



Projet 3Di - Mobilité virtuelle et l'industrie du futur à travers le fabrication additive



MOBILITÉ HYBRIDE ET NOUVEAU PROGRAMME ERASMUS+

Coordination:

Anna Carla Araujo

After 2019 : MCF – Mech. Eng. - INSA Toulouse)

2010-2019 : MCF – UFRJ – Rio de Janeiro

2014-2017 – Intern. Rel. Engineering UFRJ

Paolo Bosetti (Prof. - Industrial Eng. - Università di Trento)

1. INSA Toulouse
2. Partenaires
3. Projet Défi-diversité
4. Mobilité Virtuelle 2020
5. Planning 2021

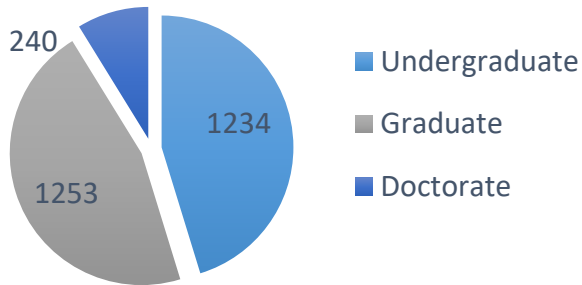


INSA

INSTITUT NATIONAL
DES SCIENCES
APPLIQUÉES
TOULOUSE

3,200 enrolled students

- 2,600 of them are Engineering students
- 24% foreign students
- 50% of students housed on campus
- 200 students in M1-M2 – Mechanical Eng.



220 partner institutions

24 Double Degree partner institutions



700 international students welcomed/year



600 students abroad/year

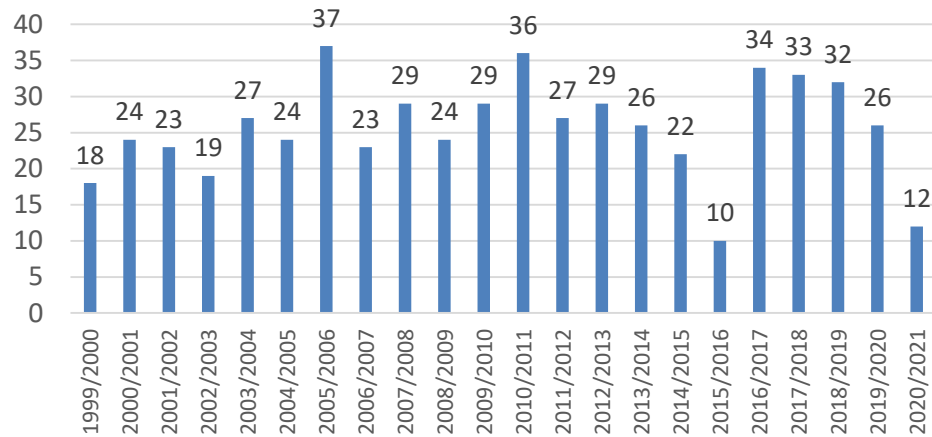
Mechanical Engineering

PRINCIPAUX SECTEURS D'ACTIVITÉ

- Industrie automobile, aéronautique, navale, ferroviaire | 44%
- Sociétés de conseil, bureaux d'études, ingénierie | 16%

<https://fr.calameo.com/read/00105768387898a13262b>

Incoming Students in Mechanical Engineering (per year)



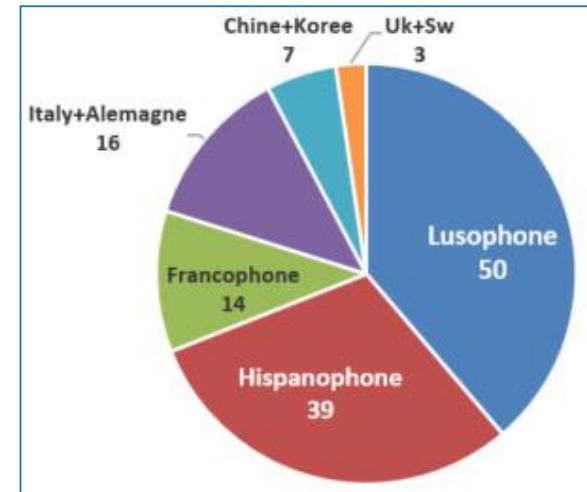
Double Degree with ITBA, Univ. Jaume I Castellon, Université Mondragon, ETSEI Barcelone, Université Saragosse, PUC-RJ, UFRJ, UFSC (Brazil) and ETS Montréal.



