intride

Soft, **Digital** and **Green Skills**
for **Smart Designers**:
Designers as Innovative TRIggers
for SMEs in the manufacturing sector

D4.1

Definition of Joint Master Degree structure and programme

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PARTNERS:

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Content Index

D4.1 Definition of Joint Master Degree structure and programme

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ABOUT THIS DOCUMENT

This document contains a presentation of the INTRIDE Joint Master Degree, titled “Strategic Design for Innovation in the manufacturing sector”, part of which will be piloted by the INTRIDE Alliance during the second semester of the academic year 2021/2022 in the respective four EU nodes, namely Italy, Poland, Romania and Spain.

The training programme have been developed based on the results of “WP3 – Field Analysis of the State of the Art”, which was aimed at achieving in depth understanding of the soft, digital and green skills needs emerged by the interviewed SMEs of the manufacturing sector of the country’s partners.

Besides, the study was aimed at gathering insights about possible innovations in higher education – including curricula, teaching and learning methods – that would lead to better and increased cross-sectorial synergies in the emerging INTRIDE field (soft, digital and green skills for SMEs of the manufacturing sector) and among HEIs, clusters and technological partners.

The training project has been further advanced through a round of co-design implemented first at international level, and then at the local levels of the EU nodes, with the involvement of local stakeholders.

INTRIDE PROJECT

The context

INTRIDE is a 10 partners alliance (Italy, Spain, Poland and Romania) aiming at developing a structured cooperation framework between HEIs, clusters/business representatives, technological centres and enterprises. The 4 countries addressed have a manufacturing system mainly based on traditional production enterprises and mainly SMEs. Furthermore the partners from the 4 regions, both HEIs/technical experts and clusters/business representatives are actively involved in the definition of their regional Smart Specialisation Strategies. Starting from the analysis of 2014 S3 and recent updates (revision of S3 roadmaps 2017-2018) it appears clearly that:

1. *digitisation of SMEs and the application of Key Enabling Technologies*
2. *SMEs integration to IndustrylEnterprise 4.0 paradigm*
3. *business model reorganisation and circular economy are the main roadmaps' topics.*

SMEs, especially those belonging to traditional manufacturing systems, need to acquire specific sets of competences (internally or externally) in order to activate innovation and technological transfer processes underpinning S3 roadmaps.

Mentioned competences are related to Soft, Digital and Green skills which will be implemented on a design knowledge-based profile being naturally able to creatively manage innovation processes.

Soft Skills: Non-cognitive skills are often labelled as 'soft skills' and can blend into personal characteristics and attitudes. These types of skills are intangible and typically hard to observe, quantify and measure. We learn them through personal development training and using them in both work and personal life.

Digital skills: are defined as a range of abilities to use digital devices, communication applications, and networks to access and manage information.

Green skills: are the abilities needed to live in, develop and support a society which aims to reduce the negative impact of human activity on the environment.

Main objective

In INTRIDE we are leading the creation of a strong link and continuous interaction among HEIs (Higher Education Institutions), industry and intermediaries by developing a joint curriculum of the designer with soft, digital and green skills conceived as innovation trigger in activating innovation processes and managing the collaboration ecosystem.

In terms of specific objectives INTRIDE aims at :

1. Developing a Joint Master Degree programme for designers focused on Soft, Digital & Green additional skills.

2. Stimulating HEIs' offer modernisation and adaptation to industry world needs.

3. Developing HE + industry community continuous interaction still through the creaction of a community platform.

Target groups

The main target groups of the INTRIDE project are the following:

- Students, employees and professionals
- Project partners: HEIs / technological experts clusters / business representatives / staff enterprises
- Other sector stakeholders across the EU: chambers of commerce / Trade unions / VET providers / National agencies (dealing with VET provision and / or innovation)

Results

The expected results regard the co-creation of a Joint Curriculum for a designer (starting from creativity skills) with added digital, green and especially soft skills aiming to create a balanced set of knowledge in order to meet labour market needs.

We strongly believe that the alliance which represents a triangle of the key partners (HEIs, technological partners and business representatives) is the proper frame to achieve the desired goals.

In terms of specific results INTRIDE aims at:

- developing a Joint Master Degree Curriculum for Smart Designers with added competencies related to Soft, Digital and Green Skills that will become the future innovation triggers for SMEs in the manufacturing sector
- building a co-creation structure under a HE-Industry community platform which is supposed to be a virtual place for activation and monitoring of innovation, technological transfers, R&D processes under the cooperation between enterprises, HEIs and technological centres.

STRATEGIC DESIGN FOR INNOVATION IN THE MANUFACTURING SECTOR

JOINT MASTER DEGREE STRUCTURE AND PROGRAMME

The Joint Master Degree structure is based on an interdisciplinary and modular approach. It foresees 6 modules based on thematic areas (design driven innovation; product and service design; art & design; KETs & digital technologies; IoT, sensors and cloud computing; circular economy, business model and economics) and each module gives fixed ECTS credits.

The structure of the Master Programme foresees modules at different levels:

- Refresher/Update courses
- Specialisation/Advanced courses

Modules can be attended separately: university graduates and post-graduates can attend the specialisation/advanced courses and the entire Joint Master Degree Course; high school graduates, professional and entrepreneurs without a University Degree can attend refresher/update courses, obtaining credits and certifications. Students can obtain the Master Degree only by attending all the modules.

The programme and the Joint Master Degree will be in accordance with the relevant legal framework of all the HEIs involved and a Road Map for the recognition process will be predisposed.

The definition of the Learning units content is based on the outcomes of the results of the WP3: the fine tune of the skills and knowledge needs of the sector and the identification of the learning objectives and outcomes that have been used to decide the list of the Modules and the course Learning Units and their content. As Learning modules are conceived with an interdisciplinary approach, teachers of different Partner Universities can participate in the training activities of the learning programme.

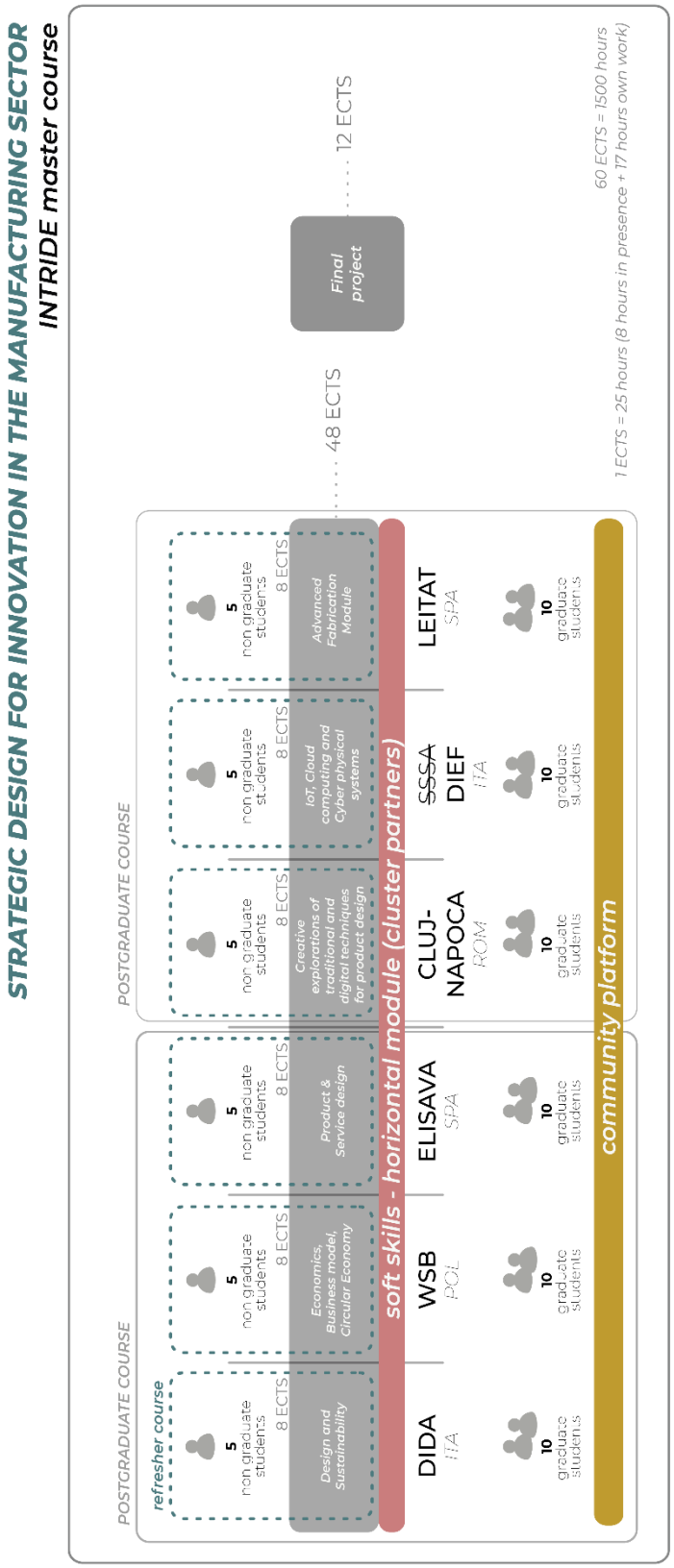
The new JMD structure and programme describes:

- Learning outputs in relation to the specific knowledge, skills and competencies, in order to secure that the new JMD programme will properly matches the market and companies' needs
- Learning units and their contents. Each Learning Unit of the Curriculum will have to be studied and delivered in a

comprehensive manner and in relation to other parts, so that the curriculum represents a coherent and appropriate Learning Path

- Structure of the Refresh/Update and Specialization Modules in the framework of the whole JMD structure
- Recommendations about the Teaching Methodology and Tools to be used in each unit and modules
- Definition of the requisites that participants should have
- Assignment of the ECTS credits to each learning unit, module and Master
- A Memorandum of Understanding (MoU), which affirms the partners' intention to develop the joint degree, taking into account the national regulations of each partner, will be signed by the HEIs

Diagram of the JMD structure



Tab of the HEIs responsible for the related learning module

Num.	Title of the module	DIDA	WSB	ELISAVA	CLUJ-NAPOCA	DIEF	LEITAT
1	Design and Sustainability	**X**					
2	Economics, business model and circular economy		**X**				
3	Product and service design			**X**			
4	Creative explorations of traditional and digital techniques for product design				**X**		
5	IoT, cloud computing and cyber physical systems					**X**	
6	Advanced Fabrication Module						**X**

GENERAL FRAMEWORK

WORK METHODOLOGY

- in-depth analysis of companies through surveys, national workshops and benchmarkings
- Point of view of students as target group

