



## Subject card

Subject name and code	Sound in games and virtual reality, PG_00070888						
Field of study	Informatics						
Date of commencement of studies	February 2025	Academic year of realisation of subject			2025/2026		
Education level	second-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	2	Language of instruction			Polish		
Semester of study	3	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Multimedia Systems -> Faculty of Electronics Telecommunications and Informatics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Bartłomiej Mróz				
	Teachers		dr inż. Bartłomiej Mróz				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	15.0	0.0	30
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	30		2.0		18.0	50
Subject objectives	The aim of the course is to familiarize students with professional tools and methods used in sound design for video games and virtual reality (VR) applications. Students gain practical knowledge of real-time audio system architecture, with a particular focus on Audiokinetic Wwise audio middleware. The course develops the ability to consciously design the sound layer as an interactive, procedural element of the player's or VR user's experience, as opposed to the linear approach characteristic of film or television music.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U03] can design, according to required specifications, and make a complex device, facility, system or carry out a process, specific to the field of study, using suitable methods, techniques, tools and materials, following engineering standards and norms, applying technologies specific to the field of study and experience gained in the professional engineering environment	Student potrafi zaprojektować i zaimplementować kompletny system audio dla prostej gry lub sceny VR z wykorzystaniem Wwise, obejmujący hierarchię obiektów dźwiękowych, zdarzenia, stany, przełączniki (switches) oraz mix, zgodnie z przyjętą specyfikacją funkcjonalną i przy użyciu standardowych praktyk inżynierskich obowiązujących w branży gier.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
	[K7_U07] can apply advanced methods of process and function support, specific to the field of study	The student is able to use advanced Wwise features (including RTPC – Real-Time Parameter Control, Dynamic Dialogue, Spatial Audio, Wwise Authoring API) as methods to support the design process of an interactive sound layer, selecting them appropriately to the requirements of a specific game or VR application project.	[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
	[K7_U09] can carry out a critical analysis of the functioning of existing technical solutions and assess these solutions, as well as apply experience related to the maintenance of advanced technical systems, devices and facilities typical for the field of studies, gained in the professional engineering environment	The student is able to critically compare and evaluate different approaches to audio implementation in games and VR (e.g., native engine solutions – Unreal Audio Engine, Unity Audio vs. middleware Wwise/FMOD), pointing out the advantages, limitations, and contexts of use of each, and analyze an existing Wwise project in terms of quality, scalability, and compliance with industry standards.	[SU2] Assessment of ability to analyse information [SU5] Assessment of ability to present the results of task
[K7_W03] knows and understands, to an increased extent, the construction and operating principles of components and systems related to the field of study, including theories, methods and complex relationships between them and selected specific issues - appropriate for the curriculum	The student has an in-depth knowledge and understanding of the architecture of audio middleware systems (using Wwise as an example), the principles of real-time sound engines, sound event hierarchy models, and the complex relationships between game/VR application logic and the audio layer, including adaptive and procedural audio mechanisms.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects	
Subject contents	<p>Course content – lecture</p> <p>The specificity of interactive sound in VR games and applications as opposed to linear audio. Real-time audio system architecture - overview of native engine and middleware solutions (Wwise, FMOD). Wwise environment: project structure, sound object hierarchy, containers, event system. Audio parameterization and adaptability: RTPC, States, Switches. Spatial Audio and surround sound in VR. Integration of Wwise with game engines - SDK, game objects, industry standards and practices.</p> <p>Course content – project</p> <p>Configuring the Wwise environment and integrating it with the game engine. Building a hierarchy of sound objects and an event system. Implementing dynamic audio using RTPC and States/Switches. Configuring Spatial Audio in a 3D/VR scene. Presentation and discussion of the final project.</p>		
Prerequisites and co-requisites	<p>Mandatory requirements:</p> <ul style="list-style-type: none"> <li>• Basic knowledge of DAW (Digital Audio Workstation) environment editing and exporting audio files.</li> <li>• Basic knowledge of acoustics and psychoacoustics at the bachelor's degree level.</li> <li>• Knowledge of at least one game engine (Unity or Unreal Engine) at a basic level the student should understand the concepts of scene, object, and event.</li> </ul> <p>Recommended requirements:</p> <ul style="list-style-type: none"> <li>• Experience with sound production (recording, sound design, mixing)</li> <li>• Basic knowledge of technical English (Wwise documentation available only in English)</li> </ul>		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Final project	51.0%	40.0%
	Presentation and defense of the project	51.0%	15.0%
	Test	51.0%	45.0%

Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. Audiokinetic, <i>Wwise Documentation &amp; Wwise 101 Certification Course</i>. Audiokinetic Inc. [online, free] - <a href="https://www.audiokinetic.com/en/learning/learn-wwise/wwise-fundamentals">https://www.audiokinetic.com/en/learning/learn-wwise/wwise-fundamentals</a></li> <li>2. A. Marks &amp; J. Novak, <i>Game development essentials: game audio development</i>. in Game development essentials. Clifton Park, NY: Delmar, Cengage Learning, 2009.</li> <li>3. A. Marks, <i>The complete guide to game audio: for composers, musicians, sound designers, and game developers</i>, Second edition. Burlington, MA: Focal Press, 2009.</li> <li>4. K. Collins, <i>Game sound: an introduction to the history, theory, and practice of video game music and sound design</i>. Cambridge, Mass: MIT Press, 2008.</li> <li>5. W. Phillips, <i>A composers guide to game music</i>. Cambridge, London: The MIT press, 2017.</li> </ol>
	Supplementary literature	<ol style="list-style-type: none"> <li>1. A. Farnell, <i>Designing sound</i>. in The MIT Press Ser. Cambridge, Massachusetts London, England: The MIT Press, 2010.</li> <li>2. R. C. Stevens &amp; D. Raybould, <i>The game audio tutorial: a practical guide to sound and music for interactive games</i>. Amsterdam: Boston Focal Press/Elsevier, 2011.</li> <li>3. K. Collins, <i>From Pac-Man to pop music: interactive audio in games and new media</i>. w Ashgate popular and folk music series. Aldershot Burlington, VT: Ashgate, 2008.</li> <li>4. Unity, <i>Unity Audio technical documentation</i>. Unity Technologies. [online, free] - <a href="https://docs.unity3d.com/Manual/Audio.html">https://docs.unity3d.com/Manual/Audio.html</a></li> <li>5. Unreal Engine, <i>Unreal Engine Audio technical documentation</i>. Epic Games. [online, free] - <a href="https://dev.epicgames.com/documentation/en-us/unreal-engine/working-with-audio-in-unreal-engine">https://dev.epicgames.com/documentation/en-us/unreal-engine/working-with-audio-in-unreal-engine</a></li> <li>6. Game Developer Community, <i>GDC Vault</i>. TechTarget, Inc. [online, free] - <a href="https://gdcvault.com/">https://gdcvault.com/</a></li> <li>7. Audiokinetic. <i>Audiokinetic</i> YouTube channel, <i>Wwise</i> webinars &amp; tutorials. Audiokinetic Inc. [online, free] - <a href="https://www.youtube.com/@Audiokinetic/courses">https://www.youtube.com/@Audiokinetic/courses</a></li> </ol>
	eResources addresses	
Example issues/ example questions/ tasks being completed	<p>Theoretical issues (lecture/test):</p> <ul style="list-style-type: none"> <li>• How does interactive audio differ from linear audio? Give examples of applications for both approaches.</li> <li>• Describe the Actor-Mixer hierarchy in Wwise. What role do Random and Switch containers play?</li> <li>• What is RTPC and how does it enable audio adaptation to the game state?</li> <li>• What are the advantages of using audio middleware (Wwise, FMOD) instead of native engine audio systems?</li> <li>• Discuss the specifics of spatial audio in VR applications - how does it differ from classic stereo/surround sound?</li> </ul> <p>Design tasks:</p> <ul style="list-style-type: none"> <li>• Configure a Wwise project for a simple 3D scene: add at least 5 sound objects, organize them into a logical hierarchy, assign audio assets.</li> <li>• Design a character footstep system that responds to the type of ground (Switch Container + integration with the engine).</li> <li>• Implement adaptive music that changes intensity depending on the RTPC value of TensionLevel controlled by game logic.</li> <li>• Configure Spatial Audio for a closed room with an entrance - use Rooms &amp; Portals, verify the sound attenuation.</li> <li>• Perform a comparative analysis: implement the same sound effect once natively in Unity Audio and once in Wwise - evaluate the differences in flexibility, labor intensity, and capabilities.</li> </ul>	
Practical activities within the subject	Not applicable	

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