology 2</i> (Vocational English Series), Pearson Education, 2012. Michael McCarthy and Felicity O'Dell: <i>Academic Vocabulary in Use</i> , 2 nd edition, Cambridge University Press, 2016. Martin Hewings: <i>Advanced Grammar in Use</i> , Cambridge University Press, 2002. <i>Oxford English-Serbian Student's Dictionary</i> , Oxford University Press, 2015. <i>Dictionary of Information Technology</i> , 3rd edition, Peter Collin Pub Ltd, 2002.			
Number of active teaching classes:	Lectures: 30	Practice: 30	
Lecture delivery methods Mixed interactive method through lectures, practice and consultations – text analysis, oral presentation, conversation and discussion, video presentations, seminars			
Knowledge evaluation (maximum number of points 100)			
Pre-exam activities	50 points	Final exam	50 points
In-class activity	10	Written exam	40
Practical exercises		Oral exam	10
Colloquiums	20	
seminars	20		

Study program: MAS Computer Games Development			
Course title: VISUAL PROGRAMMING			
Teacher(s): Miljan Milošević			
Guest professor: Petia Radeva, Michail Panagopoulos			
Course status: elective			
No of ECTS: 5			
Prerequisite: /			
Course objective The course introduces basic concepts of visual programming in Unity 3D game engine, by using C# programming language. Through the course, students will get familiar with data types, variables, control structures, input-output instruction, basic data structures, and basic elements of object-oriented (OO) programming: objects, classes, methods and inheritance. Through the development of their-own 2D and 3D video game, students will learn basics of syntax and sematic of C# programming language and become capable to create all necessary Unity features that every game has to take into account.			
Course outcomes Familiarity with basic processes of Unity 3D game engine. Familiarity with structure of C# programming language: data types, variables, conditionals, loops and lists. Ability to use OO principles and concepts of C# programming language: objects, classes, methods and inheritance. Experience in development of simple 2D and 3D video games using Unity 3D game engine and C# programming language.			
Course contents <i>Theoretic lectures</i> Introduction to video games and digital systems, Introduction to game programming, Basics of Unity 3D game engine, Creation of game project, scene and objects, Introduction to C#, Building blocks of Unity 3D scripting, Variables and components, Making decisions (Boolean operations and conditionals), Loops, Lists and Arrays, Collections, Classes, Methods, Object-oriented thinking, Inheritance, Debugging, Creation of game: From idea to implementation, Game Management, Levels, Basics of user interface (UI), Power-ups, Movement and Collisions. <i>Practical lectures</i> Application of Unity 3D game engine and C# programming language in 2D and 3D simple game development. Practical lessons assume application of gained knowledge in development of self- designed video game.			
Literature 1. Jeremy Gibson Bond, Introduction to Game Design, Prototyping, and Development: From Concept to Playable Game with Unity and C#, Addison-Wesley Professional, 1 edition, July 21. 2014. 2. Terry Norton, Learning C# by Developing Games with Unity 3D Beginner's Guide: Learn the fundamentals of C# to create scripts for your GameObjects, Packt Publishing, 2013. 3. Greg Lukosek, Learning C# by Developing Games with Unity 5.x: Develop your first interactive 2D platformer game by learning the fundamentals of C#, Second Edition, Packt Publishing, 2016. 4. Unity User Manual (2019.3), https://docs.unity3d.com/Manual/index.html (accessed at 27.05.2020.)			
Number of active teaching classes	Theory: 30	Practice: 30	
Lecture delivery methods Problem-oriented and practical teaching, self-teaching, consultations. Combination of traditional and e-learning teaching supported by corresponding literature. Practical teaching will be done in computer supported classroom, where students will solve real problems in the field of Unity 3D game engine and C# programming language, by itself and with appropriate assistance.			
Knowledge evaluation (maximum number of points 100)			
Pre-exam activities	points	Final exam	points
In-class activity	10	written exam	15
practical lectures	30	oral exam	15

