Course guide
804422 - DSA - Advanced Sound Design

Unit in charge:	Image Processing and Multimedia Technology Centre
Teaching unit:	804 - CITM - Image Processing and Multimedia Technology Centre.

Degree:	BACHELOR'S DEGREE IN DESIGN, ANIMATION AND DIGITAL ART (Syllabus 2023). (Optional subject). BACHELOR'S DEGREE IN DIGITAL DESIGN AND MULTIMEDIA TECHNOLOGIES (Syllabus 2023). (Optional subject).

Academic year: 2025   **ECTS Credits:** 6.0   **Languages:** Catalan

LECTURER

Coordinating lecturer:	Manzanares, Xavier
Others:	Manzanares, Xavier
	Febrer, Eulàlia

PRIOR SKILLS

It is reccomended (not mandatory) to have basic skills of programming, due to the fact that during the course there are contents and practices with algorythmic techniques.
Anyways those techniques will be shown from the basis.

REQUIREMENTS

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CEM 6.4. Use capture instruments and computers and editing and post-production software, and apply the appropriate procedures and techniques for the acquisition, editing, production and post-production of audiovisual productions.
CEM 14.4. Manage and carry out projects to create audiovisual documents.
CEVJ 7. Master the wide range of professional tools in the sector for developing all kinds of digital content.
CEM 11.9. Correctly use a sound studio and the equipment within it in their basic settings.
CEAAD 3. Master the wide range of professional tools in the sector for developing all kinds of digital content.
CEAAD 12. Implement and manage design and animation projects, including planning, direction, execution and evaluation.
CEM 11.1. Assess the state of current audiovisual technologies.
CEM 11.13. Use tools for processing audiovisual signals.

Transversal:
CT1a. ENTREPRENEURSHIP AND INNOVATION: Being aware of and understanding how companies are organised and the principles that govern their activity, and being able to understand employment regulations and the relationships between planning, industrial and commercial strategies, quality and profit.

06 URI N3. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.
07 AAT N3. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.

TEACHING METHODOLOGY

Featuring and learning of new content with theory, references and practices Hands-On-like.
Participative class with problem solving activities / examples, and content discussion.
Developing of a subject project with different avaluable sections, in which apply and experiment with contents shown in classroom.

LEARNING OBJECTIVES OF THE SUBJECT

- To know the theoretical concepts related to sound phenomenology and its applications at a creative level.
- To know the theoretical and technical concepts related to capture, edit, design, postproduction and live deployment.
- To know the history of music and sound art in electronic arts, videogames and audiovisual media contexts.
- Design and apply sound resources in different audiovisual and interactive media, based on narrative criteria.
- To know the most current technologies for sound treatment in scenic, interactive and new audiovisual formats.
- To know procedural and generative methods of sound synthesis applied in the field of video games and electronic arts.
- To know the auditory neuro-perception in order to integrate it in sound, audiovisual and immersive productions.

STUDY LOAD

Type	Hours	Percentage
Hours large group	18,0	12.00
Guided activities	12,0	8.00
Self study	90,0	60.00
Hours medium group	30,0	20.00

Total learning time: 150 h

CONTENTS

PART 1 : Sonic Fundamentals, Design and Edition

Description:
PART 1 .: Sonic Fundamentals
- Sound Physics > Particles > Pressure Waves and Membranes
- Listening
- Neuroperception [fundamentals] Decoding of acoustic signals in our brain (From the acoustic signal to the NAP Neural Action Potential)
- Hearing Human Auditory Range vs Perception in Biology
- Hearing & haptics
- Mechanical Frequencies vs Electromagnetic Frequencies
- Resonance> Cymatics // Resonance and Morphology of sound.
- DSP / Analogue vs Digital Sound DAC ~ (Digital to Analogue conversion) ADC ~ (Analogue to Digital conversion)
- DSP / Sample Rate & Audition
- DSP / Bitrate / Bitdepth // Sound pixelization

