HOCHSCHULE FURTWANGEN UNIVERSITY | HFU

Entwurf der

Studien- und Prüfungsordnung

des Studiengangs

Games & Immersive Media B.A.

Stand 15.3.23

Zusammengestellt von
Prof. Jirka Dell'Oro-Friedl

Inhaltsverzeichnis

Grundsätzliches

- Name: Games & Immersive Media
- Abschlussbezeichnung: Bachelor of Arts
- Fächergruppe: Kunst, Musik, Gestaltung
- Studienbereich: VIII. 2 Neue Medien
- Grundstudium 2 Semester, Hauptstudium 5 Semester
- 210 ECTS
- 5. Semester ist Praxissemester
- Projektorientierung
- Vordringlich Blockunterricht
- Bilingual Deutsch/Englisch, Englischanteil > 50% angestrebt
- Dedizierte Räume für Kohorten
- Auslandssemester wird empfohlen und unterstützt
- Die Ordnung wurde inhaltsgetrieben erstellt. Um die zu erwartenden und konzipierten Lasten korrekt darstellen zu können, wurde neben der Auszeichnung nach Eckwertepapier (ECK) auch die Auszeichnung nach Akkreditierungsverordnung (ECTS) vorgenommen.

Qualifikationsziele

Section 1: Professional Skills

- Strong expertise in designing and implementing visual arts, software, sound, and interactive elements.
- In-depth knowledge and abilities in team management, production, and marketing.
- Comprehensive theoretical understanding of media design and technology.
- Experience in collaborating with diverse teams on multiple projects using agile methodologies.

Section 2: Interdisciplinary Skills

- Ability to effectively work within multicultural teams in both German and English.
- Sensitivity to the societal impact of the development and utilization of games and immersive media.
- Competence and self-assurance in employing complex technologies in creative and artistic contexts.