TARGET OF PARTICIPANTS

- we work specifically on **small and medium-sized enterprises of the manufacturing sector**
- in the manufacturing sector scenario, **the designer trigs innovation**
- we are hypothesizing **training courses that involve companies**
- we will develop **a flexible Training program suitable for the target**
- what kind of targeting people will like to attend (mindset of the target groups)
- same group companies and students
- short modules specific for companies

CONTENTS

- we have a real multi and cross-disciplinary approach in the manufacturing sector
- we give **great importance to soft skills**, which are generally not taught directly
- basic requirements of the JMDP

STRATEGY

- In the Covid and post-Covid scenario, the virtualization and digitization of all services (market, sales, post-sales assistance at digital level) are very important
- we believe **that there is a relation between this pandemic and our wrong attitude towards Nature**
- **green skills will be most relevant in the near future**
- clear goals about the structure

TOOLS

- the **community platform will act as catalyst of stakeholders**

- **virtual place for innovation and cooperation** between enterprises, HEIs, technological centres, intermediaries, professionals and students

FINAL PROJECT

- creation of a project output that is the integration of the **INTRIDE key competences** for the new professional figure of the smart designer
- creation of a final project output that is the **integration of the theoretical parts and the practical workshops** addressed throughout the training course
- creation of a final project output which can be a product, a service, a communication strategy, a system framework, etc.
- use of the INTRIDE **community platform** as a tool to share the challenges concerning supply&demand between SME companies and designers
- definition of **international work teams**
- coordination from a **transnational and interdisciplinary team of teachers**
- use of selected platforms for sharing the JMD final projects
- **virtual tours** in the companies involved in the training activities

STRATEGIC DESIGN FOR INNOVATION IN THE MANUFACTURING SECTOR

Overview frame of the Joint Master Degree

Node	Italy, Poland, Romania, Spain
Title	Strategic Design for Innovation in the manufacturing sector
Departments	• UNIFI: Department of Architecture and Design - DIDA Department of Industrial Engineering - DIEF • WSB UNIVERSITY: Production Management and Engineering - Campus in Cieszyn • ELISAVA Research • CLUJ-NAPOCA: Design Department of UAD Cluj-Napoca • LEITAT: Advanced Engineering & AM3P departments
University level	Advanced course (for learners with a degree level) + Refresher course (for learners without a degree level)
Target-group	Completed training of 10 graduates students and 5 non graduates for each HEIs or Module
Selection	Individual interview + Application form
Training Description	The Joint Master Degree is structured into 6 modules + one final project, for a total number of 384 hours (288 hours between frontal lessons, case studies and presentation + 96 hours of practical work): 1. ***Design and Sustainability (48 hours between frontal lessons, case studies and presentation + 16 hours of practical work) – DIDA; 8 ECTS*** Key topics: design-driven innovation theory in relation to the complexity and issues of the 4.0 scenario; strategic design methodologies and tools in relation to creativity (creative thinking approach); system thinking and systemic design methodologies and tools, in order to collaborate in innovative ecosystems; design for sustainability (environmental, socio-cultural, economic) and case studies concerning methods and tools applied; project management methods and tools in relation to collaborative networks (link with territories and communities, local productive systems, etc.). Learning goals: in-depth understanding of the emerging trends in society and economy as driven by the 4.0/5.0 scenario, with key focus on design-driven innovation paradigm; application of a strategic and creative thinking and practice; facilitate system thinking and designing with a systemic approach (mind set); knowledge about the sustainability paradigm and how to put it in practice in productive environments (SMEs of the manufacturing sector); facilitate design management; activate design thinking and social innovation; soft, digital and green skills together with design methods and tools.

Methodology: frontal lessons combined with case studies and co-design workshops.
Skills related:

- Soft: strategic planning, communication, innovation, teamwork, creativity, adaptability/flexibility, leadership, ethics, responsability, crisis management
- Digital: social media, data literacy, digital marketing, networking & IT systems
- Green: consumption reduction, sustainable product management, resource management, circular economy, social responsibility, environmental awareness

2. ***Economics, business model and circular economy (48 hours between frontal lessons, case studies and presentation + 16 hours of practical work) – WSB; 8 ECTS***

Key topics: the closed-loop economy concept on the example of municipalities or regions; basics of logistics and the concepts of forward and reverse logistics, as well as managing and improving of performance of respective supply chains; principles of building strategic partnerships and alliances in the cultural and creative sector; new materials, technics and technologies using household, municipal and industrial waste; the role of design in organizations and in creation of innovations.
Learning goals: knowledge concerning principles of waste management and material flows in the city; deliver a concept (design) or case study of practice related to forward and reverse supply chains in selected organisation, including preparation of potential material requirements for redesigned products utilizing refabricated or recycled materials; increase the creativity and innovation of the group of the participants through cooperation methodologies; provide methods allowing to approach any task in open mind and creative way; provide learners/participants with basic methods and tools for the building of strategic partnerships and alliances in the cultural and creative sector; provide basic knowledge about implementation of design in different functions and different levels of organization, also with methods and tools of cooperation with designers and end users.
Methodology: frontal lesson combined with case studies and co-design workshops.
Skills related:

- Soft: strategic planning, communication, innovation, teamwork, creativity, flexibility, responsibility, crisis management, positive attitude
- Digital: digital marketing

- Green: sustainable product management, resource management, circular economy, social responsibility, environmental awareness

3. ***Product and service design (48 hours between frontal lessons, case studies and presentation + 16 hours of practical work) – ELISAVA; 8 ECTS***

Key topics: The emerging contexts of sustainable Products & Services through effective analysis and understanding of future-based trends; Advanced design methods and configuring effective design toolkits for Research, Design and Development phases; New Paradigms for Creative Processes and new trends applied to project culture; Context-based analysis regarding innovation as a process and sustainability as a strategy for P&S; New technologies and materials for sustainability.
Learning goals: Comprehension of the future context for Product & Service Design; Knowledge on New Materials, Emerging Contexts & Design outcomes for P&S; Understanding of the Agents and Interactions which occur in a Product & Service Design process; Development and Applications of Design Methods & Techniques; Effective implementation of methodologies and processes for creative and disruptive environments through a guided project praxis; Awareness of the problems, risks, effects and complex challenges to the environment; Consideration of key innovation aspects during a sustainable Product & Service Design process; Knowledge on Materials, Technologies & Processes for Innovation-driven environments; Comprehension and control of the design and development of a Product & Service Design Process: Research, Methods, Materials and Technologies; Comprehension of the relationship between service design and design for sustainability.
Methodology: frontal lessons combined with case studies and practical co-design workshops.
Skills related:

- Soft: time management, strategic planning, communication, innovation, teamwork, creativity, adaptability/flexibility, leadership, self-management, responsability
- Green: social responsibility, Sustainable Product Development, Advanced / Eco Materials, Environmental Awareness

4. ***Creative explorations of traditional and digital techniques for product design (48 hours between frontal lessons, case studies and presentation + 16 hours of practical work) – CLUJ-NAPOCA; 8 ECTS***

Key topics: furniture industry between traditional and digital technologies; fine arts and furniture design intersection with digital tools and processes; artistic techniques for product design and technology; systemic methodology of approaching the product design; art forms for broader approaches in the field of craft and design; digital revolution in product design and manufacturing; design ideas adaptation to production technologies; efficiency and comprehensiveness in product design; technologies in the field of product design; digital assets in the field of product design.
Learning goals: connect the visual design skills to image producing capacities of technology; evaluate the relation between the traditional methods and the new technologies in the field of design; develop the capacity for analysis and synthesis in order to create original designs, combining functionality with aesthetics; acquiring the capacity to use traditional methods and tools for furniture production; deeper understanding of digitalization in the context of user identity issues; evaluation of processes through which the students could develop deep knowledge in art and design; create and manipulate digital content; consider the ever-changing computer technology landscape; acquire the capacity to dominate the technical demands of the arts for enhanced practices in the field of product design; connect these scenarios with the sustainability challenges.
Methodology: frontal lesson combined with case studies and co-design workshops.
Skills related:

- Soft: communication, strategic planning, teamwork, creativity
- Digital: virtual reality, augmented reality, networks and IT systems, social media
- Green: sustainable product development

5. ***IoT, cloud computing and cyber physical systems (48 hours between frontal lessons, case studies and presentation + 16 hours of practical work) – DIEF; 8 ECTS***

Key topics: Internet of Things (IoT): definitions, framework and applications; Blockchain in IoT; Definition of cloud computing and concepts; Main properties and features of Cloud based system; Cyber Physical System concepts and examples in Industry 5.0; Sensors, actuators and control boards; Communication Design; Basic elements of digital marketing.

Learning goals: general overview of topics with applications on real
design examples; basic methods and tools to understand the concepts of storing and manage big data; basic ideas of the complex subjects about Artificial Intelligence with simple examples on real design; basic ideas of the complex subjects about Cyber Physical Systems and environments with simple examples on real design; basic methods and tools for the application of electronic devices from sensor system to design concepts; basic methods and tools to apply digital communication and digital marketing on design; comprehension of the Design role in this technologic scenario.
Methodology: frontal lesson combined with case studies and co-design workshops.
Skills related:

- Soft: Strategic planning; communication; innovation
- Digital: E-commerce; social media; digital marketing; networking & IT systems; Cybersecurity; Data literacy

6. ***Advanced Fabrication Module (48 hours between frontal lessons, case studies and presentation + 16 hours of practical work) – LEITAT; 8 ECTS***

Key topics: Additive Manufacturing (AM) introduction; Advantages of design using AM; Generative design; Topological optimization; AM implementation: requirements to fulfil, AM materials analysis and selection, AM technology analysis and selection, benchmark (Test and validation), end to end solutions.
Learning goals: capabilities to design solutions taking into account all the advantages and disadvantages of additive manufacturing; Competencies to analyse industrial scenarios (products, processes, limitations, etc.) in order to adopt the additive manufacturing technologies, Knowledge about the main additive manufacturing technologies.
Methodology: Frontal lesson combined with case studies and co-design workshops.
Skills related:

- Digital: E-commerce; Networking & IT systems.
- Green: Sustainable product development; Advanced/Eco Materials.
- Soft: Innovation; Teamwork; Creativity; Adaptability/Flexibility; Self-management.

7. ***Final project; 12ECTS***

Key topics: Overview of the INTRIDE key skills and main key topics by the six learning modules, such as Design for Sustainability; Economics, Business model and Circular economy; Product and Service design; Arts and Design; IoT and sensors; KETs and Digital technologies.

