Major	Industrial Engineering		
Master's programme	MANAGEMENT OF 3D INTERACTIVE TECHNOLOGIES-DIGITAL ENGINEERING		
Master's Code	MTI3D-IN		
Qualification awarded	Master's degree in Industrial Engineering		
Programme director	Dr. Jean-Rémy CHARDONNET (jean-remy.chardonnet@ensam.eu)		
Mode of study	Level of qualification	Field of study	Language of study
Full time	Master ISCED 7	Engineering ISCED-F-O7	French Material in English
ECTS	Campus	Length of programme	Specific arrangements for recognition of prior learning
120 (60/year)	Chalon-sur-Saône	2 years (from September to September)	Yes (VAE or VAP)
Keywords	Digital Engineering, Virtual Reality, Augmented Reality, Mixed Reality, 3D Interaction, Industry 4.0, Factory of the Future, Virtual Twins, Virtual Mock-Up, Human Factors, Virtual Prototyping		

Admission requirements

Type	Level	Way
French proficiency	Level B1	Certificate
English proficiency	Level B1	Certificate
Previous degree	For first year of Master (M1): Third year of Bachelor (L3) minimum, or equivalent, in Engineering or Computer Science For second year of Master (M2): First year of Master (M1) minimum, or equivalent, in Engineering or Computer Science	Certificate of achievement

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

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

Overall objectives

The MTI3D-IN programme aims at training future engineers and researchers to evolve in complex multi-disciplinary environments embedding 3D Interactive Technologies as well as other mainstream digital engineering concepts including Industry 4.0 concepts, technologies, and processes:

- Become a specialist in digital chain methods and tools for product/service lifecycle management
- Master the design of 3D interaction technologies for virtual immersion

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 have experienced or been exposed to the current and future challenges for Digital engineering, 3D Interactive technologies and Industry 4.0 applications.
2) To be able to participate in and contribute to develop a transversal approach coupling management, design, modelling, scripting, validation studies on end-users, analysis of an immersive application in any field
3) To be able to understand, explain, practice, and implement all the methods and tools of digital transformation (3D, image, VR...), adapting to the needs of users/contractors
4) To be able to deploy sustainable digital technological solutions.
5) To be able to lead or innovate in the scope of the Industry 4.0 paradigm and within a multi-disciplinary environment

Sets of expected 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-IN programme are as follows:

- Thorough theoretical knowledge of the main concepts, methods, models and tools involved in Digital engineering, 3D Interactive technologies and other mainstream digital engineering concepts including Industry 4.0 technologies and processes
- Extended practical skills for the definition of multi-disciplinary technical solutions for digital engineering considering human factors
- Thorough understanding of the overall digital chain and the associated concepts
- Structured research methodology to be used as a template to address a wide range of 3D interactive technology-related research challenges
- Transversal adaptation, integration, analysis, critical thinking, self-learning, communication, valorisation and organizational skills gained when confronting to both academic and industrial multi-disciplinary projects
- International exposure through several collaborations throughout the world

Programme structure

Learning outcomes are reached through a well-balanced training program 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-IN programme is a two-year Master programme that covers four semesters (Figure 1), with several modules in common with the MTI3D-IVI programme proposed at the Laval Institute (modules highlighted in green in Figure 1):

- **First year (Master 1)**

  o **First semester (S1): From September to March**
    This semester is composed of four technical modules for a total of 294 hrs, 1 professionalizing module of 75 hrs including language courses, 3 technical projects for a total of 300 hrs, for a total of 50 ECTS

  o **Second semester (S2): From April to August**
    The second semester is devoted to a 4- or 5-month internship and has 10 ECTS. The internship can be carried out in a company in France or abroad.