projects	30		
----------	----	--	--

Study program: MAS Computer Games Development			
Course title: USER INTERFACE DESIGN			
Teacher (s): Ana Kaplarević Mališić, Dalibor Nikolic			
Lecturer from industry: Tatjana Atanasijević			
Course status: elective			
No. of ECTS: 5			
Prerequisites: /			
Course objective: The course introduces the concepts of interaction between a man and a computer and design of user interface, as well as the assessment methods and techniques that can be used during the whole life cycle of computer interactive systems. It explains the principle and processes for documenting and implementing different development phases, including requests analysis, users' needs analysis, information architecture, development of prototypes, modeling and production.			
Course learning outcomes: At the end of the course, students are expected to understand the significance of human factor, cognitive processes, context analysis, users' needs and demands, their transformation into specifications and prototypes, and to successfully implement them during the development, implementation and analysis of user interface performances.			
Course contents: <i>Theoretical lectures</i> Concepts of user interface design in the product life cycle. Standards, principles, most influential factors. Concepts of interaction and interface. Understanding and conceptualization of interaction design. Cognitive aspects, social interaction, emotional interaction. Interfaces – command, graphic, multimedia, virtual reality, web, mobile telephones, electronics and appliances, speech, touch, movement, gestures, haptics, augmented reality. Methodology and activities of user interface design. Information architecture. Interaction design. Scalability engineering. The visual design of the user interface. Engineering of prototype design. Methodology and process of user interface design in agile software development. The phase of empathy/scalability research – definition of demands and validation of problems. The phase of definition / information architecture – problem examination. The phase of interactive design (Idea-Prototype-Test) / interaction design, prototyping and visual design – solution specification. The phase of programing and releasing into production process / engineering of user interface – solution validation. The phase of valuation / analysis of scalability – solution scalability. <i>Practical lectures</i> - Group analysis and discussion about certain topics, selected articles and seminars. - Solving assigned tasks and problems, both independently and under the supervision of teachers.			
Literature 1. R. Hartson, P. S. Pyla, <i>The UX Book: Process and guidelines for ensuring a quality user experience</i> , Elsevier (2012) 2. B. Shneiderman, C. Plaisant, M. Cohen, S. Jacobs, N. Elmqvist, N. Diakopoulos, <i>Designing the user interface: strategies for effective human-computer interaction</i> , Pearson (2016) 3. B. Shneiderman, C. Plaisant, M. Cohen, S. Jacobs, N. Elmqvist, N. Diakopoulos, <i>Designing the user interface: strategies for effective human-computer interaction</i> , Pearson (2016) 4. J. Gothelf, <i>Lean UX: Applying lean principles to improve user experience</i> , O'Reilly Media, Inc. (2013) 5. R. Unger, C. Chandler, <i>A Project Guide to UX Design: For user experience designers in the field or in the making</i> , New Riders (2012)			
No. of active teaching hours:	Lectures: 30	Practice: 30	
Teaching methods Problem-oriented lectures, practice, independent work of students, consultations.			
Knowledge evaluation (maximum number of points 100)			
Pre-exam activities	70 points	Final exam	30 points
In-class activity	10	oral exam	30
practical exercises			
project(s)	30		

mid-term(s)			
seminar(s)	30		

Study program: MAS Computer Games Development			
Course title: 3D COMPUTER GRAPHICS			
Teacher (s): Nenad Filipović			
Guest professor: Irena Galic			
Lecturer from industry: Danilo Babin			
Course status: elective			
No. of ECTS: 5			
Prerequisites:			
Course objective			
Acquiring basic knowledge in the field of three-dimensional computer graphics.			
Course outcomes			
Students gained basic skills in raster and vector graphics. They are able to independently develop applications with three-dimensional graphics using appropriate software tools, applying the principles of computer graphics.			
Course contents:			
<i>Theoretical lectures</i>			
Computer graphics and geometry as computer disciplines. Structure of input / output devices. Graphic hardware. Raster graphics. Ray-tracing algorithms.			
Mathematical apparatus (trigonometry, analytic geometry and linear algebra). Coordinate systems.			
Graphics in space. Basic facilities in space. Transformations in space. Linear transformations (scaling, shear, rotation, reflection). Composition and decomposition of transformations. Translation and affine transformations. Inverse transformations. Transformation of coordinate systems.			
Views. Display types (wire structure, shading, hidden lines). Transformation of the view. Transformations of camera, projection and viewport transformations. Orthographic projection. Perspective.			
Graphic tube. Clipping. Z-buffer algorithm. Precision.			
Data Structures. Representation of points, polygons and bodies. Graph scene. Spatial data structures.			
<i>Practical lectures</i>			
Draw basic objects with attributes (dashed lines, line thickness). An incremental algorithm for drawing circles and ellipses. Polygons, filling the inside of the polygon and polygon orientation. Wired poliedra model. Polygonal mesh network. Development of spatial models. Transformation of the model and view. Partial transformations of scene elements. Animated display. Usage of the Unity 3D Development Platform.			
Literature:			
1. Драган Цветковић. Рачунарска графика, СЕТ Београд, 2006.			
2. P. Shirley, S. Marschner. Fundamentals of Computer Graphics, CRC Press, 2009.			
3. J. Kessenich, G. Sellers, D. Shreiner. OpenGL Programming Guide, Pearson Education, 2013. (www.opengl-redbook.com)			
4. https://unity.com			
No. of active teaching hours:	Lectures: 30	Practice: 30	
Teaching methods			
Problem-oriented teaching, student preparation of seminars, homework assignments, practical training.			
Examination (maximum number of points 100)			
Exam prerequisites	70 points	Final exam	30 points
student's participation during lectures		oral exam	30
colloquiums	50		