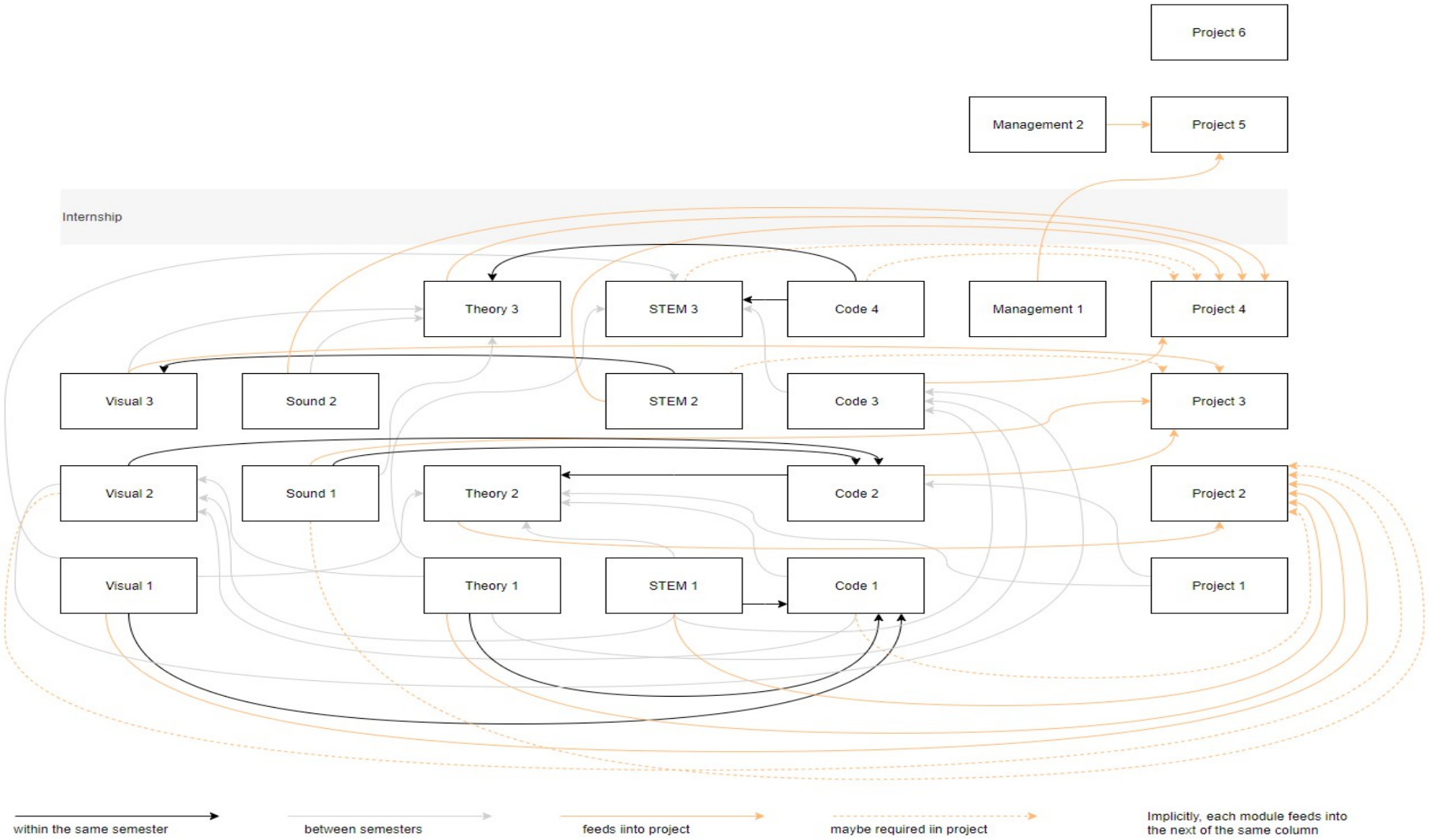
Section 3: Career-Oriented Goals

- Robust foundation for pursuing various careers in the gaming industry.
- Strong groundwork for exploring diverse professions within immersive media outside the gaming sector.
- Opportunities for further specialization in chosen fields such as computer science, media technologies, digital asset creation, media management, and media design.

Überblick

S27							WPM 12 | All - #3 - #4	Project 6 18 eg All - Bachelor Thesis - Thesis Seminar
W26						Management 2 6 |4NN	WPM 12 | All - #1 - #2	Project 5 12 eg | 3All - Complex Digital Project
S26	Internship							
W25			Theory 3 5:6 eg 4NN	STEM 3 5:6 e 2GR,2UH	Code 4 5:6 e 2RL,2JA,2SH	Management 1 5:6 | 4NN		Project 4 10:6 eg | 3All - Advanced Digital Project
S25	Visual 3 5:6 e 2CM,1RR,1NN	Sound 2 5:6 eg | 4NN (Tross)		STEM 2 5:6 e(g) | 4TSr	Code 3 5:6 e 2UH, 2CM			Project 3 10:6 eg | 3All - Simple Digital Project
W24	Visual 2 5:6 e 2CM,2NN	Sound 1 5:6 eg | 4NS	Theory 2 5:6 e | 2JD,2TSr		Code 2 5:6 e 4JD			Project 2 10:6 eg | 3All - Physical Game
S24	Visual 1 6 eg 2CF,4NN		Theory 1 6 g(e) 4TSl	STEM 1 6 e(g) | 2RL,1UH.1TSr	Code 1 6 e 3JD,1RR			Project 1 6 eg | 2KH,2UH - Entry Project

Abhängigkeiten



Sound 1 Norbert Schnell

Content
- Basics of sound, listening and sonic interaction
- Basics of acoustics and psychoaoustics
- Basics of digital audio (in sound and music processing)
- Interactive audio tools
- Spatial/immersive audio techniques
- Techniques of interactive audio design

Lecturer
- Norbert Schnell (4 SWS)