INGENIEUR spécialité GENIE MECANIQUE

Niveau d'étude : BAC +5

Mec. Eng. (2016-2021)
Incoming students





UNIVERSITÀ DI TRENTO



ECIU
university

INSA INSTITUT NATIONAL
DES SCIENCES
APPLIQUÉES
TOULOUSE

European Consortium of Innovative Universities

People

620

Professors and
Researchers

45

Visiting Professors
each year

710

Administrative
Staff

16.909

Enrolled students
in 2017-2018

Undergraduate **12.716**
Graduate **3.615**
PhD **578**

1.277

Foreign students
in 2017-2018

Undergraduate **683**
Graduate **450**
PhD **144**

20 Master's Courses taught in English

38 Double degree programs in 13 different countries



Aalborg University
Dublin City University
Hamburg Univ. of technology
Groupe INSA
Kaunas University of Technology
Linköping University
Tampere University
Uní. Autònoma de Barcelona
Universidade de Aveiro
University of Stavanger
Università di Trento
University of Twente

Paolo Bosetti

Professore associato

Dipartimento di Ingegneria Industriale



- AMICO: Additive Manufacturing e automazione processo per materiali Ibridi e Compositi
- "Drones for Finding Avalanche--Buried" (D--FAB)
- Incremento del livello di automazione, autodiagnosi, precisione e integrazione funzionale delle Macchine Utensili Italiane mediante sistemi cognitivi artificiali che realizzano processi di percezione/decisione

- Advanced Formula SAE
- Design and control of product and process
- Laboratorio Formula SAE
- Manufacturing Automation
- Misure meccaniche e termiche
- Misure per l'ingegneria industriale

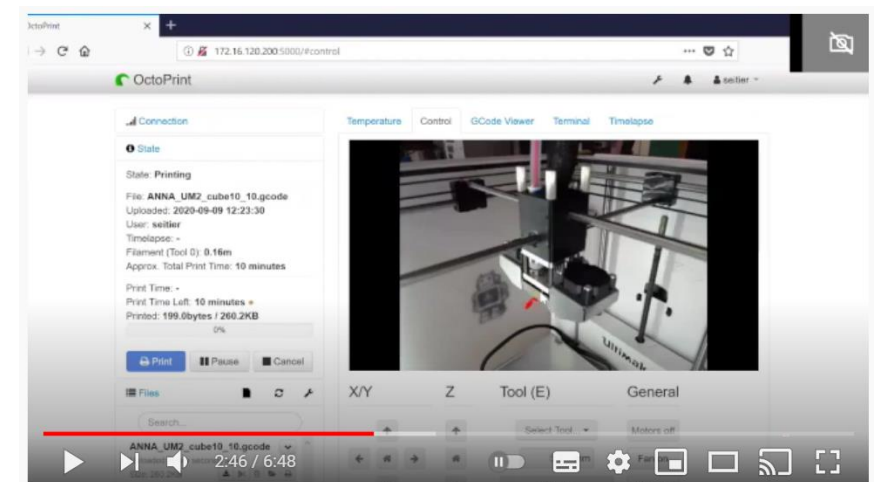
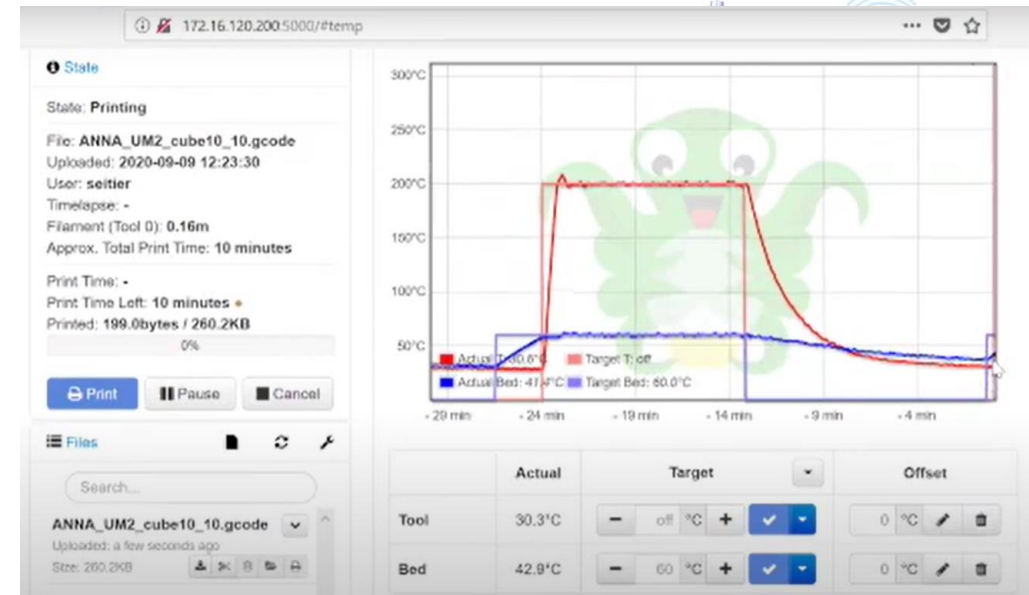
Industrial Internet of Things (Industry 4.0)

