



Major	Industrial Engineering		
Master's programme	MANAGEMENT OF 3D INTERACTIVE TECHNOLOGIES		
Master's Code	MTI3D-IVI M2		
Qualification awarded	Master's degree in Industrial Engineering		
Programme director	Dr. Olivier CHRISTMANN (olivier.christmann@ensam.eu)		
Mode of study	Level of qualification	Field of study	Language of study
Full time	Master ISCED 7	Engineering ISCED-F-07	French
ECTS	Campus	Length of programme	Specific arrangements for recognition of prior learning
60	Angers	1 year (from September to September)	Yes (VAE or VAP)
Keywords	Virtual Reality, Augmented Reality, Mixed Reality, Research Methodology, Experimental Research Design, Human-machine interfaces, Programming, Real-time computer graphics, User experience, 3D modelling, Rendering, Texturing, Lighting, Post processing, Innovation, Management.		

Admission requirements

Type	Level	Way
English proficiency	Level B2	Certificate
Previous degree	First-year of Master's (M1) minimum, or equivalent, in Engineering	Certificate of achievement

Applicants interested in the MTI3D-IVI M2 programme must follow the online procedure and adhere to the schedule.

<https://artsetmetiers.fr/en/formation/master-admissions>

Overall objectives

The MTI3D-IVI programme aims at training future engineers and researchers who will be able to handle, understand and design new applications using immersive technologies. Students acquire the technical, theoretical and practical background to integrate R&D departments of the largest groups as well as local and national SMEs. The MTI3D-IVI also participates in the training of tomorrow's Academics, Researchers and R&D Managers, by addressing all the steps of a research work in the field of human-machine interfaces with experiments involving participants.



Programme learning goals

The table below details the abilities to be acquired and the expected proficiency levels according to the following grading scale:

- 1) To develop a solid understanding of the current and future challenges in virtual and augmented reality.
- 2) To be able to contribute to the development of complete projects involving 3D modelling, programming and interfacing (using a wide range of hardware) in various fields such as industry, health, training, design support and simulation.
- 3) To be able to design and conduct scientific experiments involving human participants using virtual and augmented reality technologies.
- 4) To acquire management skills to lead multidisciplinary teams.

abilities	Expected abilities	Expected proficiency level
		R&D
<i>Disciplinary knowledge and reasoning</i>	1.1 Knowledge of underlying mathematics and science	4
	1.2 Core fundamental knowledge of engineering	4
	1.3 Advanced engineering fundamental knowledge, methods and tools	4
<i>Personal and professional skills attributes</i>	2.1 Analytical reasoning and problem solving	4
	2.2 Experimentation, investigation and knowledge discovery	4
	2.3 System thinking	3
	2.4 Ethics, though and learning	4
	2.5 Ethics, equity and other responsibilities	4
<i>Interpersonal skills: Teamwork and communication</i>	3.1 Teamwork	4
	3.2 Communications	4
	3.3 Communications in foreign language	3
<i>Conceiving, Designing, implementing, operating, innovating and entrepreneurship in the context of Corporate Social Responsibility</i>	4.1 External, societal and environmental context	3
	4.2 Enterprise and business context	3
	4.3 Conceiving, systems engineering and management	3
	4.4 Designing	4
	4.5 Implementing	3
	4.6 Operating	3
	4.7 Leading engineering endeavours	4
	4.8 Engineering entrepreneurship	3

More specifically, the **key strengths** of the MTI3D-IVI M2 programme are as follows:

- Extended practical skills in the complete production pipeline of virtual and augmented reality applications
- Deep understanding of underlying concepts of a virtual reality, with a focus on user centred experience design



- Deep practical and theoretical knowledge in scientific research methodology: scientific writing, experimental protocols, statistical analysis
- Transversal adaptation, integration, analysis, critical thinking, self-learning, communication, valorisation and organizational skills gained when confronting to both academic and industrial multi-disciplinary projects

Programme structure

Learning outcomes are reached through a well-balanced training programme that combines theoretical and practical learning sequences, during which students are placed in both academic and real-life industrial configurations, in order to develop multiple transversal skills.

The MTI3D-IVI programme is a one-year Master programme that spreads on two semesters

- o **First semester (S3): From September to March**
This semester is composed of 3 technical modules (258h), 1 scientific module (72h), 1 management module (72h), 3 project modules including a long research project of 166h, for a total of 30 ECTS
- o **Second semester (S4): From March to September**
The second semester is dedicated to the Master thesis (4 to 6 months) for 30 ECTS. The internship will take place in a research structure (laboratory or company) in France or abroad

Code	Title	Sem.	Year	ECTS	Hours	Compulsory/Optional	Teaching modalities
MS	Research methodology	S3	M2	5	30	Compulsory	Course/Exercises/Project
MT1	Augmented and Virtual Reality	S3	M2	5	120	Compulsory	Course/Exercises/Project
MT2	3D Modelling, Texturing and Animation	S3	M2	5	60	Compulsory	Course/Exercises/Project
MT3	3D Real Time Programming	S3	M2	5	90	Compulsory	Course/Exercises/Project
MM	Management and Innovation	S3	M2	5	39	Compulsory	Course/Exercises/Project
PJ	Projects	S3	M2	5	164	Compulsory	Projects
MTI	Master Thesis Internship	S4	M2	30	N/A	Compulsory	Internship

Table 1: Detail of the modules of the MTI3D-IVI M2 programme over the two semesters.

Study and assessment rules

Each module can be evaluated by means of practical works, projects, reports, oral presentations, exams and the assessment rules are explained at the beginning of the programme. Each module is evaluated between 0 and 20.

For technical, management and scientific modules (MTI, MM, MS, PJ)

- The final mark of each module must be ≥ 10 , and there is no compensation between the modules

For master thesis (MTI)

- The final mark of the master thesis must be ≥ 10

Retake exams are organized at the beginning of the second semester.

Graduation requirements

To be graduated, students need to comply with the following rules:

Master 2

- Validate 30 ECTS during the first semester
- Validate 30 ECTS during the second semester

At the end of the MTI3D-IVI programme, the final average is calculated based on the ECTS distribution, and mentions are awarded (very good, good, fair, passable)

Careers of graduates and access to further studies

Depending on their results and professional expectations, graduate students can continue their professional careers as:

- PhD student in a field related to virtual and augmented reality, either in academia or industry (CIFRE), becoming a recognised expert in immersive technologies.
- Virtual/augmented reality R&D engineer/researcher in large companies or start-ups in a variety of sectors (e.g. manufacturing, construction, services, consultancy) and fields (e.g. automotive, aerospace, health, transport, real estate, new technologies, gaming).