Credits
- 5 ECTS / 6 ECK

Language
- German / English

Teaching
- Seminar
- preferably 3 week block

Assessment
- 1 sbA

Sound 2 Norbert Schnell

Content
- Basics of sound design
- Foley and sound effects
- Sound libraries
- Music genres
- Music and emotion
- Music in context
- Music analysis
- Basics of composition (rhythm, melody, harmony)
- Basics of instrumentation and orchestration

Lecturer
- NN HfM Trossingen (4 SWS)

Credits
- 5 ECTS / 6 ECK

Language
- German / English

Teaching
- Seminar / eduScrum
- preferably 3 week block

Assessment
- 1 sbA

STEM 1 Thomas Schneider

Module STEM 1

Contents:

Geometry / Linear Algebra / Graphical projections:

- Geometry of 2D and 3D:
- Coordinates of Points and Vectors
- Change of Coordinate Frames
- Systems of Linear Equations
- Metric Spaces: Distances, Lengths, Angles
- Matrices and Linear Transformations
- Homogeneous Coordinates
- Matrices and Affine Transformations

- Graphical Representations of 3D Objects

- Parallel / Axonometric Projections
- Linear Perspective: Image Construction using Desargues' Theorem
- Points at Infinity and Vanishing Points
- Projection Matrices: Unified Approach

Lecturers

- Thomas Schneider, Ruxandra Lasowskis, Uwe Hahne
- Adjunct Lecturer(s)

Credit Point Assignments:
6 ECTS/ECK

Language

- English
- German upon consensual request of all participants

Teaching Format:

- Seminar (15 weeks plus exam period)

Assessment:

- 1 sbA (Practical Work)
- 1K (Final Examination)

STEM 2 Thomas Schneider

Module STEM 2

Contents:

- Foundations

- Basic Calculus
- Parametrized Curves in 2D and 3D
- Elements of Kinematics

- Dynamical Systems

- Deterministic Models, Differential Equations
- Setting up and Evalutating Models for Example Systems
- Project Work: Visualization of the Behavior of Simple Systems by Means of Web Applications

- Foundations of Camera Optics

- Paraxial Ray Tracing
- Camera Lenses and their cardinal points
- Focus, Magnification, Depth of Focus
- Comparison: Optical Properties of the Human Eye vs. Camera Optics

- Physics Engines

Lecturers

- Thomas Schneider
- Adjunct Lecturer(s)

Credit Point Assignments:

5 credit points (ECTS) / 6 credit point (ECK)

Language

- English
- German upon consensual request of all participants

Teaching Format:
Seminar
Three-Week Block

Assessment:

- 1 sbA (Practical Work)
- 1 sbK (Final Examination)

STEM 3 Uwe Hahne

Contents

- Practical electronics and signal processing
- Physical Computing
- Computer Vision for Extended Reality (XR)
- IoT, Tangible Interfaces

Lecturers

- 2SWS Gabriel Rausch
- 2SWS Uwe Hahne

Points

- 5 ECTS
- 6 ECK

Language

- English

Teaching

- Seminar / eduScrum
- preferably 3 week block

Assessment

- 1 sbA (small project with hardware)

Prerequisites	Obtained in
Foundations of digital information and graphics processing (Bits, Bytes, Pixel, Colorcodes, Bitmaps, etc.)	Theory1
Foundations of physics, basic calculus (differentiation)	STEM2
Foundations of hardware architectures (CPU, GPU)	Code3
Linear algebra	STEM1
Fundamental UI-Design	Visual1
Some knowledge of Human-Computer-Interaction	Theory1
Basic Machine Learning concepts	Code4

Theory 1 Thomas Schlegel

Theory 1

- Computer Science & Computing Introduction

- Interactive Systems

- Human Computer Interaction & User-Centered Design

- Cognition and Perception

Contents

- Why Computer Science?
- Current Research and Technology
- History of the Computer
- Technology Hardware, von Neumann
- Computer Science Basics: Bits & Bytes, Pixels
- Boolean Logic
- Perception (Visual, Auditive and Haptic), including Colors
- Cognition and Memory
- HCI topics
- User-Centered Design & User-Centered Design Process