	Learning goals: Capability to put into practice and develop through the final project most of the learning inputs acquired during the theoretical and practical training activities; Challenges activated in the INTRIDE community platform will be the starting point for the production of the final projects. Methodology: Students will work in international work-groups; prototyping phase focused on the production of the final projects conceived during the training activities; peer-to-peer review with transnational teaching and tutoring teams. Skills related: It will be addressed most of the INTRIDE key skills (soft, digital, green), with a specific focus based on the main topics explored and developed in the final project production.
Outcomes of the JMD	• Increase green, soft and digital skills • Ability to cooperate with the market stakeholders in creative and collaborative contexts • Comprehension of how to act in a perspective of sustainable innovation • Ability to orient themselves in the post-pandemic market, recognizing the future scenario trends (virtualization, digitization, e-commerce...) • Multi and cross disciplinarity • Increase design skills developing a systemic/strategic approach • Contacts and experiences with the business world of SMEs of the manufacturing sector • Specific knowledge and competencies on emerging trends of 5.0 scenario
Learning outputs of the JMD	• Interdisciplinary tools/competencies for the designer, useful to activate a *design-driven innovation* mindset in order to work in collaborative contexts • Toolguide • Toolbox (i.e. skills map, networking map, scenarios, mapping and storytelling tools)
Hours and ECTS	1 ECTS = 25 hours (8 hours in presence + 17 hours own work) Advanced course: 1200 hours (384 hours in presence), divided into 900 theoretical part (288 hours in presence) and 300 practical part (workshop) (96 hours in presence) Totally = 60 ECTS Refresher course: 300 hours (96 hours in presence) corresponding to 12 ECTS

Preferred requisites for the participants	• Curriculum vitae e/o studiorum • Any experiences with SMEs of the manufacturing sector > if yes, please specify the mission of the company and any applied sustainability and innovation processes • Any experience or research on realities/projects/innovations linked to sustainability issues • Any learning experience (school or out of school) on soft, digital or green skills • Any experience or training on project management
Attendance (%)	75%
Period of implementation	The first three modules will be tested in the second semester 2021-2022
Implementing partners	• University of Florence – DIDA: structure and development of module 1 • WSB University: structure and development of module 2 • ELISAVA: structure and development of module 3 • University of Art and Design in Cluj-Napoca (UAD Cluj-Napoca): structure and development of module 4 • University of Florence - DIEF: structure and development of module 5 • LEITAT: structure and development of module 6 • DiD: identification of manufacturing enterprises bringing challenges and participation; development of the workshops related to module 1 and 5 • ZC: identification of manufacturing enterprises bringing challenges and participation; development of the workshops related to module 2 • TFC: identification of manufacturing enterprises bringing challenges and participation; development of the workshops related to module 4 • CENFIM: identification of manufacturing enterprises bringing challenges and participation; development of the workshops related to module 3 and 6
Locations	• DIDA - DESIGN CAMPUS UNIFI Calenzano • Cieszyn - WSB & Castle Cieszyn premises • ELISAVA - Barcelona Campus Premises CENFIM - Barcelona Showroom LEITAT - Terrassa Office • UAD (University of Art and Design in Cluj-Napoca) • DIEF - PLESSO DIDATTICO SANTA MARTA Firenze • LEITAT -Terrassa HeadQuarters / DFACTORY Barcelona ELISAVA - Barcelona Campus Premises CENFIM - Barcelona Showroom

In the next page, we reported the diagrams of the two postgraduate courses that will form the JMD, which titles are **"Design for Sustainability in the manufacturing sector"** and **"Design for Digital Transformation in the manufacturing sector".**

Each learning module will consist of 8 ECTS, which will be structured in 6 ECTS for the theoretical part and 2 ECTS for the workshop. Regarding the horizontal module related to the soft skills, we **included soft skills' module in the practical part of each learning module**. This means that each module's workshop will be developed together with clusters taking into account soft skills.

Diagram of the Postgraduate n.1
"Design for Sustainability in the manufacturing sector"

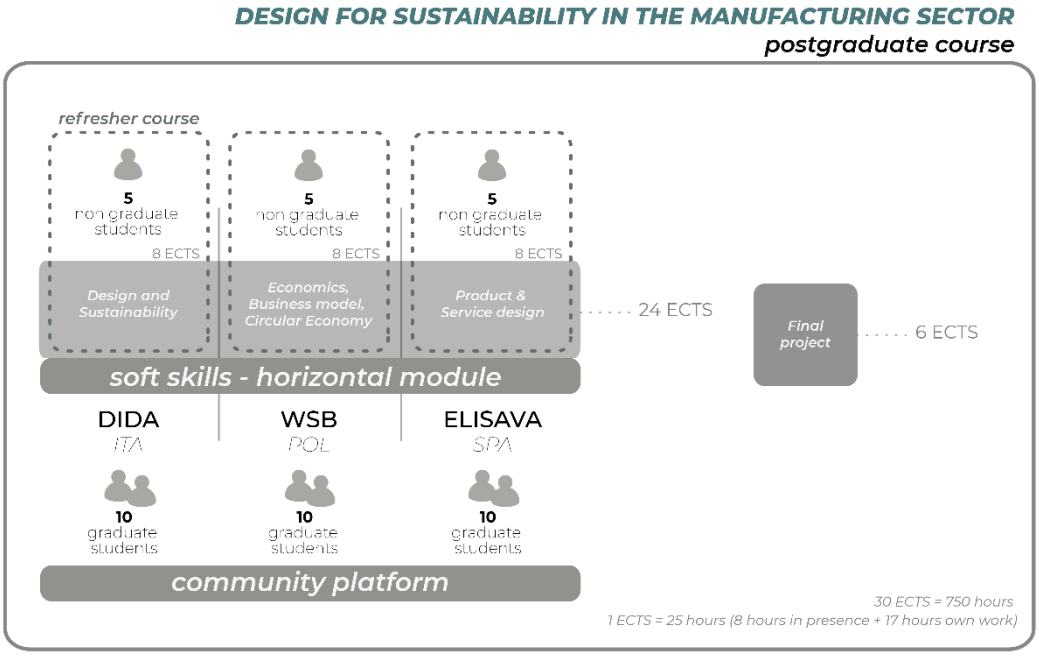
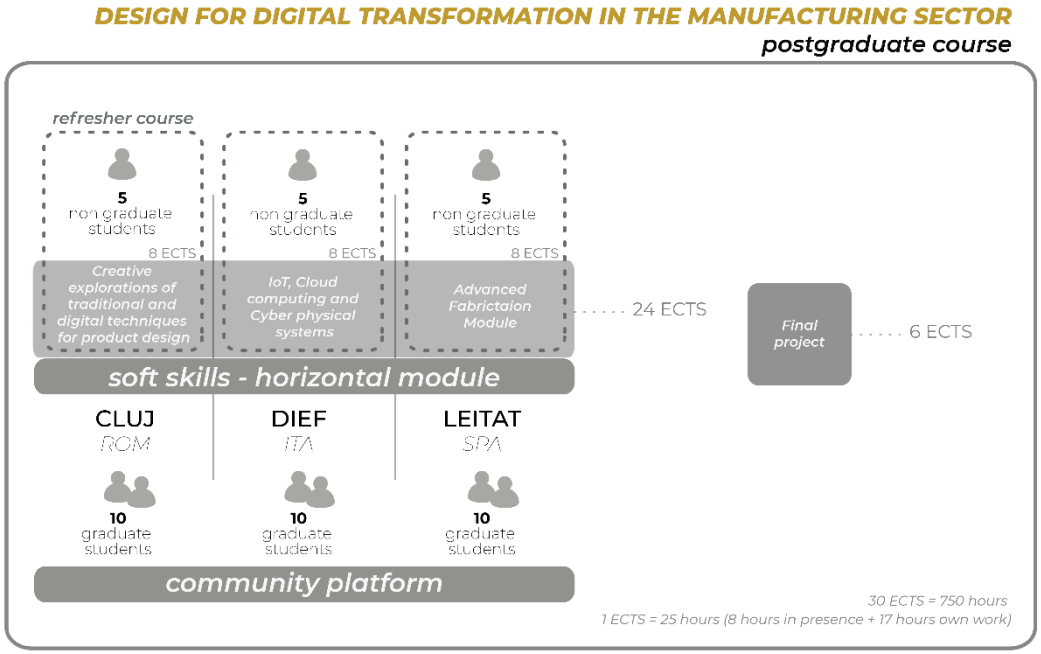


Diagram of the Postgraduate n.2
"Design for Digital Transformation in the manufacturing sector"



LEARNING MODULES

Module 1 – "Design and Sustainability"
DIDA – Design and Sustainability

Node	Italy - Florence
Title	**Design and Sustainability**
Department	Department of Architecture and Design - DIDA-UNIFI
University level	Advanced course (for learners with a degree level) + Refresher course (for learners without a degree level)
Target-group	Completed training of 10 graduates students and 5 non graduates for each HEIs or Module
Selection	Individual interview + Application form
Module's Description	The module is structured into 6 units + final workshop, for a total number of 64 hours (48 hours between frontal lessons, case studies and presentation + 16 hours of practical work). Units: 1. ***Design between digital and green transformation: the green perspective (8 hours, frontal lessons combined with case studies)*** Key topics: introduction to the main meanings of digital and green transformation, with reference to the recent European guidelines. Particular attention to the green perspective with an overview of the connected issues. Principles of design-driven innovation approach in relation to the complexity and issues of the 5.0 scenario. Emerging trends and topics concerning digital and green transformation, with specific focus on a new green perspective. Learning goals: provide learners/participants with in-depth understanding of the emerging trends in society and economy as driven by the 4.0/5.0 scenario, with key focus on design-driven innovation paradigm. Methodology: frontal lessons combined with case studies. 2. ***Systemic design for innovative ecosystems (8 hours, frontal lessons combined with case studies)*** Key topics: principles of strategic design methodologies and tools in relation to creativity (creative thinking approach). Learning goals: provide learners/participants with basic methods and tools for the application of a strategic and creative thinking and practice. Methodology: frontal lesson combined with case studies. 3. ***Strategic design and creativity (8 hours, frontal lessons combined with case studies)***

Key topics: principles of system thinking and systemic design methodologies and tools, in order to collaborate in innovative ecosystems.
Learning goals: provide learners/participants with basic methods and tools to facilitate system thinking and designing with a systemic approach (mind set).
Methodology: frontal lesson combined with case studies and short workshops.