seminars	20		
----------	----	--	--

Study program: MAS Computer Games Development
Course title: SOFTWARE ENVIRONMENT FOR COMPUTER GAMES DEVELOPMENT 2
Teacher (s): Miljan Milošević, Igor Saveljić
Course status: elective
No. of ECTS: 5
Prerequisites: 3D Computer graphics, Visual programming, 3D modeling
<p>Course objective:</p> <p>To master game engines (GE) (software environments for the development of 2D and 3D video games with real-time interaction) by using the Unity GE and C# programming language. Students will become familiar with key terminology and components of modern GEs, and how to use them efficiently for developing 2D and 3D games. By developing proficiency with the Unity, the student will learn how to articulate a game design into component parts, and engineer a prototype application of that design.</p>
<p>Course outcomes:</p> <ul style="list-style-type: none"> • Through discussions and assignments student will gain understanding of the key GE components terminology and functionalities. • When given a game design document and corresponding assets, student can develop a working prototype of that design in Unity. • Student will be able to modify an existing Unity game package to modify and customize with artwork, sound, UI, mechanics, balance, and game-feel. • Students will demonstrate an ability to engineer solutions to given problems and obstacles in assignments, and a proficiency working with Unity Game Engine.
<p>Course contents:</p> <p><i>Theoretical lectures</i></p> <ol style="list-style-type: none"> 1. Introduction to Game engines (GE) (What are GE?; GE features needed for developing various game genres; Composing parts and architecture of modern GE); 2. Introduction to Unity (Understanding the Game Loop; Creating Gameplay; Asset Workflow; Analysis and profiling of developed game); 3. Unity Asset Pipeline (What are assets? Common types of Assets; Asset workflow; Asset packages and Asset Store; Scripting with Assets; Animations); 4. Scripting in Unity (Objects, Actions/Behaviors, User Inputs, GUI, Debugging, Publishing); 5. Physics and Collisions in Unity (Rigidbody; Colliders; Joints; Character Controllers; Collisions; Continuous collision detection; Physics Debug Visualization); 6. Prototyping the game – 1 (Encapsulation of Physics, Animation + Scripting lessons) and definition of the final project for students; 7. Art & Animation (Rendering; Special Effects; Particle Effects; Lighting; Game Audio) 8. User interfaces (The Visual Tree; The Event system; Built-in controls; Canvas; Visual components; Layout; Interaction components and Event management); 9. Character and Enemy AI (Game AI; What are game agents? State machines; Navigation and pathfinding; Steering behaviors; Machine learning trends and techniques in Game AI); 10. Virtual and augmented reality applications in Unity game engine (XR and VR modules); 11. Prototyping the game 2 – Encapsulation of lessons 7-10; 12. Network & Multiplayer (Converting single-player game into multi-player game); 13. Final project presentation. <p><i>Practical lectures</i></p> <ol style="list-style-type: none"> 1. Development tools and environment (Installation and overview of the Unity); 2. Walkthrough the Unity graphical user interface commands and working environment;

3. Importing and managing objects and resources in Unity;
4. C# scripting in Unity – adding logic and functionalities to objects;
5. Implementing collision detection and physical behavior to Unity game objects;
6. Development of a simple 2D physics-based game in Unity;
7. Adding effects and animating game objects;
8. Development of GUI and interaction with users in Unity;
9. Implementing behavior of game objects and characters (Game AI);
10. Converting PC game into VR game;
11. Development of a physics-based game, with objects that interact and behave realistically;
12. Converting single-player game into multi-player game.