Lecturers

- 5 SWS Thomas Schlegel

Points

- 6 ECTS

Language

- German (English on Request)

Teaching

- Seminar
- 3 week block or semester lecture

Assessment

- 1sbK

Theory 2 Jirka Dell'Oro-Friedl

Contents

Seminar 1: Game Design

- Game Studies
- Design Graphs
- Design Methodologies

Seminar 2: Probability and Strategy

- Elementary Combinatorics
- Finite Probability Spaces: Examples
- Bernoulli Processes and Binomial Distributions
- Expected Value and Variance
- Conditional Probabilities, Bayes' Theorem
- Game Theory
- Strategy

Lecturers

- Seminar 1: 2SWS Jirka Dell'Oro-Friedl
- Seminar 2: 2SWS Thomas Schneider

Points

- 5 ECTS
- 6 ECK

Language

- English

Teaching

- Seminar / eduScrum
- preferably 3 week block

Assessment

- Seminar 1: 1sbK (e-Test)
- Seminar 2: 1sbKO

Prerequisites	Obtained in
Theory 1	Theory 1
Visualization, Storyboarding	Visual1
Design graphs	Code1, Code2
Design Thinking	Management1
Perspective	Visual1, STEM1

Theory 3 N.N.

Contents

- Level Design
- Mission Design
- Narrative Design
- Storytelling
- Environmental
- UX-Design

Lecturers

- 4SWS NN

Points

- 5 ECTS
- 6 ECK

Language

- English

Teaching

- Seminar / eduScrum
- preferably 3 week block

Assessment

- 1sbK (e-Test)

Prerequisites	Obtained in
Theory 2	Theory 2
Sound1, Sound2	Sound1, Sound2
Visual1, Visual2, Visual3	Visual1, Visual2, Visual3
Game AI	Code4
Multiplayer	Code4

Assessment

- 1 sbA

Visual 1 Christian Fries

Contents

- Draft and sketching
- Figurative thinking
- Storyboard
- Color theory and practical application
- Visual Character-Developement
- UI-Design-Basics

Lecturers

- 2 SWS Christian Fries
- 4 SWS nn

Points

- 6 ECTS / ECK

Language

- German / English

Teaching

- Seminar
- preferably 3 week block

Visual 2 Christoph Müller

- 3D Modeling
- Box Modeling
- Sculpting
- Poly Modeling/Polygon Flow
- Retopology

- Materials Lights and Texturing
- UV Unwinding
- Texture painting
- Normal Mapping
- Material generation for Game Engines
- Light and Material

- Character
- From Concept Art to 3D-Primitive Block-Out

- Animation Basics
- Keyframe Animation
- Path Animation

- From Models to Assets
- Modeling for Realtime Engines
- Materials for Realtime Engines

Lecturers

- 2 SWS Christoph Müller
- 2 SWS NN

Points

- 5 ECTS / ECK

Language

- English

Teaching

- Seminar / eduScrum
- preferably 3 week block

Assessment 1 sbA (small project: from concept art to game engine asset)

Prerequisites	Obtained in
Creating Concept Art	Visual 1
Basic understanding of media file formats, especially Pixel and vector formats	Code 1 / Theory 1
Basic understanding of 3D Vectors, Normals, Dot Product	STEM 1

Visual 3 Christoph Müller

- Advanced Material and Shading
- 3D-Animation (Realtime)
- Non-linear animation
- Animation State-machines
- Animation Blending
- Combining Physics and scripted Animation

- Character Animation
- Rigging
- Forward / Inverse Kinematics
- Walk Cycles

- Visual Design
- 2D Animation

Lecturers

- 1 SWS Regina Reusch
- 2 SWS Christoph Müller
- 1 SWS NN

Points

- 5 ECTS / ECK

Language

- English

Teaching

- Seminar / eduScrum
- preferably 3 week block

Assessment 1 sbA (small project: simple animated character)

Prerequisites	Obtained in
Concept Art	Visual 1
3D Modelling for Realtime	Visual 2
Basic understanding of physical facts (mass, force, velocity, acceleration)	STEM 2

Management1 N.N.