- **Second year (Master 2)**

  o **First semester (S3): From September to January**
    This semester is composed of one professionalizing module of 56 hrs, including language courses, 6 scientific modules for a total of 179 hrs, 2 projects for a total of 195 hrs, for a total of 30 ECTS

  o **Second semester (S4): From February to August**
    The second semester is devoted to the Master thesis of 6 months and has 30 ECTS. The internship can be carried out in a research structure (laboratory or company) in France or abroad.
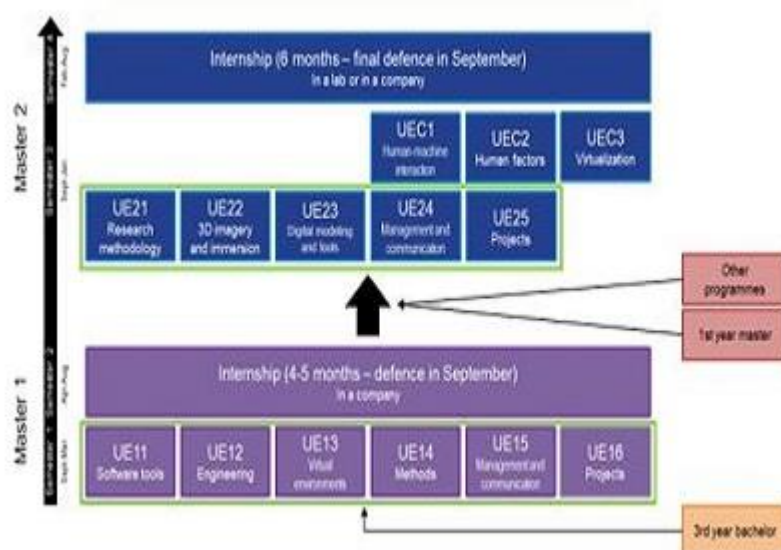
Figure 1 : Structure of the MTI3D-IN programme.

Code	Title	Sem.	Year	ECTS	Hours	Compulsory/ Optional	Teaching modalities
UE11	Software tools	S1	M1	10	96	Compulsory	Course/Exercises/Project
UE12	Engineering	S1	M1	8	54	Compulsory	Course/Exercises/Project
UE13	Virtual environments	S1	M1	8	108	Compulsory	Course/Exercises/Project
UE14	Methods	S1	M1	8	36	Compulsory	Course/Exercises/Project
UE15	Management and communication	S1	M1	8	75	Compulsory	Course/Exercises/Project
UE16	Projects	S1	M1	8	300	Compulsory	Projects
MT1	Master 1 thesis	S2	M1	10	NA	Compulsory	Internship
UE21	Research methodology	S3	M2	5	49	Compulsory	Course/Exercises/Project
UE22	3D imagery and immersion	S3	M2	5	32	Compulsory	Course/Exercises/Project
UE23	Digital modeling and tools	S3	M2	5	62	Compulsory	Course/Exercises/Project
UE24	Management and communication	S3	M2	3	56	Compulsory	Course/Exercises/Project
UE25	Projects	S3	M2	6	195	Compulsory	Projects
UEC1	Human-machine interaction	S3	M2	2	12	Compulsory	Course/Exercises/Project
UEC2	Human factors	S3	M2	2	12	Compulsory	Course/Exercises/Project

Code	Title	Sem.	Year	ECTS	Hours	Compulsory/ Optional	Teaching modalities
UEC3	Virtualization	S3	M2	2	12	Compulsory	Course/Exercises/Project
MT2	Master thesis	S4	M2	30	NA	Compulsory	Internship

Table 1 : Detail of the modules of the MTI3D-IN 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.

To pass each module:

- The final mark of each module must be ≥ 10;
- The average of all the modules (UEi) must be ≥ 10.

For master thesis (MT1 and MT2):

- The final mark of each 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 1

- Validate 50 ECTS during the first semester;
- Validate 10 ECTS during the second semester.
- Acceptance from Master 1 to Master 2 can be granted with only 50 ECTS in the case where MT1 is not validated, but this module (MT1) must be validated during Master 2.

Master 2

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

At the end of the MTI3D-IN programme, the final average is calculated based on the ECTS distribution, and honours 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 Digital Engineering and Virtual Reality, in academia or in industry (CIFRE), to become a recognized expert in the area of Interactive and Immersive Technologies;
- R&D engineer/researcher in large companies or start-ups, in numerous sectors (manufacturing, construction, services, consultancy, etc.) and fields (automotive, aerospace, education, health, IoT, etc.) in any area.
- Entrepreneur in immersive technologies.