Literature

1. Alan Thorn, Naučite Unity 5.x, Kompjuter biblioteka, 2017.
2. Gregory J, Game Engine Architecture, CRC Press, 2015.
3. Jeremy Gibson Bond, Introduction to Game Design, Prototyping, and Development, Part I, Game Design and paper Prototyping, 2014.
4. Harrison Ferrone, Learning C# by Developing Games with Unity 2019: Code in C# and build 3D games with Unity, 4th Edition, Packt publishing, 2019.
5. Darwin Yu, Game A.I. Made Easy: Designing Agents: With Unity3D Examples, 2018.

Number of active teaching classes

Theoretical lessons: 30

Practical lessons: 30

Teaching performance methods

Audio-visual, lectures.

Knowledge assessment (maximum number of points 100)

The maximum number of points is 100. At the final exam, a student can get up to 30 points, and up to 70 points for activities during the semester (pre-exam obligations). During the semester, the student is evaluated by grading his/her: activities at classes (10), practical assignments (4x4), colloquium (14) and the seminar-final project (30). At the end of the course, in the exam period, the final exam is assessed by discussing (10) and solving hands-on assignments (20) related to the previously defended final project:

Pre-exam obligations	points	Final exam	points
Activities during lectures	10	Written exam	20
Practical teaching	16	Oral exam	10
Colloquium(s)	14		
Seminar(s)	30		

Study program: MAS Computer Games Development

Course title: CHARACTER ANIMATION

Teacher(s): Marina Ilic

Course status: elective

No of ECTS: 5

Prerequisite: /

Course objective

The course aims to introduce students with the knowledge and skills of thinking and creating in the spirit of character animation - to start and give life to characters and their relationship, understand the mechanics of movement, develop a sense of timing (estimate the duration and speed of movement), learn the process and technology of making animation, to obtain elements of modeling three-dimensional shapes and their further manipulation in animation and to acquire knowledge from the history of animation.

Course outcome

(ISBN 978-0123869081)			
No. of active teaching hours	Lectures: 30	Practices: 30	
Lecture delivery methods Lectures, auditory exercises and independent work of students.			
Examination (maximum number of points 100)			
Exam prerequisites	Points	Final exam	Points
In-class activities	5	Oral exam	30
Practical exercises	15		
Projects	50		

Study program: MAS Computer Games Development			
Course title: PROGRAMMING OF MOBILE APPLICATIONS			
Teacher (s): Nenad Grujović, Vukašin Slavković			
Course status: elective			
No. of ECTS: 5			
Prerequisites:			
Course objective Acquiring general knowledge and special skills for understanding the concepts of mobile computing. Gaining technologies and tools for developing software solutions for mobile devices and systems.			
Course learning outcomes Knowledge of technologies for programming mobile applications. The student is competent to understand the concepts of mobile computing and to develop software solutions for mobile computing systems.			
Course contents: <i>Theoretical lectures</i> Overview of mobile computing. Hardware of mobile devices. Communication protocols for mobile devices. Programming languages and operating systems for mobile devices. User interface in mobile devices. Multimedia in mobile devices. Graphics. Network services. Location based services. Working with databases. Security in mobile devices. <i>Practical lectures</i> Exercises are performed in a computer classroom. Creating a project with a practical and concrete problem.			
Literature 1. Schwarz R., Steele J., Nelson D.: Android 4 Израда апликација помоћу пакета Android SDK, Микро књига, 2014, ISBN 978-8675553908 2. Taniar D.: Mobile Computing: Concepts, Methodologies, Tools, and Applications, Information Science Reference 2009, ISBN 978-1605660547 3. Kamal D.: Mobile Computing, 2th edition, Oxford University Press, 2012, ISBN 978-0198068914 4. Rogers R., Lombardo J., Mednieks Z., Meike G.: Android Application Development, 5. Shroff Publishers & Distributors Pvt Ltd 2010, ISBN 978-8184047332			
No. of active teaching hours:	Lectures: 30	Practice: 30	
Lecture delivery methods Lectures, laboratory exercises, homework assignments, projects			
Examination (maximum number of points 100)			
Pre-exam obligations	points	Final exam	points
In-class activity	5	written exam	30
practical exercises	30		
colloquiums	35		

Students understand and know how to apply different types of movements from nature. After completing the course Character animation, students are able to create and animate three-dimensional models.

Course content

Theoretic lectures

Introduction to character animation (basic concepts and terminology), bipedal walking cycle, bipedal running, four-legged walking cycle, principles of animal movement, cycles in nature, effects, vocalization, deformation, anticipation of movement, bird flight. FK (forward kinematic) and IK (inverse Kinematic).