Contents

- Producing
- Quality Management
- User Research
- Community Management
- Financial calculation

Lecturers

- 4SWS NN

Points

- 5 ECTS
- 6 ECK

Language

- ?

Teaching

- Seminar / eduScrum
- preferably 3 week block

Assessment

- 1sbK (e-Test)

Prerequisites

Obtained in

Management2 N.N.

Contents

- Publishing
- Entrepreneurship
- Monetization
- Marketing
- Lifecycle Management

Lecturers

- 4SWS NN

Points

- 6 ECTS / ECK

Language

- ?

Teaching

- Seminar / eduScrum
- preferably 3 week block

Assessment

- 1sbK (e-Test)

Prerequisites

Obtained in

Code1 Jirka Dell'Oro-Friedl

Contents

- Creative Coding
- Web Fundamentals
- 2D-Scenegraph
- Procedural Code
- Coding Audiovisuals
- Computational Thinking

Lecturers

- 3SWS Jirka Dell'Oro-Friedl
- 1SWS Regina Reusch

Points

- 6 ECTS / ECK

Language

- English

Teaching

- Seminar / eduScrum
- preferably 3 week block

Assessment

- 1 sbK (e-Test)

Prerequisites	Obtained in
Foundations of digital information and grafics processing (Bits, Bytes, Pixel, Colorcodes, Bitmaps, Vectorgrafics etc.)	Theory1
Foundations of digital sound (Sampling, Playback)	STEM1 (Matthias ist interessiert hier ei Beitrag zu leisten)
Experience in creating grafics manually	Visual1
Elementary linear algebra	STEM1
Fundamental UI-Design	Visual1
Some knowledge of Human-Computer-Interaction	Theory1

Code2 Jirka Dell'Oro-Friedl

Contents

- Software Design
- Object Orientation
- 3D-Scenegraph
- Game Patterns & Techniques
- Component Entities

Lecturers

- 4SWS Jirka Dell'Oro-Friedl

Points

- 5 ECTS
- 6 ECK

Language

- English

Teaching

- Seminar / eduScrum
- preferably 3 week block

Assessment

- 1sbK (e-Test)

Prerequisites	Obtained in
Code1	Code1
Spatial audio	Sound1
Modelling, texturing, lighting	Visual2
Foundations of software engineering	Management1
Perspective	Visual1, STEM1

Code 3 Uwe Hahne

Contents

- Realtime Computer Graphics
- Shader
- Advanced SW design patterns
- Computation Performance
- Advanced Audiovisuals

Lecturers

- 2SWS Christoph Müller
- 2SWS Uwe Hahne

Points

- 5 ECTS
- 6 ECK

Language

- English

Teaching

- Seminar / eduScrum
- preferably 3 week block

Assessment

- 1 sbA (small project with GPU coding and review)

Prerequisites	Obtained in
Foundations of digital information and graphics processing (Bits, Bytes, Pixel, Colorcodes, Bitmaps, etc.)	Theory1
Computer Graphic basics (Vertices, Faces, Meshes, Scenegraphs, Textures, Lighting)	Visual2
Linear algebra (Matrix, Vector)	STEM1
Coding skills that allow to read any language	Code 2

Code 4 Ruxandra Lasowski

Contents

- Game AI
  - Finite Automata und Behaviour Trees
  - Agents, Search Problems, Uninformed Search
  - Informed Search (A* and Heuristics)
  - Adversarial Search and Games I: Minimax, Alpha-beta Pruning
  - Adversarial Search and Games II: Expectimax, MCTS
  - Reinforcement Learning
- Network
  - Database
  - Relational and NoSQL databases
  - Network
  - Server APIs
  - Backend services