PART 1.2: Sound Design
- Field Recording, Sampling & Synthesis (from RA to abstraction)
- FieldRecordings [types]: Raw Irrigation, Soundscapes, Voice, Human, Social, Nature, Cosmos, Interviews, Speech, Podcast
- Sampling: Patchwork and Remix / Copyrights and Licenses
- Synthesis: from electricity to sound. Genesis of sound
- Synthesis [fundamentals]: sine, square, triangle, sawtooth
- Synthesis [type]: additive, subtractive, granular.
- Synthesis [filtering]: lop hip bp reverb delay distortion.
- Hardware Type of hardware to electronic music (Sequencers, Synthesizers, Rhythmbox, Bassliners, Droners)
- Historical Evolution of modular synthesis> in Laptop Music> DIY Synths
- Open Paradigm Music: DIY / DIWO Synth communities
- Modular Synths & Examples
- Live Coding & Examples
- Open Hardware Electronics & Examples
- Circuit Bending & Examples
- Luthierism & Makers, CNC Techs, wiring, Conductive ink & code. Raspberry Pi, Bela Platform, ajolote, Bare Conductive
- Sound Design> Sonic Algoryhtms & Automats
- Sonic Programming: Pure-data and Sonic Pi
- Generative programming: Automata / GNRTV.Blocks

PART 1.3: Editing and PostProduction
- Production> DAW & Edit Content creation for podcasts
- Edit Recording: Envelopes, Fades, Avoid Clicks, Find the groove, normalizing
- Frequency ranges, timbres and character of the instruments.
- Basic methods of mastering.

Full-or-part-time: 70h
Practical classes: 30h
Self study : 40h

PART 2: History of music in the audiovisual media

Description:
- Music for cinema: from the soundtrack in situ to the present day. This review will present conceptual elements, in order to situate the main practical elements that can be extrapolated to non-cinematic audiovisual environments (spotting, synchronization, use of leitmotif, etc.).

- Music in video games, pointing to the technological evolution and tools that have made it possible, to synchronization with film music.

- Sound introduction in interdisciplinary artistic environments. It will be formulated from previous examples, through concepts of soundscape, sound-art, media art, etc.

- Sonology vs. musicology

Full-or-part-time: 20h
Practical classes: 7h 30m
Self study : 12h 30m

PART 3: Sound Design and Storytelling in Games and New-Media Art

Description:
Music application and video game genres:
- Sound introduction strategies and optimal formulas according to genres (MOBA, fight, adventure, terror, puzzles, etc.)
- The role of musical narrative in audiovisual proposals, from video games to projects interdisciplinary / New Media Art
Basic notions of music to create associations strategic emotions, flow state promotion, etc.
Interconnected methods between generative/procedural audio engines with game engines and interaction systems
-Emotions and storytelling through sound.

Full-or-part-time: 20h
Practical classes: 12h 30m
Self study : 7h 30m

PART 4: Immersive - Sonic Spaces

Description:
- Sonic Interaction Design
- Binaural
- Immersivity
- Haptics
- Transperception & Synaesthesia
- Eco · location
- Brain Waves
- Sound / 360o spatialization
- Sonic Generative Programming
- Interaction and immersion. OSC connectivity between software.
- Tools to introduce sounds and music in immersive audiovisual proposals, from synthesizers to orchestral recordings in studio or foley techniques.
- Speculative Design and MusicAI
- Advanced Music Technology

Full-or-part-time: 40h
Practical classes: 15h
Self study : 25h

ACTIVITIES

PROJECT

Description:
It will be evaluated by carrying out a project related to the contents of the subject.
Students will be able to choose between three different types of projects and will carry them out individually or as a team (with different volumes of development depending on whether it is individual or not).

Material:
It will be defined in the published document in Atenea at the beginning of the course.

Delivery:
It will be defined in the published document in Atenea at the beginning of the course.

Full-or-part-time: 80h
Self study: 50h
Guided activities: 15h
Practical classes: 15h

Scoring Exercises

Description:
In addition to the subject main project, there will be several scoring exercises.
The instructions of the exercises will be defined in uploaded documents at Atenea during the course.

Full-or-part-time: 10h
Self study: 10h

GRADING SYSTEM

(ENG)
Subject will be avaluated through a Research Project, which will have different phases and deadlines.
- Exposition Avaluation Partial - 10%
- Delivery Avaluation Partial - 10%
- Exposition Final Project - 10%
- Delivery Final Project - 35%
- Participation and learning attitude - 10%
- Hands·On practices + exercises at class- 25%

Irregular actions that may lead to a significant variation of the grade of one or more students constitute a fraudulent performance of an evaluation act. This action entails the descriptive grade of failure and a numerical grade of 0 for the ordinary global evaluation of the course, without the right to re-evaluation.