Practical lectures

Introduction to 3D software, skeletal system hierarchy in 3D software, keyframes animation, squash and stretch, line and shape modeling, given character modeling, torso, extremities, head: eyes, lips, ear, digital sculpture, Elements of 3D materialization, skeletal systems and attribute selection, rigging, skinning, skin, binding.

Literature

1. Borivoj Dovniković: ŠKOLA CRTANOG FILMA (FCS-FAA, Belgrade 2007)
2. Richard Williams: THE ANIMATOR'S SURVIVAL KIT, Faber&Faber, 2001
3. Preston Blaire: ANIMATION (Walter Foster)
4. Preston Blaire: ANIMATE FILM CARTOONS (Walter Foster)
5. Muybridge: HUMAN FIGURE IN MOTION (Dover 0-486-20204-6)
6. Muybridge: ANIMAL FIGURE IN MOTION (Dover 0-486-20203-8)
7. Harold Whitaker, John Hallas: TIMING FOR ANIMATION, Focal Press, 1981
8. Frank Thomas, Ollie Johnston: ILLUSION OF LIFE, Hyperion, 1981
9. Ranko Munitić: POLA VEKA FILMSKE ANIMACIJE U SRBIJI, Institut za film/Aurora, 1999

Number of active teaching classes	Theory: 30	Practice: 30
--	-------------------	---------------------

Lecture delivery methods

Lectures, practical lectures with concrete tasks, workshops

Knowledge evaluation (maximum number of points 100)

Pre-exam activities	points	Final exam	points
In-class activity	10	written exam	50
practical lectures	10		
colloquiums	15		
seminars	15		

Study program: MAS Computer Games Development

Course title: SOUND AND MUSIC PRINCIPLES IN COMPUTER GAMES 2

Teacher (s): Zoran Komadina

Industry lecturer: Kristina Marković

Course status: Elective

No. of ECTS: 5

Prerequisites: Sound and music principles in computer games 1

Course objective:

Students should learn the specifics of interactive music and sound. They should acquire skills of using FMOD Studio and Unity engine software to create a practical assignment (a functional video game demo scene) which should include music, sound and dialogues. The goal is to get a bigger picture of varieties and functions of video game audio, which would eventually help students in game development process and enhance their creativity and independent work.

Course learning outcomes:

After completion of the course students should:

Acquire skills of working with interactive music, sound and dialogues and successfully apply different implementation techniques in FMOD Studio and Unity engine software. They should be able to create a short

interactive music composition using different compositional techniques.			
Course contents:			
<i>Theoretical lessons</i>			
1) Video games music composition techniques (horizontal resequencing, vertical remixing); music implementation/programming techniques; video game sound design techniques (loops, trigger sounds, cut scenes, etc.); sound implementation/programming techniques (loops, multi instruments, randomization, parameters, etc.); dialogue processing techniques; working with sound libraries; audio files organization (export and naming conventions)			
<i>Practical lessons</i>			
2) Interactive music; critical listening and analysis; using audio production software (Reaper, Cubase); working with virtual instruments; MIDI programming; sound and dialogue recording; practical assignments that assume creating short interactive music composition; creating FMOD Studio project incorporating different implementation techniques of music and sound; creating functional video game demo scene using FMOD Studio и Unity engine which assumes successful implementation of music, sound and dialogues; real time mixing			
Literature			
1. Collins, Karen. Game sound: An introduction to the history, theory and practice of video games music and sound design, Cambridge, Massachusetts, The MIT Press -Cambridge, 2008.			
2. Sweet, Michael. Writing Interactive Music for Video Games: A Composer’s Guide. London: Pearson Press, 2014.			
3. Marks, Aaron. The complete guide to game audio – For composers, musicians, sound designers, and game developers, Oxford: Elsevier, Inc. 2009.			
Number of active teaching classes	Theoretical lessons: 30		Practical lessons: 30
Lecture delivery methods			
Theory lessons include a lot of examples and analysis. Practical lessons are mostly assignment driven and promote using specialized software with the purpose of creating functional demos.			
Knowledge assessment (maximum number of points 100)			
Pre-exam obligations	points	Final exam	points
<i>Activities during lectures</i>	10	Written exam	30
<i>Practical teaching</i>	20	Oral exam	20
<i>Colloquium(s)</i>		
Seminar(s)	20		
*2 A4 format pages maximum			