    - Network, Multiplayer:
    - Internet- and Streaming: Networking Protocols Basics
    - Optional: Dedicated Gameserver: Architectures, APIs
    - Networking Multiplayer-Gameserver:
    - a) Online: Client Server /P2P /MMOG Architectures and Protocols
    - b) Local: LAN/WLAN
    - c) Dedicated MMOG@home: NAT, DDNS, STUN
    - Cloud Gaming over public networks (Shadow/Blade/Google)

Lecturers

- 2SWS Ruxandra Lasowski
- 2SWS Stephanie Heintz
- 2SWS Jürgen Anders

Points

- 5 ECTS
- 6 ECK

Language

- English

Teaching

- Seminar / eduScrum
- preferably 3 week block

Assessment

- 1sbK
- 1sbA

Prerequisites	Obtained in
Basics in Computer science	Theory 1
Basics for AI	STEM 1, Theory 1 + 2

Assessment

- 1 sbA

Project1: Entry Project Nikolaus Hottong

Contents

- No-Code/Low-Code Game Project
- Agile Mindset
- Methods (Scrum, Design Thinking, Team Building)
- Playful approach to media development
- Project-based learning
- Presentation and event planning

Lecturers

- Nikolaus Hottong (2 SWS)
- Uwe Hahne (2 SWS)

Points

- 6 ECTS/ECK

Language

- englisch

Teaching

- Seminar / eduScrum
- 3 week block, preferably first block of course (-> Teambuilding)

Project2: Physical Game

Contents

- Design and creation of a physical game, optionally with digital augmentation
- Practical application of various skills acquired in previous modules
- Team- and projectmanagement
- Practice visualization, documentation, communication, presentation
- Work with physical material to create prototypes

Lecturers

- 3SWS in total for three docents as jury

Points

- 10 ECTS
- 6 ECK

Language

- English/German

Teaching

- Workshop / Scrum
- preferably 6 week block

Assessment

- 1A

Prerequisites	Obtained in
Visual Design	Visual1
Foundations of perception & cognition	Theory1
Perspective	Visual1, STEM1
Probability, strategy and game theory	STEM1, Theory2
Foundation of game design	Theory2
3D-Modelling for stills or 3D-printing, if applicable	Visual2
Audiodesign, if applicable	STEM1, Sound1
Generative design of stills if applicable	Code1

Project3: Simple Digital Project

Contents

- Design and creation of a simple interactive application
- Practical application of various skills acquired in previous modules
- Implemention of graphics, sound, behaviour, animation, text
- Team- and projectmanagement
- Practice visualization, documentation, communication, presentation
- Work with digital material to create prototypes

Lecturers

- 3SWS in total for three docents as jury

Points

- 10 ECTS
- 6 ECK

Language

- English/German

Teaching

- Workshop / Scrum
- preferably 6 week block

Assessment

- 1A

Prerequisites	Obtained in
Project1	Project1
Interactive & immersive audio	Sound1
Software design, software engineering	Management1, Code2
2D and/or 3D-animation	Visual3
3D-modelling for interaction, if applicable	Visual2
Coding	Code1, Code2
Foundations of physics engines and dynamical systems, if applicable	STEM2

Project4: Advanced Digital Project

Contents
- Design and creation of an advanced interactive application
- Practical application of various skills acquired in previous modules
- Implemention of advanced technologies e.g. AR/VR, spatial audio/video, tangible interfaces
- Team- and projectmanagement
- Practice visualization, documentation, communication, presentation
- Work with digital material to create advanced prototypes