4. ***Sustainability for manufacturing sector companies (8 hours, frontal lessons combined with case studies)***

Key topics: principles of design for sustainability (environmental, socio-cultural, economic) and case studies concerning methods and tools applied.
Learning goals: provide learners/participants with knowledge about the sustainability paradigm and how to put it in practice in productive environments (SMEs of the manufacturing sector).
Methodology: frontal lesson combined with case studies.

5. ***Collaborative networks: Design as catalyst agent (8 hours, frontal lessons combined with case studies)***

Key topics: principles of project management methods and tools in relation to collaborative networks (link with territories and communities, local productive systems, etc.).
Learning goals: provide learners/participants with basic methods and tools to facilitate design management.
Methodology: frontal lesson combined with case studies and short workshops.

6. ***Design thinking for social innovation (8 hours, frontal lessons combined with case studies)***

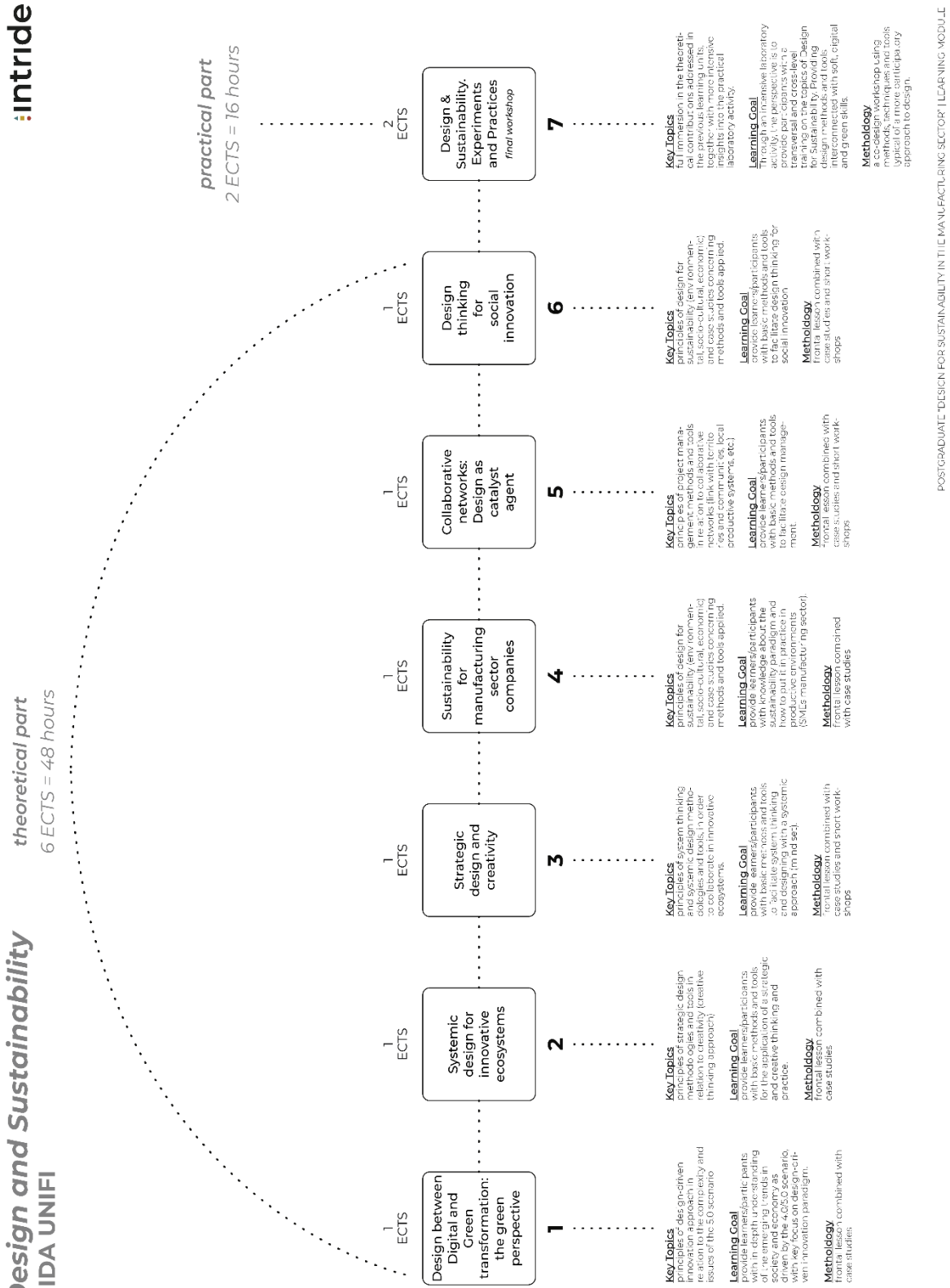
Key topics: principles of design sustainability (environmental, sociocultural, economic) and case studies concerning methods and tools applied.
Learning goals: provide learners/participants with basic methods and tools to facilitate design thinking and social innovation.
Methodology: frontal lesson combined with case studies and short workshops.

7. ***Final workshop "Design&Sustainability. Experiments and Practices" (16 hours, practical workshop)***

Key topics: full immersion in the theoretical contributions addressed in the previous learning units, together with more intensive insights into the practical laboratory activity.
Learning goals: Through an intensive laboratory activity, the perspective is to provide participants with a transversal and

	cross-level training on the topics of Design for Sustainability. This, together with the aim of providing design methods and tools interconnected with soft, digital and green skills. Methodology: a co-design workshop is foreseen using methods, techniques and tools typical of a more participatory approach to design. The participants of the learning module will be at the center of the planned practical activities, with the support of the teachers and tutors involved.
Outcomes of the module	• Increase green, soft and digital skills • Ability to cooperate with the market stakeholders in creative and collaborative contexts • Comprehension of how to act in a perspective of sustainable innovation • Ability to orient themselves in the post-pandemic market, recognizing the future scenario trends (virtualization, digitization, e-commerce…) • Multi and cross disciplinarity approach • Increase design skills developing a systemic/strategic approach
Learning outputs of the module	• Interdisciplinary tools/competencies for the designer, useful to activate a *design-driven innovation* mindset in order to work in collaborative contexts • Toolbox (i.e. skills map, networking map, scenarios, mapping and storytelling tools) • Contacts and experiences with the business world of SMEs of the manufacturing sector (data base)
Hours and ECTS	1 ECTS = 25 hours (8 hours in presence + 17 hours own work) Advanced course: 200 hours (64 hours in presence), divided into 150 theoretical part (48 hours in presence) and 50 practical part (workshop) (16 hours in presence) ECTS = 8 Refresher course: 50 hours (16 hours in presence) corresponding to 2 ECTS
Attendence (%)	75%
Period of implementation	Second semester 2021-2022 (pilot test)
Implementing partners	• University of Florence – DIDA: main organizer and coordinator of the training • DiD: identification of manufacturing enterprises bringing challenges and participation; development of module's workshop
Locations	DIDA - DESIGN CAMPUS UNIFI Calenzano
Learning module referent	Prof. Giuseppe Lotti – University of Florence – DIDA

Diagram of the Module n.1 "Design and Sustainability"



Module 2 – Economics, business model and circular economy
WSB University – "Economics, business model and circular economy"

Node	Poland - Cieszyn
Title	**Economics, business model and circular economy**
Department	Production Management and Engineering - Campus in Cieszyn
University level	Advanced course (for learners with a degree level) + Refresher course (for learners without a degree level)
Target-group	Completed training of 10 graduates students and 5 non graduates for each HEIs or Module
Selection	Individual interview + Application form
Module's Description	The module is structured into 6 units + final workshop, for a total number of 64 hours (48 hours between frontal lessons, case studies and presentation + 16 hours of practical work). Units: 1. ***Circular economy (8 hours, frontal lessons combined with case studies)*** Key topics: the closed-loop economy concept on the example of municipalities or regions. Learning goals: knowledge concerning principles of waste management and material flows in the city; in-depth analysis of best practices from European cities and development of basic research on it. Methodology: frontal lessons combined with case studies. 2. ***Sustainable Logistics (8 hours, frontal lessons combined with case studies)*** Key topics: basics of logistics; concepts of forward and reverse logistics; performance of supply chains. Learning goals: deliver a concept (design) or case study of practice related to forward and reverse supply chains in selected organisations, including preparation of potential material requirements for redesigned products utilizing reused or recycled materials. Methodology: frontal lesson combined with case studies. 3. ***Heuristic methods (8 hours, frontal lessons combined with case studies and short workshops)*** Key topics: additional methods of increasing creativity (heuristic methods) and innovations that will extend the methods learned in module 1 carried out by DIDA; recycling; methods and techniques of fast and effective generation of business ideas or possible solutions and modifications for already generated ideas.

Learning goals: providing the group with methods allowing to approach any task in an open mind and creative way (i.e. brainstorm, superposition method, 635 method, etc.), ; create or propose solutions for given or found problem/task.
Methodology: frontal lesson combined with case studies.

4. ***Strategic partnerships and alliances in creative industries (8 hours, frontal lessons combined with case studies)***

Key topics: principles of building strategic partnerships and alliances in the cultural and creative sector.
Learning goals: provide learners/participants with basic methods and tools for the building of strategic partnerships and alliances in the cultural and creative sector.
Methodology: frontal lesson combined with case studies.

5. ***Between recycling and upcycling (8 hours, frontal lessons combined with case studies and short workshops)***

Key topics: new materials, techniques and technologies using household, municipal and industrial waste. New paradigm focused on garbage as a new material resource.
Learning goals: Knowledge coming from experiments, urban and industrial practice about how to use new materials in different sectors of human activities.
Methodology: frontal lesson combined with case studies and short workshops.