“The IIoT is the connection of industrial products such as components and/or machines to the internet with wire and wireless connections, increasing value with additional monitoring, analysis and optimization.”

- **Optimization of manufacturing operations and supply chain at distance**
- **Production-asset monitoring and tracking quality**
- **Field service organizations**
- **Remote monitoring and remote operation**
- **Condition-based maintenance with Big data**



New Competence for engineers





Appel à Projets Bonus DEFI Diversités 2020

- L'équipe pédagogique de la formation constituée de membres des établissements : INSA-Toulouse, Università di Trento (Italie) qui est partenaire du réseau ECIU et une université Brésilienne ;
- Ce module visera à regrouper des étudiants de différents établissements sous la forme de réunions virtuelles pour construire un **projet mécanique** et d'atelier de **fabrication à distance** en ligne pour faciliter l'intégration d'étudiants issus de domaines scientifiques différents ;
- Développement et **usage de services numériques** : orientation et organisation via Moodle, impression 3D via wifi et échange des fichiers de projets dans le parcours du projet.
- Contribue à la pratique de la **langue anglaise** dans une situation professionnelle.

- Section 1 : Visioconférence de présentation et *Brainstorming* entre les étudiants internationaux
- Section 2 : Définition des éléments mécaniques du projet et *découverte des équipements*
- Section 3 : Présentation des projets mécanique aux formateurs via vidéo dans Moodle
- Section 4 : Connection et surveillance à distance de l'**impression 3D**
- Section 5 : Assemblage et réimpression des pièces non-conformes
- Section 6 : Elaboration de la présentation des résultats du projet
- Section 7 : Présentation du projet en ligne

Project Proposed
Before Lock Down

2020 Virtual Mobility in Additive Manufacturing course

Two mixed groups with virtual mobility
Defined calendar and objectives
Communication in English – Defined design tools

Constraints for the project :

- Each group should print one device with multicomponent manufactured in 3D Printing
- Machines from both countries should be used for components manufacturing
- The groups are free to create any device, but the market target is a consumer like the reference (professional or institution reference)

Available equipment for printing

Equipment in France:

- Ultimaker 2+ (PLA and ABS)
- Ultimaker 3 (PLA and ABS)
- Ultimaker 3 ext (PLA and ABS)
- Formlabs form 2 (gray and black resine)
- Scanner handscan from Creaform

Equipment in Italy

- [MarkForged Mark-2](#), with Opal, Carbon and kevlar long fibers
- [Formlabs Form2](#), with plenty of materials, from elastic to ceramics
- [HP JetFusion 4200](#), PA12
- Creaform GO!Scan
- [MetraSCAN 3D](#)



2020 Virtual Mobility in Additive Manufacturing course



Ci-dessous les cours OpenINSA. Certains ne sont pas ouverts à tout public.

Pour les alumnis, merci de cliquer ci-dessous dans la [catégorie OpenINSA - Alumnis](#).

<https://open.insa-toulouse.fr/course/view.php?id=329>

Open-Moodle

3D-i - Virtual mobility in 3D printing course

Home / My courses / 3D-i - Virtual mobility in 3D


Navigation

- Home
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 - Site pages
 - My courses
 - formation des nouveaux enseignants chercheurs - vo...
 - Formation des NEC 2019-2020
 - Challenge Culture INSA 2020
 - Incoming to Mec. Eng. INSA Toulouse
 - 3D-i - Virtual mobility in 3D**
 - Participants
 - Badges
 - Competencies
 - Grades
 - General
 - General rules and advices
 - Product ideas
 - Group A
 - 3D Masters (aka Group B)
 - Courses