Study program: MAS Computer Games Development
Course title: AESTHETICS AND MODES OF CREATIVE THINKING
Teacher (s): Vladimir Mako
Course status: elective
No. of ECTS: 5
Prerequisites:
Course objective: The aim of the course is to introduce students to essential aesthetic ideas developed through the avant-garde approach to creative thinking and research. In that context, one of the most important aspects is related to aesthetics as form of cultural and social communication through the process of creativity. By these means, students will acquire skills for continuous development of personal creative thinking and its aesthetic articulation.
Course learning outcomes: Understanding and ability for each student to develop various modes of creative thinking, and aspects of aesthetic articulation of the creative process into a new knowledge as an innovative

social and cultural value.			
Course contents:			
<i>Theoretical lessons</i>			
Lectures regarding avant-garde and contemporary ideas dealing with aesthetic and creative approach to the articulation of the process of innovative creativity, and to the evolutionary development of creative thinking.			
<i>Practical lessons</i>			
Practical work is based on research seminar. Topics should be chosen according to each student's research interest within the various fields of creative industries. Nevertheless, the focus of the research will be on aspects of aesthetic communication of outcomes of the process of creative thinking.			
Literature			
1. Irvin Singer, <i>Modes of Creativity: Philosophical Perspectives</i> , The MIT Press, Cambridge Mass., 2011.			
2. Theodor Adorno, <i>The Culture Industry</i> , Routledge, London, 2004.			
3. <i>Design and Aesthetics: a Reader</i> , Ed. Jerry Palmer and Mo Dodson, Routledge, London, 1996.			
4. Henry Bergson, <i>Creative Evolution</i> , Macmillan and Co., London, 1928.			
5. Henri Bergson, <i>An Introduction to Metaphysics</i> , Macmillan and Co., London, 1913.			
Number of active teaching classes	Theoretical lessons: 30	Practical lessons: 30	
Lecture delivery methods			
Lectures in theory and group discussions on the issues related to the research seminar			
Knowledge assessment (maximum number of points 100)			
Pre-exam obligations	points	Final exam	points
In-class activities	10	Written exam	
<i>Practical teaching</i>		Oral exam – presentation of the research seminar outcomes	50
<i>Colloquium(s) – activities within the research seminar</i>	40	
Seminar(s)			

Study program: MAS Computer Game Development
Course title: ENTREPRENEURSHIP AND MANAGEMENT
Teacher(s): Marija D. Gačić Industry lecturer: Srdjan Atanasijevic, Natasa Vujnovic Sedlar
Course status: elective
ECTS: 5
Prerequisites:
Course objective Introducing students to the basics of entrepreneurship, business management, marketing and finance, in order to stimulate them in an entrepreneurial way of thinking and enable them to start and run their own business in the field of computer programs and games, as well as to present their ideas to potential corporate customers.
Learning outcomes of the course The student is able to, by acquiring basic knowledge in the field of entrepreneurship, management, finance, project management and marketing, develop his own idea for computer software/game on the market. The student is also trained to start his own business in this field, organize a work team, manage the business and create a business model adapted to the gaming industry, as well as to present and valorize his idea within the corporation.
Course content <i>Theoretical part – lectures</i> • Basics of entrepreneurship, development of creative ideas, basic concepts of innovation, creating a business

plan.

- Fundamentals of management, leadership and team management
- Project Management
- Methods of Financing an enterprise
- Business model development

Practical part – exercises

Exercises are auditory and include the development and presentation of an individual or team project that represents student's business idea.

Literature

1. Ronny Baierl, Judith Behrens, Alexander Brem, *Digital Entrepreneurship: Interfaces Between Digital Technologies and Entrepreneurship*, FGF Studies in Small Business and Entrepreneurship, Springer, 2019, ISBN 3030201384, 9783030201388
2. Jonathan P. Allen, *Digital Entrepreneurship*, Routledge, 2019, ISBN 1138583693, 9781138583696
3. Hosu, Ioan, Iancu, Ioana, *Digital Entrepreneurship and Global Innovation Advances in Business Strategy and Competitive Advantage*, IGI Global, 2016, ISBN 1522509542, 9781522509547

Number of active teaching hours	Lectures: 30	Practice: 30
--	---------------------	---------------------

Lecture delivery methods
Lectures, case studies, discussion, practical work and tasks in computer lab, project.