6. ***Innovations by design. Design management in business (8 hours, frontal lessons combined with case studies and short workshops)***

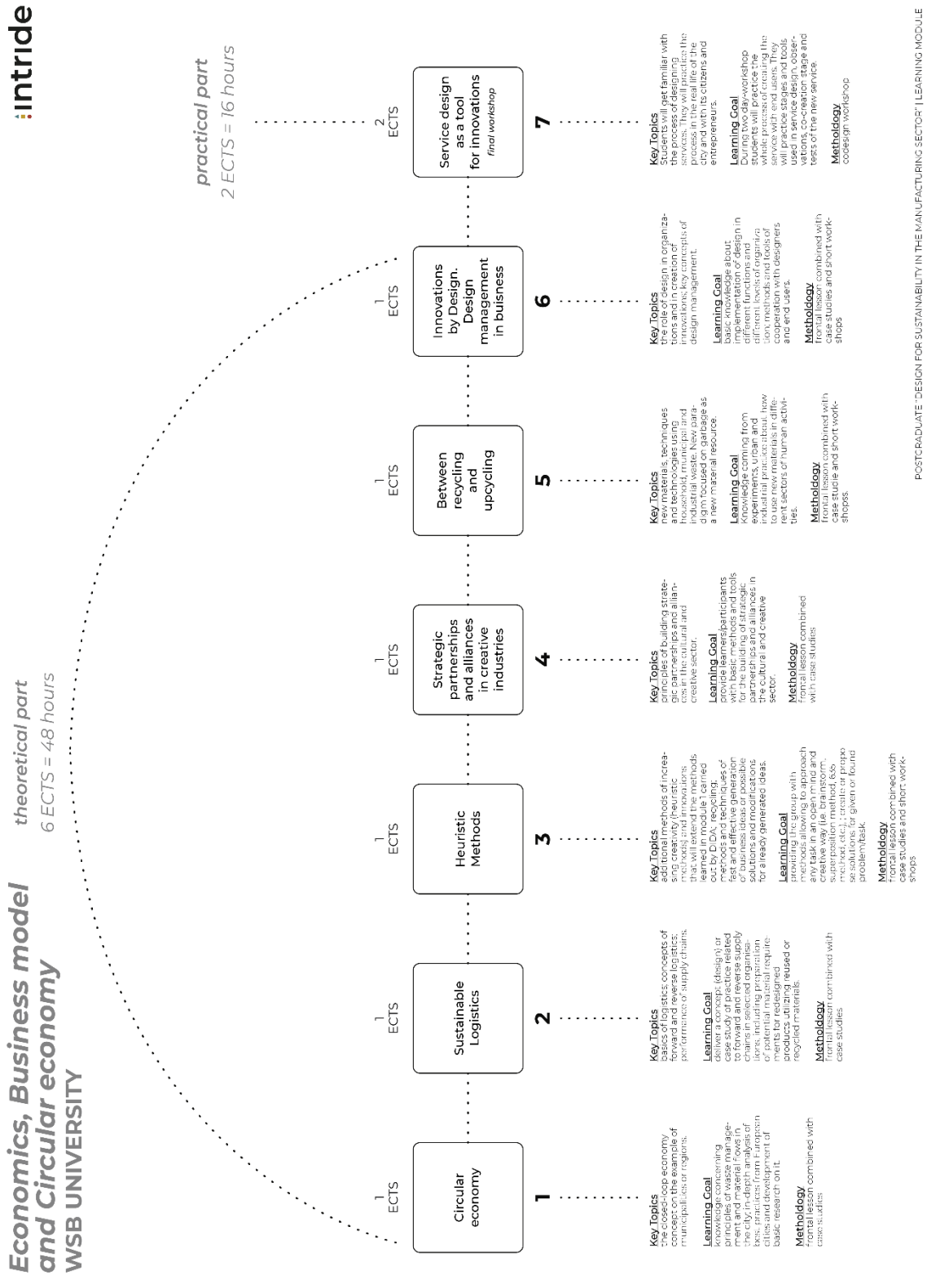
Key topics: the role of design in organizations and in creation of innovations; key concepts of design management.
Learning goals: basic knowledge about implementation of design in different functions and different levels of organization; methods and tools of cooperation with designers and end users.
Methodology: frontal lesson combined with case studies and short workshops.

7. ***Final workshop: "Service design as a tool for innovation" (16 hours, practical workshop)***

Key topics: Students will get familiar with the process of designing services. They will practice the process in the real life of the city and with its citizens and entrepreneurs.
Learning goals: During two day-workshop students will practice the whole process of creating the service with end

	users. They will practice stages and tools used in service design, observations, co-creation stage and tests of the new service. Methodology: co-design workshop.
Outcomes of the module	• knowledge about Sustainable Logistics and they role in economy and business strategic and skills related with this activities • knowledge about the design role in organizations and creation of innovations with design • increase the creativity and innovation • increase of the ability to co-create with end users • increase of the use of design tools • competencies on service design practice
Learning outputs of the module	• methods and tools for the building of strategic partnerships and alliances in the cultural and creative sector • methods and tools to find creative and innovative solutions of problems • concept (design) or case study of practice related to forward and reverse supply chains in selected organisations, including preparation of potential material requirements for redesigned products utilizing refabricated or recycled materials. • methods and tools of service design • basic research in selected city - principles of waste management and material flows in the city (desk analysis - state of the art)
Hours and ECTS	1 ECTS = 25 hours (8 hours in presence + 17 hours own work) Advanced course: 200 hours (64 hours in presence), divided into 150 theoretical part (48 hours in presence) and 50 practical part (workshop) (16 hours in presence) ECTS = 8 Refresher course: 50 hours (16 hours in presence) corresponding to 2 ECTS
Attendence (%)	75%
Period of implementation	Second semester 2021-2022 (pilot test)
Implementing partners	• WSB University: main organizer of the module • ZC: identification of manufacturing enterprises bringing challenges and participation; development of module's workshop
Locations	Cieszyn - WSB & Castle Cieszyn premises
Learning module referent	Łukasz Wróblewski, PhD. - Head of the Production Management and Engineering Chair - WSB University - Campus in Cieszyn

Diagram of the Module n.2
"Economics, business model and circular economy"



Module 3 –Product & Service Design
ELISAVA – "Product & Service Design"

Node	Spain – Barcelona
Title	**Product & Service Design**
Department	ELISAVA Research
University level	Advanced course (for learners with a degree level) + Refresher course (for learners without a degree level)
Target-group	Completed training of 10 graduate students and 5 non graduates for each HEIs or Module
Selection	Individual interview + Application form
Module's Description	The module is structured into 6 units + final workshop, for a total number of 64 hours (48 hours between frontal lessons, case studies and presentation + 16 hours of practical work). Units: 1. ***Service & Product Design: Future & Sustainable Trends Research & Analysis (8 hours, frontal lessons combined with case studies)*** *Service & Product Design: Research* *Future & Sustainable Trends* Key topics: what is product & service design? future trends analysis with a focus on sustainability. Learning goals: comprehension of the current context for Product & Service Design; Knowledge on the future challenges and trends of Product & Service Design in a sustainable context. Methodology: frontal lessons combined with case studies. 2. ***Design & Creative Methods II (8 hours, frontal lessons combined with case studies)*** *Service & Product Design: Methodology* *Advanced Project Methods* Key topics: what is an advanced design method? Applied Design toolkits; Research methods; Generative methods; Validation methods. Learning goals: knowledge of the Agents and Interactions which occur in a Product & Service Design process; Development and Applications of Design Methods & Techniques and case studies. Methodology: frontal lesson combined with case studies.

3. ***Design Stage: New Paradigms for Creative Processes & New Trends in Project Culture (8 hours, guided workshop)***
   Service & Product Design: Workshop
   New Creative Paradigms

Key topics: new paradigms for research and creative processes; applied design praxis and Project culture.
Learning goals: applied methodologies and processes for creative and disruptive environments; Application of theoretical knowledge and competencies through a guided project praxis.
Methodology: Guided Workshop

4. ***Product-Service Systems (8 hours, frontal lessons combined with case studies)***
   Service & Product Design: Systems
   Strategic Innovations for Sustainability.

Key topics: what is a product-service system strategy? Contextual analysis regarding innovation as a process and sustainability as a strategy.
Learning goals: awareness of the problems, risks, effects and complex challenges to the environment; Consideration of key innovation aspects during a sustainable Product & Service Design process.
Methodology: frontal lesson combined with case studies.

5. ***Technology as a Strategic Force for Change (8 hours, frontal lessons combined with case studies)***
   Service & Product Design: Technology
   Materials and Technologies for Sustainability.

Key topics: new technologies and materials for sustainability, new paradigms, new manufacturing methods, new artisans.
Learning goals: knowledge of Innovation related to Agents, Materials and Technologies for Product & Services; Knowledge and Development of Holistic Approaches which enable the implementation of strategic and innovative solutions.
Methodology: frontal lesson combined with case studies.

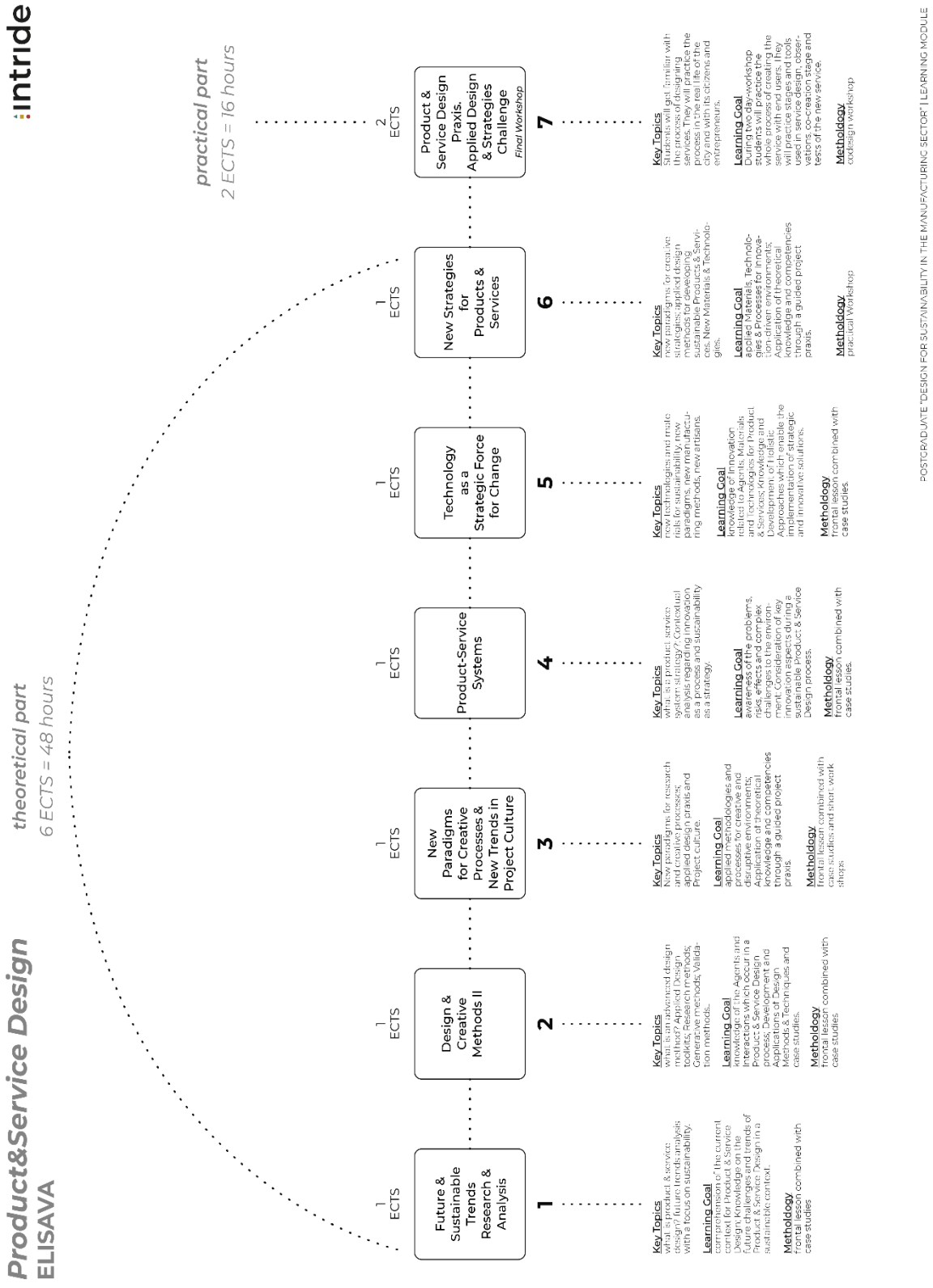
6. ***Design Stage: New Strategies for Products & Services (8 hours, practical workshop)***
   Service & Product Design: Workshop
   Applied Materials, Technologies & Processes.