Lecturers
- 3SWS in total for three docents as jury

Points
- 10 ECTS / 6 ECK

Language
- English/German

Teaching
- Workshop / Scrum
- preferably 6 week block

Assessment
- 1A

Prerequisites	Obtained in
Project2	Project2
Spatial audio	Sound1
Music & sound design	Sound2
Modelling and animation in 2D and 3D	Visual2, Visual3
3D-Modelling for interaction, if applicable	Visual2
Advanced coding	Code3
Foundation of physics engines & dynamical systems	STEM2
Storytelling, narrative design if applicable	Theory3
UX-Design	Theory3
Foundations of multiuser experiences, if applicable	Code4
Advanced computer-Interaction, if applicable	Code4
Tangible interfaces, computer vision, physical computing if applicable	STEM3

Project5: Complex Digital Project

Contents

- Professional Design and creation of a complex interactive application
- Practical application of various skills acquired in previous modules
- Consideration and calculation of professional publishing, marketing, monetization, quality assurance.
- Practice professional workflow

Lecturers

- 3SWS in total for three docents as jury

Points

- 12 ECTS / ECK

Language

- English/German

Teaching

- Workshop / Scrum
- preferably 8 week block

Assessment

- 1A

Prerequisites
Obtained in
Project3

Project3

Prerequisites	Obtained in
Project3	Project3
Producing, business calculation, advanced management	Management 1+ 2

Project6: Final Assignment

Contents

- Bachelor Thesis
- Thesis Seminar

Lecturers

- 2SWS all docents

Points

- 18 ECTS / ECK

Language

- English/German

Teaching

Assessment

- 1 T: 12 ECTS/ECK
- 1 PN: 6 ECTS/ECK

Qualifikationszielmatrix

			Unterstützung der Qualifikationsziele in den Modulen (0=keine, 1=indirekte, 2=direkte)																										
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Nr.	Qualifikationsziel	Summe	Project 1	STEM 1	Code 4	Visual 1	Visual 2	Visual 3	Code 3	STEM 2	STEM 3	Sound 1	Sound 2	Theory 1	Theory 2	Theory 3	Code 1	Code 2	Project 2	Project 3	Project 4	Project 5	Project 6	Management 1	Management 2	WPM 1	WPM 2	WPM 3	WPM 4
	Section 1: Professional Skills																												
1	Strong expertise in designing and implementing visual arts, software, sound, and interactive elements.	27			1	2	2	2	2		2	2	2	1	1	1	2	2	1	1	1	1	1						
2	In-depth knowledge and abilities in team management, production, and marketing.	20				1	1	1	1						1	1			2	2	2	2	2	2	2				
3	Comprehensive theoretical understanding of media design and technology.	29		2	2	2	2	2	2	2	2	2	2	1	2	2	1	1						1	1				
4	Experience in collaborating with diverse teams on multiple projects using agile methodologies.	30	2		1	2	2	2	2	2	1						1	1	2	2	2	2	2	2	2				
	Section 2: Interdisciplinary Skills																												
5	Ability to effectively work within multicultural teams in both German and English.	29	2	2	1	1	1	1	1	1	1				1	1	1	1	2	2	2	2	2	2	2				
6	Sensitivity to the societal impact of the development and utilization of games and immersive media.	20	1		1	1	1	1						2	2	2			1	1	1	1	1	2	2				
7	Competence and self-assurance in employing complex technologies in creative and artistic contexts.	30			1	2	2	2	1		2	2	2	1		1	2	2	2	2	2	2	2						
	Section 3: Career-Oriented Goals																												
8	Robust foundation for pursuing various careers in the gaming industry.	38	1	1	2	1	2	1	2		2	1	1	1	2	1	2	2	2	2	2	2	2	1	1	1	1	1	1
9	Strong groundwork for exploring diverse professions within immersive media outside the gaming sector.	38		1	2	1	1	2	2	2	2	1	1	1	1	1	2	2	2	2	2	2	2	1	1	1	1	1	1
10	Opportunities for further specialization in chosen fields such as computer science, media technologies...	12																						2	2	2	2	2	2