Knowledge assessment (maximum 100 points)

Pre-exam obligation	70 points	Final exam	30 points
Student's activity during lectures	10	Oral exam	30
Practical classes/tests			
Project (development and presentation)	30		
Colloquiums	30		
Seminars/homework			

Study program: MAS Computer Games Development

Course title: COMPUTER GAMES AND LAW

Teacher/s: Sonja Lučić

Course status: elective

Number of ECTS: 5

Prerequisites

Course objective

Computer games have recently become a product used by millions of users around the world. Nevertheless, there seems to be great uncertainty among users and producers regarding the legal protection, i.e. the legal qualification of computer games within the existing legal regime dealing with it (primarily regulations in the field of Intellectual Property Rights).

The purpose of the course is to provide students with basic knowledge about the legal protection of computer games.

Course learning outcomes

Students will have the opportunity to discuss various legal issues related to computer games and game platforms. Special attention will be paid to cases from national and foreign law practices. The expected outcome of the course is that students master the basic knowledge of the legal protection of computer games and to successfully apply the acquired knowledge in practice and everyday life.

Course contents

Lectures

INTELLECTUAL PROPERTY RIGHTS. The concept of intellectual property rights. Copyright - general notes. Patent law - general remarks. Trademark law - general remarks. Business secret (know-how). Computer games as an object of intellectual property.

COMPUTER GAMES AND COPYRIGHT. Classification of computer games in terms of copyright. Computer games as a computer program. Computer games as an audiovisual work. Computer games as a database.

COMPUTER GAMES AND TRADEMARK LAW. Protection of the name of computer games with a trademark. Trademark acquisition procedure. Contents of the trademark.

COMPUTER GAMES AND PATENT LAW. Patent protection of software. Computer games and licenses.

COMPUTER GAMES VS PERSONAL DATA PROTECTION AND CHILD PROTECTION. Computer games and the Audiovisual Media Services Directive. Computer games and audiovisual services. Legal regulation of advertising in computer games. Computer games and personal data protection. Protection of children, youth and human dignity.

Practice: case studies and workshops.

Literature: Marković, S., Popović, D., Intellectual Property Right, Belgrade, 2017.

No. of active teaching hours	Lectures: 30	Practice: 30	
Lecture delivery methods			
Lectures, exercises and consultations			
Examination (maximum number of points 100)			
Pre-exam obligation	Points	Final exam	Points
In-class activities	15	written exam	
practical exercises	15	oral exam	60
colloquium(s)	10	
seminar(s)			

Study program: MAS Computer Games Development
Course title: VIRTUAL REALITY SYSTEMS
Teacher(s): Nenad Filipović
Guest professor: Zlatan Car
Industry lecturer: Atanas Hristo
Course status: elective
No. of ECTS: 5
Prerequisites:
Course objective: Training students to design and implement a virtual/augmentative reality system.
Course learning outcomes: Upon completion of the course, students will be able to use acquired knowledge and skills to develop a virtual/augmentative reality system with practical experience with a variety of VR (virtual reality) devices.
Course contents: <i>Lectures</i> Milgram's real-virtual continuum and metrics of virtuality/augmentativity. VR system elements, VR devices - immersive and nonimmersive classes, 3D audio, 3D video and tactile devices, tracking techniques of body, head, limb and eye, VR / AR interactivity, VR programming techniques on examples (for example, using OpenGL). Examples of VR systems, augmentative reality systems, basic AR architecture systems, AR systems examples. <i>Practices</i> Exercises are performed in a computer classroom. On the exercises, using a programmatic (eg using OpenGL) or modern authoring system students develop simple VR/AR scenes with non/semi-immersive devices. Creating a project with a practical and concrete problem.
Literature 1. R. Szeliski: Computer Vision: Algorithms and Applications, Springer, 2010. (ISBN 978-1848829343) 2. E.R. Davis: Computer and Machine Vision: Theory, Algorithms, Practicalities, Academic Press, 2012.

