Major	Industrial Engineering		
Master's programme	MANAGEMENT OF 3D INTERACTIVE TECHNOLOGIES		
Master's Code	MTI3D-IVI		
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 (Laval Institute)**	**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
French proficiency	**Level B2**	**Certificate**
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 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.

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 acquire a solid knowledge of current and future challenges in the field of virtual and augmented reality
2) To be able to take part in the development of a complete project from 3D modeling, to programming and interfacing (using a wide range of hardware) in several areas (industry, health, training, design support, 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
Disciplinary knowledge and reasoning	**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**
Personal and professional skills attributes	**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**
Interpersonal skills: Teamwork and communication	**3.1 Teamwork**	**4**
	3.2 Communications	**4**
	3.3 Communications in foreign language	**3**
Conceiving, Designing, implementing, operating, innovating and entrepreneurship in the context of Corporate Social Responsibility	**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 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 centered 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

- **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
- **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

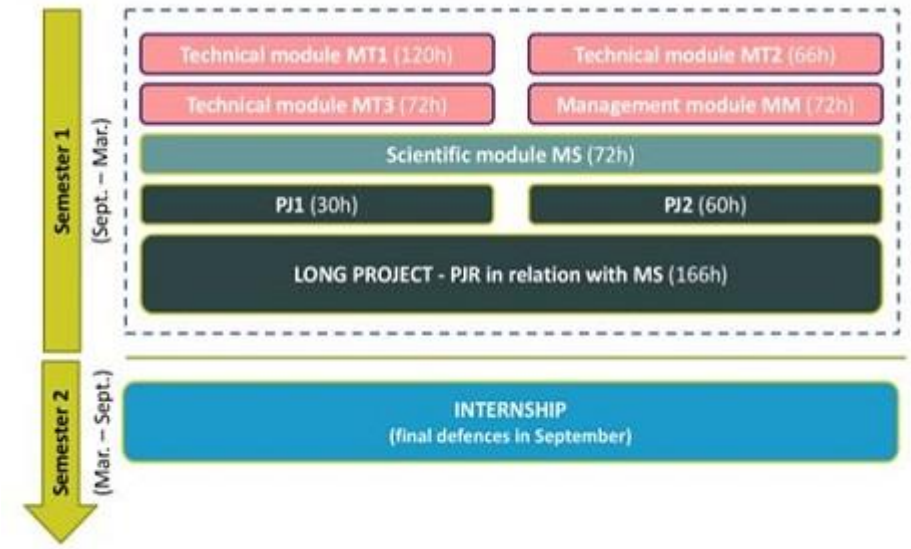

Figure 1 : Structure of the MTI3D-IVI programme.

Code	Title	Sem.	Year	ECTS	Hours	Compulsory/ Optional	Teaching modalities
MS	Research methodology	S3	M2	5	72	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	66	Compulsory	Course/Exercises/Project
MT3	3D Real Time Programming	S3	M2	5	72	Compulsory	Course/Exercises/Project
MM	Management and Innovation	S3	M2	5	72	Compulsory	Course/Exercises/Project

Code	Title	Sem.	Year	ECTS	Hours	Compulsory/ Optional	Teaching modalities
PJR	Research project	S3	M2	3	166	Compulsory	Long Project
PJ1	Innovation Challenge	S3	M2	1	30	Compulsory	Project
PJ2	Virtual Reality Challenge	S3	M2	1	60	Compulsory	Project
MTI	Master thesis internship	S4	M2	30	N/A	Compulsory	Internship

Table 1 : Detail of the modules of the MTI3D-IVI 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 and MS)

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

For project (PJi and PJR)

- The final mark of each project 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, satisfactory)

Careers of graduates and access to further studies

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

- PhD student in a field related to Virtual and Augmented Reality in academia or in industry (CIFRE), to become a recognized expert in immersive technologies
- Virtual/augmented reality R&D engineer/researcher in large companies or start-ups, in numerous sectors (manufacturing, construction, services, consultancy, etc.) and fields (automotive, aerospace, health, transport, real estate, new technologies, game, etc.).