If the lecturers have indications of the use of AI tools not allowed in the evaluation tests, they may summon the students concerned to an oral test or a meeting to verify the authorship.

EXAMINATION RULES.

Development work will be carried out where the concepts and techniques shown in the classroom can be applied.

These works are developed throughout the course by carrying out a partial evaluation and a final one to have a continuous assessment, following the instructions and deadlines described in the corresponding document that will be published at Atenea.

The evaluation of the works does not only involve the resolution of the proposed projects, but also the defense of the results in the respective public presentations.

In addition, there will be practical exercises in laboratory format / 'HandsOn', to reinforce technical methodologies / processes.

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Any incident that does not allow to solve the practices and works in the indicated terms, will be communicated to the profesorado by means of message by the Virtual Campus; after this communication, the relevance or not of any cause that motivates the non-presentation of the exercise will be resolved and the alternatives will be established to complete the evaluation if the causes are justified. The causes of non-presentation of exercises that are communicated to the teaching staff by the Head of Studies will also be considered justified.

The re-evaluation method will be the implementation of elements suggested by the teacher, contextualized in each work, having a defined delivery time within the established re-evaluation periods.

BIBLIOGRAPHY

Basic:

- Roads, Curtis. The Computer Music Tutorial. MIT Press,
- Franinović, Karmen & Serafin, Stefania. Sonic Interaction Design. MIT Press,
- Kreidler, Johannes. Programming Electronic Music In Pd [on line]. 2008Available on: https://gem.iem.at/Members/caiobarros/kreidlerbook/kreidler_loadbang/at_download/file.
- Hermann, Thomas; Hunt, Andy & Neuhoff, John G.. The Sonification Handbook [on line]. 2011Available on: https://sonification.de/handbook/. ISBN 978-3-8325-2819-5.
- Groh, Jennifer M.. Making Space How the Brain Knows Where Things Are [on line]. Harvard University Press, 2014Available on: https://www.hup.harvard.edu/catalog.php?isbn=9780674863217. ISBN 9780674863217.
- Collins, K.. Game Sound: An Introduction to the History, Theory, and Practice of Video Game Music and Sound Design. The MIT Press, 2008.
- Munday, R.. "Music In Video Games". A J. Sexton. Music, Sound and Multimedia: From the Live to the Virtual. Edinburgh University Press, 2007. 51-67.
- Summers, T.. Understanding Video Game Music. Cambridge University Press, 2016.
- Wahlen, Z.. "Play Along. An Approach to Videogame Music". Game Studies. The international journal of computer game research [on line]. 4(1)Available on: http://gamestudies.org/0401/whalen/.

Complementary:

- Roads, Curtis. Microsound [on line]. The MIT Press, Available on: https://mitpress.mit.edu/books/microsound.
- Music Aided Design The Foundations of Spatial Music [on line]. https://felixfaire.com/synaestheticspace/felixfairedissertation.pdfAvailable on: https://felixfaire.com/synaestheticspace/felixfairedissertation.pdf.- Goodman, Steve. Sonic Warfare - Sound, Affect, and the Ecology of Fear [on line]. The MIT Press, Available on: https://mitpress.mit.edu/books/sonic-warfare.
- Brinkmann, Peter. Making Musical Apps. O'Reilly Media, Inc., 2012.
- Donelly, K. J., Gibbons, W. i Lerner, N. (Eds).. Music in Video Games: Studying Play. 2014.
- Gibbons, W.. Unlimited Replays: Video Games and Classical Music. Oxford University Press, 2018.
- Schafer, M.. Soundscape: Our Sonic Environment and the Tuning of the World. Inner Traditions Bear and Company., 1999.

RESOURCES

Hyperlink:
- Bases de datos. Música Audiovisual. http://musicaudiovisual.com/es/bases- VVAA - Sonic Interaction Design - Catalogue of an exhibition at Norwegian Museum of Science, Technology and Medicine, 2011. https://bek.no/wp-content/uploads/2020/08/SID-Web.pdf- Links Codi & Apps de seguiment i pràctiques Fodie.Sonora Secció XM. http://oneshaptiques.space/edu/citm/fodie.sonora/