Study program: MAS Computer Games Development			
Course title: STUDY RESEARCH WORK			
Teacher (s): All teachers at the study program			
Course status: obligatory			
No. of ECTS: 10			
Prerequisites: enrolled in a final semester of MAS			
Course objective: To introduce students to the rules, procedures and processes of independent and comprehensive research work, as well as writing professional/scientific texts.			
Course learning outcomes: The student is trained for the application of principles and theoretical basics, practical knowledge acquired during the studies, and for the use of both written literature and content that can be found on the Internet, thus being able to independently improve their knowledge.			
Course contents: <i>Study Research</i> The content of the course is determined by the mentor for each candidate separately, and is made by the candidate's independent work on the topic he has selected from the list of available topics for the Master thesis. This work is continuously monitored by the mentor. The student should also research, for the preparation of the Master thesis, the basic results of the narrow areas on which the Master thesis is based. The student should master the style of writing and be able to use literature independently, including the reviewed texts (scientific works and books).			
Literature Literature is determined by the mentor, depending on the topic of the master thesis.			
No. of active teaching hours:	Lectures:: 0	Practice: 10	
Teaching methods The mentor introduces a student with the topic of the Master thesis and recommends the literature. The student works independently in consultation with the mentor. If necessary, the student can also consult with other teachers, who deal with issues related to the topic of work itself.			
Examination (maximum number of points 100)			
Exam prerequisites	70 points	Final exam	30 points
student's participation during lectures		oral exam	30
practical exercises	70		

Study program: MAS Computer Games Development			
Course title: INTERNSHIP			
Teacher (s):			
Course status: obligatory			
No. of ECTS: 5			
Prerequisites: enrolled in an adequate semester			
Course objective: Introducing students to the conditions and methods of work in studios for the development of computer games, and all phases of pre-production, production, testing and post-production of computer games. Students should consider: the global organization and the way of functioning of key segments of the development team, as well as the possibilities of creative and technical solving of specific tasks during the development of a computer game, and take an active part in the work. The study program envisages, in accordance with the accreditation standards, 90 hours of professional practice per semester.			
Course outcomes: The students have the capacity to engage themselves efficiently and successfully in activities within the scope of work of different studios for computer games development, to improve the level of practical knowledge, to build capacities to handle new conditions and to improve their communication level.			
Course contents:			

<p>Students are introduced with:</p> <ul style="list-style-type: none"> • organization, way of functioning and specific tasks of studies for the development of computer games • pre-production, production and post-production phases of development and distribution of computer games • teamwork and key segments of the production team • hardware and software platforms used and the specifics of the workflow development model <p>- received specific tasks to be completed independently.</p>			
Literature			
No. of active teaching hours	Lectures: 0	Practice: 90	
Teaching methods			
<p>The practice is realized in studios for the development of computer games, through independent work. Each student is assigned a mentor among the employees in the studio in which the internship is performed. Study of processes and activities through insight into the documentation and practical work on certain tasks. At the end of the internship, the mentor gives an assessment of the success of the internship, which is one of the elements in assessing the success of the achieved goals of the course. After the internship, the student submits a report on his / her own work and activities in the form of a seminar paper, and then presents it.</p>			
Knowledge assessment (maximum number of points 100)			
Pre-exam obligations	60 points	Final exam	40 points
In-class activity		oral exam	40
practical exercises			
projects			
seminar(s)	60		

Study program: MAS Computer Games Development		
Course title: MASTER THESIS		
Teacher(s): All teachers at the study program		
Course status: obligatory		
No. of ECTS: 15		
Prerequisites: Passed all exams from master academic studies		
Course objective:		
<p>The goal of the final work is to demonstrate the ability of the student to independently process a topic in the field of informatics. The student also needs to demonstrate that he can use available software and literature (including literature from the Internet), to accurately and precisely write the work, to know how to quote the literature, and clearly explain his work.</p>		
Course learning outcomes:		
<p>The student showed his independence in processing the subject and precision in preparation of the text. The student also showed that he can make an electronic presentation of his work, that he can orally present the most important parts of his work in a good way, and that he can respect the given time.</p>		
Course contents:		
<p>Final work - thesis represents the student's independent work made in a written form, with instructions and consultations with the subject teacher. The student chooses the topic for the preparation of the thesis in the field of scientific-professional and professional-applicative courses.</p>		
Literature:		
Depending on the selected topic.		
No. of active teaching hours	Lectures:	Practices:
Teaching methods		
<p>The student submits at least three copies of completed work to the subject teacher and one copy to the Faculty library. The student also delivers his work to the Faculty library in an electronic form. The Commission for Defense of Master thesis is formed by the Council at the proposal of the subject teacher. The date and time of the public defense of work is published on the bulletin board of the Faculty at least five working days before the scheduled date of the defense, and the candidate's assessment of this exam is communicated to the candidate immediately after the completed defense, with an appropriate explanation.</p>		

Examination (maximum number of points 100)			
Pre-exam obligations	Points	Final exam	Points
In-class activity		Oral exam	
Practical exercises			
Projects			