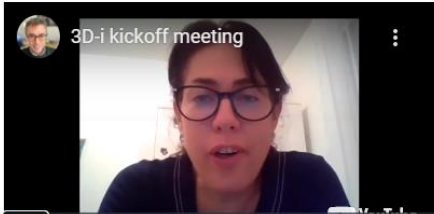
Administration

News

- Welcome to the course



Kick-off meeting



General rules and advices

- Softwares and Files storage
- General Calendar
- Available equipment for printing
- Constraints for the project

Zoom links

The following Zoom link is valid throughout the course duration and will be used for plenary meetings:

<https://unitn.zoom.us/j/85471496801?pwd=OEVCM1VMelV6RWNNQkhlcHlzNkSSQT09>

Meeting ID: 854 7149 6801

Passcode: 468417

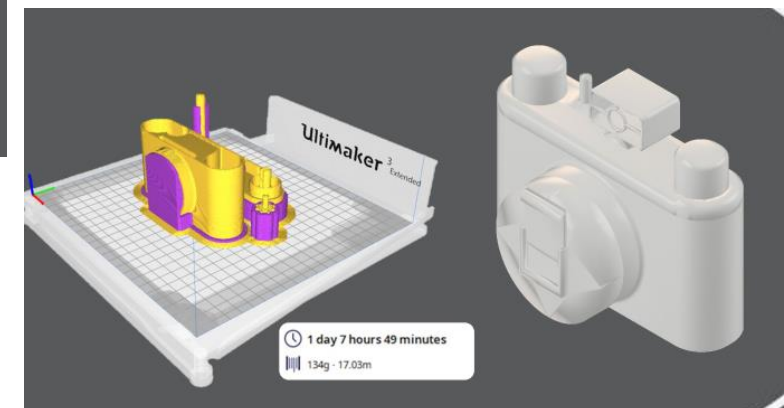
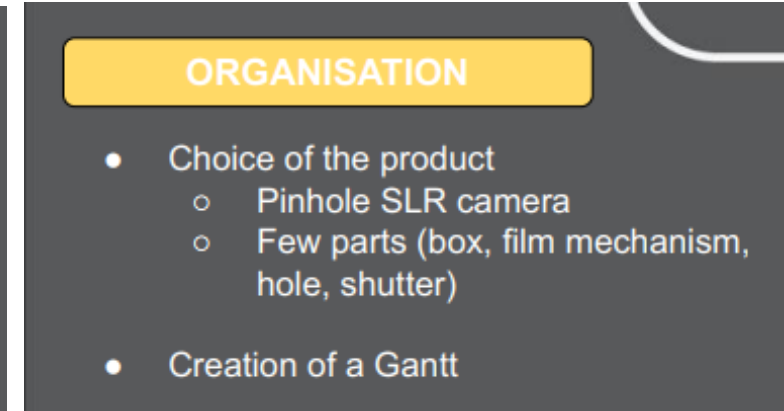
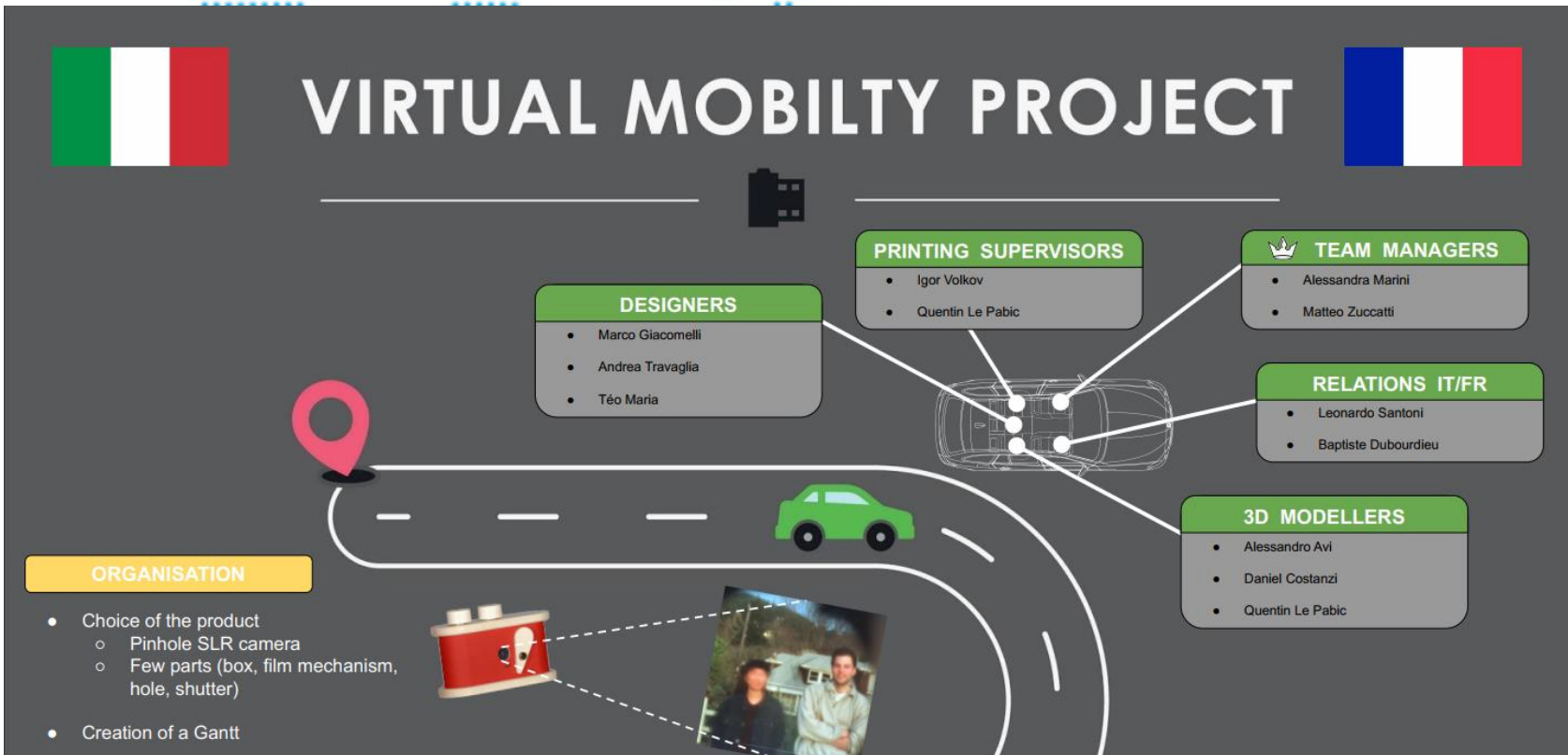
Q&A Forum