Key topics: new paradigms for creative strategies; applied design methods for developing sustainable Products & Services. New Materials & Technologies.

	Learning goals: applied Materials, Technologies & Processes for Innovation-driven environments; Application of theoretical knowledge and competencies through a guided project praxis. Methodology: Practical Workshop 7. ***Final workshop: Product & Service Design Praxis. Applied Design & Strategies Challenge (16 hours, practical workshop)*** *Service & Product Design: Final Workshop* Key topics: product & services practical challenge. Applied Methods, Materials, Technologies, and new paradigms for creative approaches on Project Culture. Interaction with real industry contexts. Learning goals: Comprehension and control of the design and development of a Product & Service Design Process: Research, Methods, Materials and Technologies. Knowledge on Product & Service Management and its diverse implications. Methodology: co-design workshop.
Outcomes of the module	• Increase design skills developing a systemic/strategic approach • Knowledge on the future challenges and trends of Product & Service Design • Knowledge of the Agents and Interactions which occur in a Product & Service Design process • Knowledge on Product & Service Management and its diverse implications • Awareness of the problems, risks, effects and complex challenges to the environment • Knowledge of Innovation related to Agents, Materials and Technologies for Product & Services • Knowledge and Development of Holistic Approaches which enable the implementation of strategic and innovative solutions

Learning outputs of the module	• Development and Applications of advanced Design Methods & Techniques • Research, Applied Techniques & Processes for creative and disruptive environments • Application of theoretical knowledge and competencies through guided project praxis • Consideration of the context aspects during a Product & Service Research, Design and Development process (context mapping) • Applied Techniques & Processes for Innovation-driven environments. • Comprehensive control of a Product & Service Design Process
Hours and ECTS	1 ECTS = 25 hours (8 hours in presence + 17 hours own work) Advanced course: 200 hours (64 hours in presence), divided into 150 theoretical part (48 hours in presence) and 50 practical part (workshop) (16 hours in presence) ECTS = 8 Refresher course: 50 hours (16 hours in presence) corresponding to 2 ECTS
Attendance (%)	75%
Period of implementation	Second semester 2021-2022 (pilot test)
Implementing partners	• ELISAVA: main organizer and coordinator of the module: Lecturers, Content definition and implementation. • CENFIM: identification of manufacturing enterprises bringing challenges and participation; development of module's workshop • LEITAT: identification of new Materials and Technologies bringing participation; development of module's workshop
Locations	ELISAVA - Barcelona Campus Premises CENFIM - Barcelona Showroom LEITAT - Terrassa Office
Learning module referent	Albert Fuster - Academic Director Cristina Taverner - Head of Business & Academia Relations

Diagram of the Module n.3 "Product & Service Design"



POSTGRADUATE "DESIGN FOR SUSTAINABILITY IN THE MANUFACTURING SECTOR" LEARNING MODULE

Module 4 – Creative explorations of traditional and digital techniques for product design
CLUJ-NAPOCA – "Creative explorations of traditional and digital techniques for product design"

Node	Romania – Cluj
Title	**Creative explorations of traditional and digital techniques for product design**
Department	Design Dpt. of UAD Cluj-Napoca
University level	Advanced course (for learners with a degree level) + Refresher course (for learners without a degree level)
Target-group	Completed training of 10 graduate students and 5 non graduates for each HEIs or Module
Selection	Individual interview + Application form
Module's Description	The module is structured into 6 units + final workshop, for a total number of 64 hours (48 hours between frontal lessons, case studies and presentation + 16 hours of practical work). Units: 1. ***Design between digital and green transformation: the digital perspective (8 hours, frontal lessons combined with case studies)*** Key topics: introduction to the main meanings of digital and green transformation, with reference to the recent European guidelines. Particular attention to the digital perspective with an overview of the connected issues. Art and technology linked and integrated continuously in design projects development, furniture industry between traditional and digital technologies; fine arts and furniture design intersection with digital tools and processes. Emerging trends and topics concerning digital and green transformation, with specific focus on a new digital perspective. Learning goals: connect the visual design skills to image producing capacities of technology; evaluate the relation between the traditional methods and the new technologies in the field of design. Methodology: lectures based on presentation on computer, individual exercises under supervision, conversation, using the resources, critical analysis of the students' exercises. 2. ***New computational tools and infrastructures which could be introduced into "traditional" processes of artistic and craft-based production (8 hours, frontal lessons combined with case studies***

Key topics: artistic techniques for product design and technology available at the time of the creation process; systemic methodology of approaching the product design
Learning goals: develop the capacity for analysis and synthesis in order to create original designs, combining functionality with aesthetics; restoring the balance and the possibility of a more constructive and even-handed aesthetic relationship between creative handwork and digital work.
Methodology: lectures based on presentation on computer, individual exercises under supervision, conversation, using the resources, critical analysis of the students' exercises.

3. ***The dynamics of integration of new technological systems and practices into craft and creative design (8 hours, frontal lessons combined with case studies)***

Key topics: art forms for broader approaches in the field of craft and design.
Learning goals: acquiring the capacity to use traditional methods and tools for furniture production and a deeper understanding of total-digitalization in the context of users identity issues.
Methodology: lectures based on presentation on computer, individual exercises under supervision, conversation, using the resources, critical analysis of the students' exercises.

4. ***Digital technologies impact into artistic design (8 hours, frontal lessons combined with case studies)***

Key topics: digital revolution in product design and manufacturing; design ideas adaptation to production technologies in order to release all potential of new modern technologies.
Learning goals: evaluation of various processes which provide different perspectives through which the students could develop meaningful and deep understandings in art and design.
Methodology: lectures based on presentation on computer, individual exercises under supervision, conversation, using the resources, critical analysis of the students' exercises.

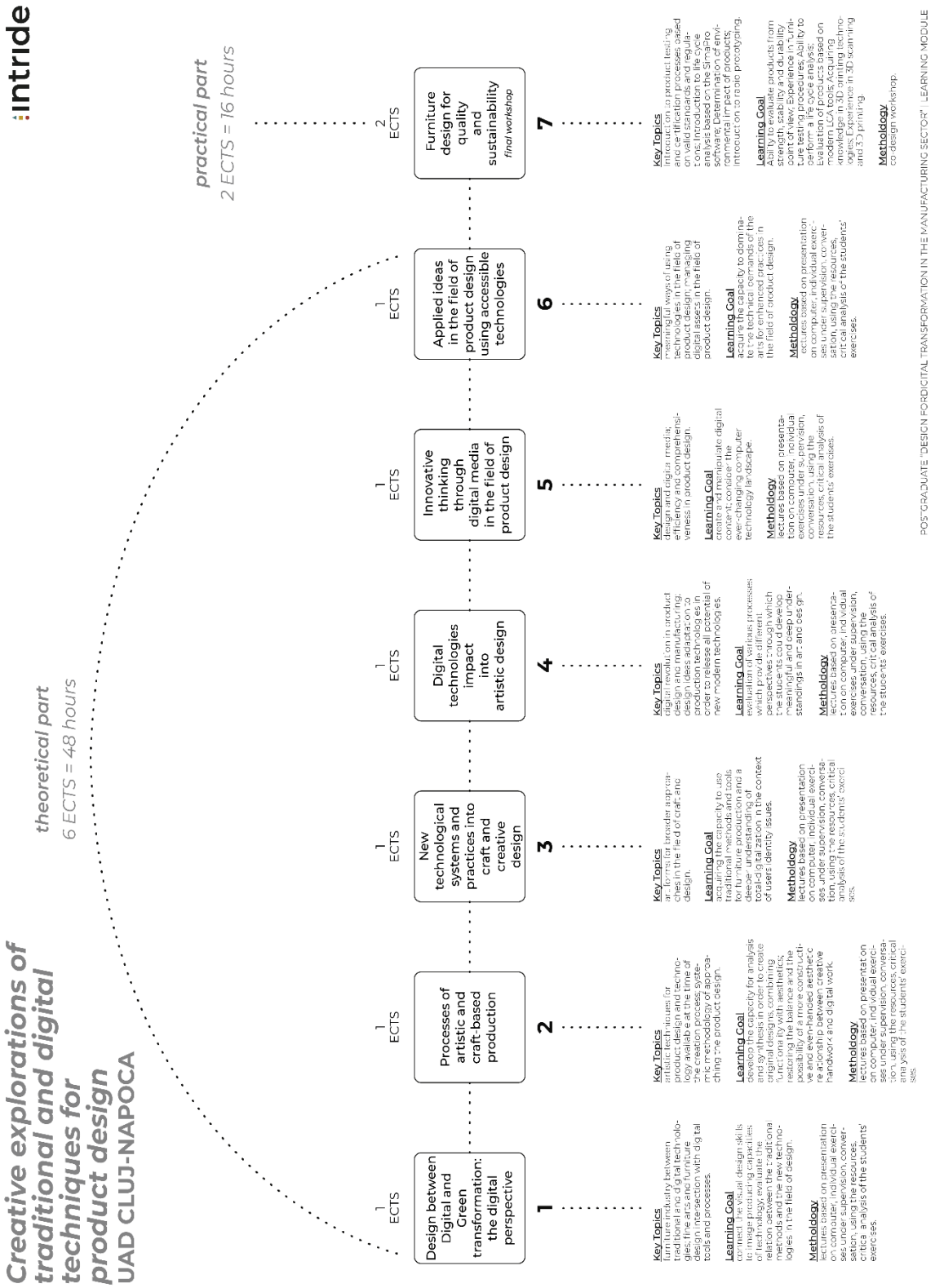
5. ***Innovative thinking through digital media in the field of product design (8 hours, frontal lessons combined with case studies)***

Key topics: design and digital media; efficiency and comprehensiveness in product design
Learning goals: create and manipulate digital content; consider the ever-changing computer technology landscape.

	Methodology: lectures based on presentation on computer, individual exercises under supervision, conversation, using the resources, critical analysis of the students' exercises. ***6. Optimal ideas and practically applied ideas for finding the best solutions in the field of product design using accessible technologies (8 hours, frontal lessons combined with case studies)*** Key topics: meaningful ways of using technologies in the field of product design; managing digital assets in the field of product design. Learning goals: acquire the capacity to dominate the technical demands of the arts for enhanced practices in the field of product design. Methodology: lectures based on presentation on computer, individual exercises under supervision, conversation, using the resources, critical analysis of the students' exercises. ***7. Final workshop "Furniture design for quality and sustainability" (16 hours, practical workshop)*** Key topics: Introduction to product testing and certification processes based on valid standards and regulations**;** On-site tests of furniture**;** Introduction to life cycle analysis based on the SimaPro software**;** Modeling and analyzing product life cycles, determination of environmental impact of products**;** Introduction to rapid prototyping**;** On-site 3D printing of models, parts or full-scale prototypes Learning goals: Ability to evaluate products from strength, stability and durability point of view; Experience in furniture testing procedures; Ability to perform a life cycle analysis; Evaluation of products from their environmental impact based on modern LCA tools; Optimization of product designs from environmental point of view (DFE – Design for Environment); Acquiring knowledge in rapid prototyping, 3D printing technologies; Experience in 3D scanning and 3D printing. Methodology: co-design workshop.
Outcomes of the module	• Ability to develop a digital design and art methodology and practice; • Deep knowledge in the field of product design (tradition, experiment, innovation, development); • Knowledge on creative application of research methodologies and techniques.

Learning outputs of the module	• Use of specific elements related to visual language's grammar, syntaxis and semiotics. • Use of certain specialized visual analysis methods, within digital media context, connected to the field of product design. • Defining the paradigm and the methodologies connected with the theoretical-experimental research in the field of the visual arts (frameworks, design models, etc.). • Adapting the language and the communication means to digital media (specific tools). • Analysis, synthesis and interpretation of data and information from the professional context;
Hours and ECTS	1 ECTS = 25 hours (8 hours in presence + 17 hours own work) Advanced course: 200 hours (64 hours in presence), divided into 150 theoretical part (48 hours in presence) and 50 practical part (workshop) (16 hours in presence) ECTS = 8 Refresher course: 50 hours (16 hours in presence) corresponding to 2 ECTS
Attendance (%)	75%
Period of implementation	After the end of INTRIDE project
Implementing partners	• CLUJ-NAPOCA: main organizer and coordinator of the training • TFC: identification of manufacturing enterprises bringing challenges and participation; development of module's workshop
Locations	UAD (University of Art and Design in Cluj-Napoca)
Learning module referent	Reader PhD. George-Ciprian MIHNEA, the Director of the Design Department at the University of Art and Design in Cluj-Napoca

Diagram of the Module n.4 “Creative explorations of traditional and digital techniques for product design”



Module 5 – IoT, cloud computing and cyber physical systems
DIEF – "IoT, cloud computing and cyber physical systems"

Node	Italy – Florence
Title	**IoT, cloud computing and cyber physical systems**
Department	Department of Industrial Engineering – DIEF-UNIFI
University level	Advanced course (for learners with a degree level) + Refresher course (for learners without a degree level)
Target-group	Completed training of 10 graduates students and 5 non graduates for each HEIs or Module
Selection	Individual interview + Application form
Module's Description	The module is structured into 6 units + final workshop, for a total number of 64 hours (48 hours between frontal lessons, case studies and presentation + 16 hours of practical work). Units: 1. ***Internet of Things*** ***(8 hours, frontal lessons combined with case studies)*** Key topics: Internet of Things (IoT) overview and fundamental concepts; IoT framework and applications; Sensors and actuators; Embedded systems; Networking protocols; Security and privacy; Domains and Connected Ecosystems; Blockchain in IoT; Standards and interoperability. Learning goals: Outline the main concepts and properties of IoT and provide key contents for building an IoT based apllication. Methodology: frontal lessons supported by lecture slides and presentations of case studies. 2. ***Cloud Technologies and architectures*** ***(8 hours, frontal lessons combined with case studies)*** Key topics: Definition of cloud computing and concepts; Virtualization and containers; Main properties and features of Cloud based system; IoT Services Platform, functions and requirements; Integration of IoT with Cloud Computing. Learning goals: Outline methods and tools to understand the concepts of Cloud technologies and provide key contents for implementing services based on web applications, data storage, computation, data sharing. Methodology: frontal lessons supported by lecture slides and presentations of case studies. 3. ***Fundamentals and vision of Artificial Intelligence*** ***(8 hours, frontal lessons combined with case studies)*** Key topics: Introduction to AI and short history; Machine learning techniques; Data mining; Statistical pattern

recognition; other learning approaches: reinforcement, imitation…
Learning goals: Outline concepts and methods about machine learning with simple examples about supervised and unsupervised learning.
Methodology: frontal lessons supported by lecture slides and presentations of case studies.

4. ***Cyber Physical Systems***
   (8 hours, frontal lessons combined with case studies)

Key topics: Cyber Physical System overview and fundamental concepts; Application in Industry 5.0; Advanced robotic capabilities; internet of robotic things; robot development in ROS.
Learning goals: Outline concepts and methods for designing CPS and robotic solutions with navigation, interaction, manipulation and perception capabilities.
Methodology: frontal lessons supported by lecture slides and presentations of case studies.

5. ***Designing in the IoT scenario***
   (8 hours, frontal lessons combined with case studies)

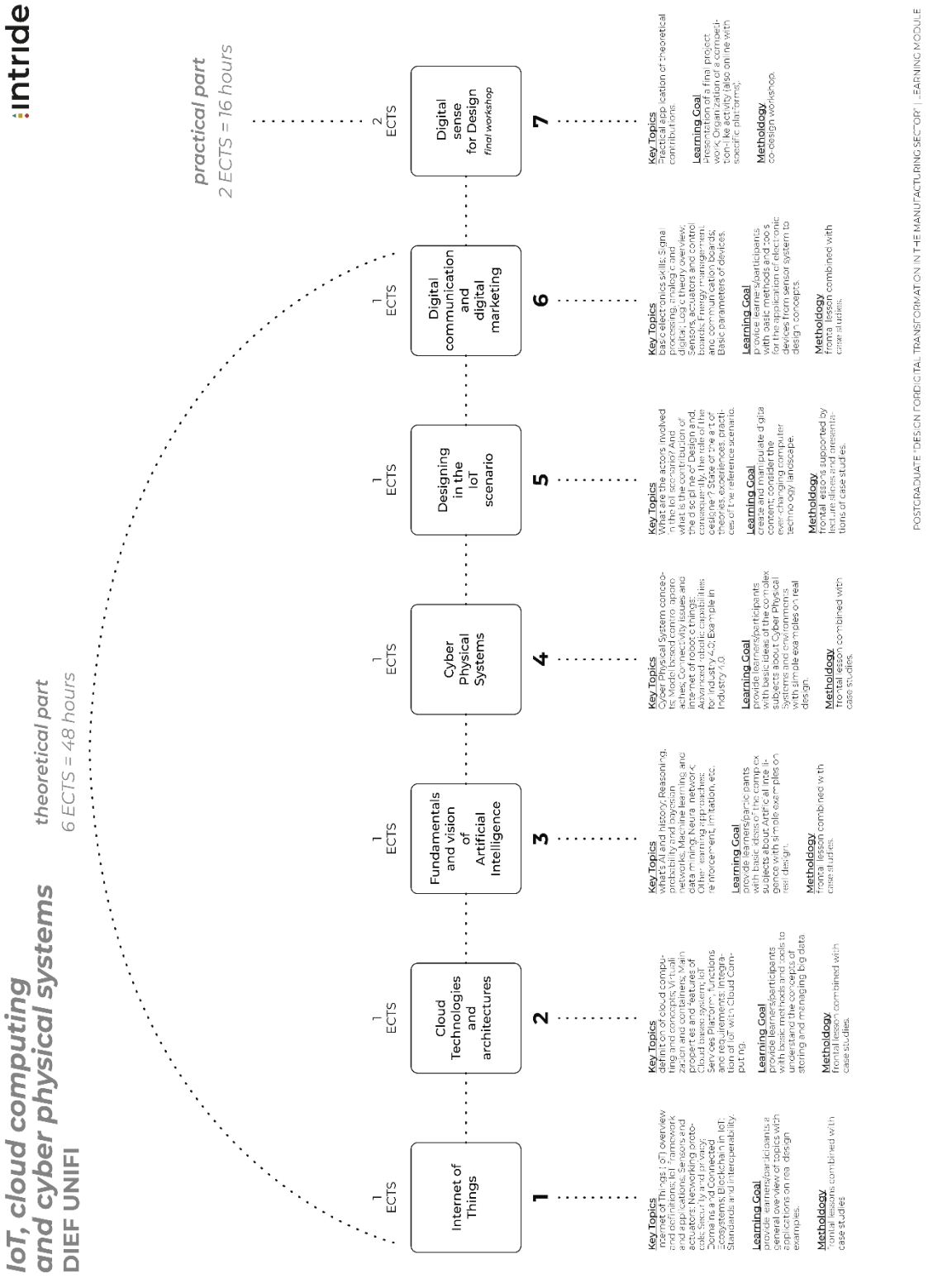
Key topics: What are the actors involved in the IoT scenario? And what is the contribution of the discipline of Design and, consequently, the role of the designer? State of the art of theories, experiences, practices on product/service design linked to the reference scenario.
Learning goals: Provide learners/participants with basic methods and tools for the application of electronic devices from sensor system to design concepts.
Basic electronics skills; Signal processing, analogic and digital; Logic theory overview; Sensors, actuators and control boards; Energy management and communication boards; Basic parameters of devices.
Methodology: frontal lessons supported by lecture slides and presentations of case studies.

6. ***Digital communication and digital marketing***
   (8 hours, frontal lessons combined with case studies)

Key topics: business strategies, digital techniques, social media metrics, digital and multichannel communication, brand manager, organization and promotion of events, marketing and web-marketing, event manager, sponsorship, SEO and SEM; Communication Design; overview and definitions; Basic elements of marketing; Problem and objective analysis; Creation and management of the project team.
Learning goals: Provide learners/participants with basic methods and tools to apply digital communication and digital marketing on design.

	Methodology: frontal lessons supported by lecture slides and presentations of case studies. ***7. Final workshop "Digital sense for design" (16 hours, practical workshop)*** Key topics: 1. Practical experiences in creating applications with sensors and connected devices using Arm microcontroller and communication modules. Learning goals: Capability to manage information acquired from sensor or interacting devices in order to design interactive systems and applications. Methodology: Co-design workshop and preparation of a final project work.
Outcomes of the module	• knowledge on Internet of Things and Key enabling technologies • knowledge on interdisciplinary connection between new digital technologies and design • increase of digital skills for smart designers • increase use of 5.0 technologies in design fields
Learning outputs of the module	• use of new digital technologies for the Design landscape • practical application of sensor systems • practical application of AI methods and tools • use of design methods and tools for the application in sensor and KETs systems
Hours and ECTS	1 ECTS = 25 hours (8 hours in presence + 17 hours own work) Advanced course: 200 hours (64 hours in presence), divided into 150 theoretical part (48 hours in presence) and 50 practical part (workshop) (16 hours in presence) ECTS = 8 Refresher course: 50 hours (16 hours in presence) corresponding to 2 ECTS
Attendence (%)	75%
Period of implementation	After the end of INTRIDE project
Implementing partners	• DIEF: main organizer and coordinator of the training • DID: identification of manufacturing enterprises bringing challenges and participation; development of module's workshop
Locations	• DIEF - PLESSO DIDATTICO SANTA MARTA Firenze
Learning module referent	Prof. Filippo Cavallo – University of Florence – DIDA

Diagram of the Module n.5
"IoT, Cloud Computing and cyber physical systems"



Module 6 – Advanced Fabrication Module
LEITAT– "Advanced Fabrication Module"

Node	Spain – Barcelona
Title	**Advanced Fabrication Module**
Department	LEITAT
University level	Advanced course (for learners with a degree level) + Refresher course (for learners without a degree level)
Target-group	Completed training of 10 graduates students and 5 non graduates for each HEIs or Module
Selection	Individual interview + Application form
Module's Description	The module is structured into 6 units + final workshop, for a total number of 64 hours (48 hours between frontal lessons, case studies and presentation + 16 hours of practical work). Units: 1. ***Additive manufacturing introduction (8 hours, frontal lessons combined with case studies)*** Key topics: Digital product development framework; Open design; Collaborative Networks; Social Manufacturing; Co-creation; Digital Tools; Additive Manufacturing technologies overview; Mass customization; Cloud Manufacturing. Learning goals: Provide a general point of view about AM and all the topics that are related with this innovative technology. The learner will contextualize the AM in the contemporary industry. Methodology: Frontal lessons combined with case studies. 2. ***Additive manufacturing implementation (8 hours, frontal lessons combined with case studies)*** Key topics: requirements to fulfil; AM materials analysis and selection; AM technology analysis and selection; Benchmark (Test and validation); End to end solutions. Learning goals: provide all the needed tools and steps to follow in order to adopt AM in a company/industry taking into account all the different fields in the AM value chain. Methodology: frontal lessons combined with case studies. 3. ***Additive manufacturing technologies (8 hours, frontal lessons combined with case studies)*** Key topics: material extrusion technology: Fused Deposition Modelling (FDM). VAT photopolymerization technology: Stereolithography (SLA), Digital Light Processing (DLP), and Liquid-crystal display (LCD-AM). Learning goals: knowledge in AM technology, specifically with material extrusion technology. Methodology: frontal lessons combined with case studies.

4. ***Design for additive manufacturing (8 hours, frontal lessons combined with case studies)***

Key topics: introduction to the emerging core design principles and skills necessary to fully exploit the benefits of additive manufacturing. Overview of design for additive manufacturing (DfAM) fundamentals. Latest trends in additive manufacturing such as optimising parts with generative design, minimising material with lattices and simplifying assemblies with part consolidation.
Learning goals: knowledge in core design principles for AM technology to manufacture innovative products.
Methodology: frontal lessons combined with case studies.

5. ***Additive manufacturing technologies - Metals & Polymers (8 hours, frontal lessons combined with case studies)***

Key topics: Knowledge in AM technology to manufacture polymers, specifically with polymers with UV polymerization (resins). Powder Bed Fusion (PBF): Multi Jet Fusion (MJF), Selective Laser Melting (SLM), and Selective Laser Sintering (SLS); Direct Energy Deposition (DED): Laser Engineering Net Shape (LENS); Electron Beam Additive Manufacturing (EBAM).
Learning goals: knowledge in AM technology to manufacture metals and polymers where (1) the raw material is provided in powder or (2) a direct energy to melt material is applied.
Methodology: frontal lessons combined with case studies.

6. ***Additive manufacturing technologies - Others (8 hours, frontal lessons combined with case studies)***

Key topics: binder Jetting (BJ); Material Jetting (MJ).
Learning goals: knowledge in AM technology to manufacture other materials apart from metals and polymers.
Methodology: frontal lessons combined with case studies.

7. ***Final workshop "Product development" (16 hours, practical workshop)***

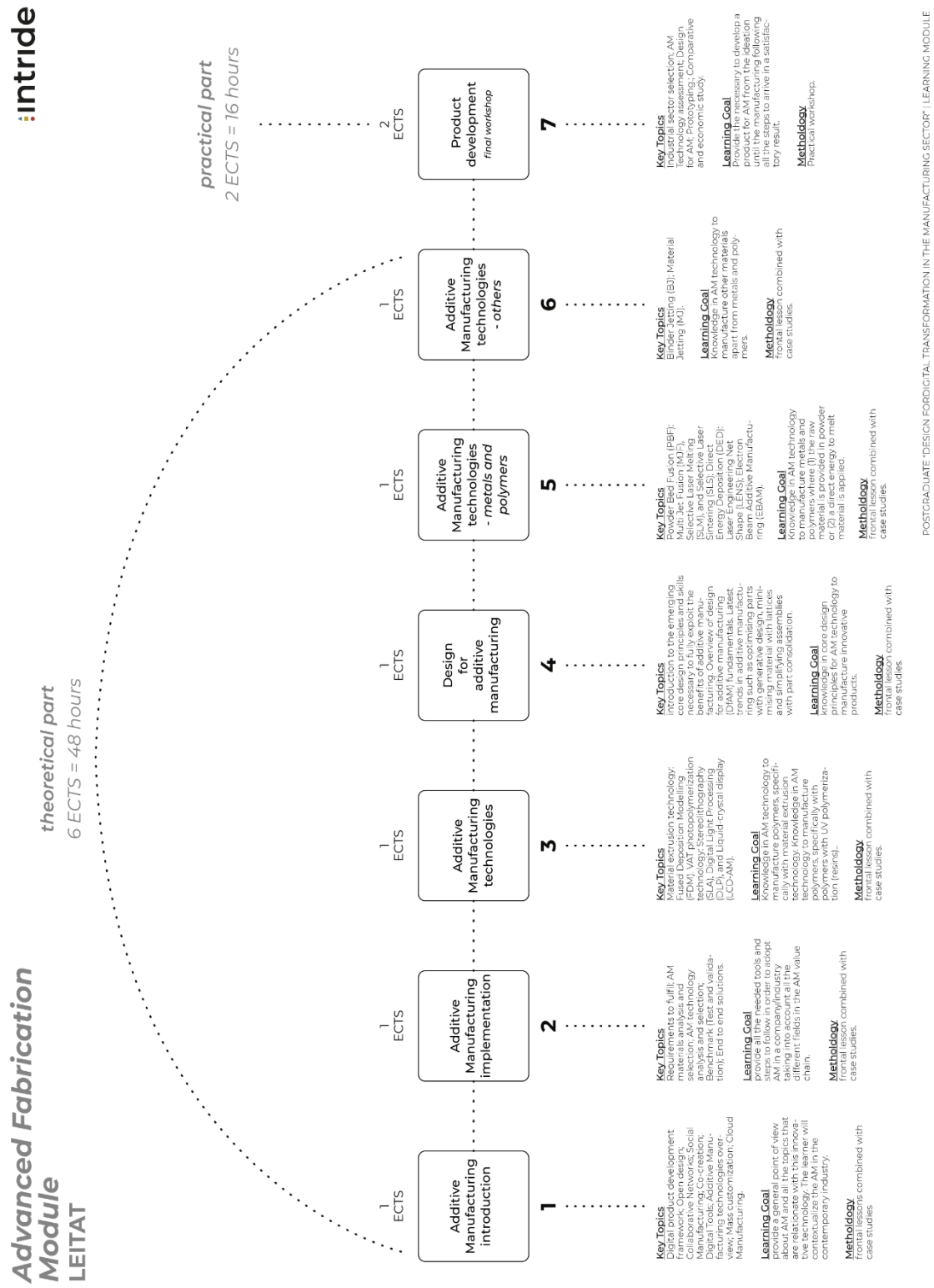
Key topics: industrial sector selection; AM Technology assessment; Design for AM; Prototyping.; Comparative and economic study.
Learning goals: provide the necessary to develop a product for AM from the ideation until the manufacturing following all the steps to arrive in a satisfactory result.
Methodology: practical workshop.

Outcomes of the module	• Knowledge in Design for AM (DfAM). • Knowledge in the general advantages and disadvantages of AM. • Increase in the understanding of Industry 4.0.

Learning outputs of the module	• Important considerations to take into account for using different AM technologies. • Overview of the different AM technologies. • Practical applications of AM in the real industrial scenarios. • Conceptual applications of AM for product innovation.
Hours and ECTS	1 ECTS = 25 hours (8 hours in presence + 17 hours own work) Advanced course: 200 hours (64 hours in presence), divided into 150 theoretical part (48 hours in presence) and 50 practical part (workshop) (16 hours in presence) ECTS = 8 Refresher course: 50 hours (16 hours in presence) corresponding to 2 ECTS
Attendance (%)	75%
Period of implementation	After the end of INTRIDE project
Implementing partners	• LEITAT: main organizer and coordinator of the training • CENFIM: identification of manufacturing enterprises bringing challenges and participation; development of module's workshop
Locations	• LEITAT -Terrassa HeadQuarters / DFACTORY Barcelona ELISAVA - Barcelona Campus Premises CENFIM - Barcelona Showroom
Learning module referent	Pere Badalló i Cañellas - LEITAT

Diagram of the Module n.6

“Advanced Fabrication Module”



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