Ask and you'll be answered.

Product ideas

- Ideas for products

2020 Virtual Mobility Group A (3 French + 8 Italians)



2020 Virtual Mobility Group A (3 French + 8 Italians)

o Report on our advancement

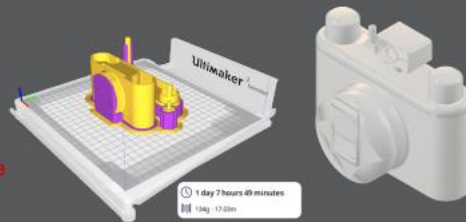
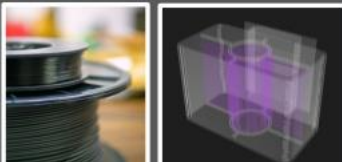
PRINTING PARTS

- Printer choice
- Materials
- Printing setup
- Printing time
- Issues with geometry



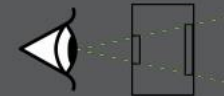
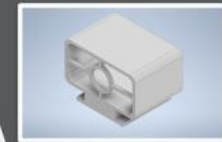
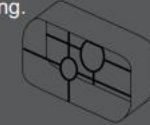
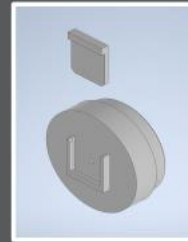
PLA + made with - weakness
PVA + water soluble - break down over time

Onyx + carbon fiber
Eiger software



CONCEPT & 3D MODELS

- Main body: Allows the use of standard film rolls and moving parts are integrated into the body.
- Gear mechanism: Allows to know the position of the film inside the camera.
- Shutter mechanism: Manual sliding performed by user. Shutter installed directly on the lens
- Viewfinder: Design that ensures that the user sees the correct field of view. When the eye is at the correct distance the two circles appear overlapping.



PROBLEMS ENCOUNTERED

- We lost time at the beginning without knowing what to do
- Misunderstanding between 3D modellers and designers
- We lost time during christmas holidays
- Not well-defined deadlines in the latest part of the project
- Problems with the printing



Operating Temperature
15 - 32°C

2020 Virtual Mobility Group B (2 French + 3 Brazilians* + 5 Italians)

* Physically in Double Degree mobility in INSA Toulouse

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES TOULOUSE

3D Masters

UNIVERSITÀ DI TRENTO

Dungeons & Dragons box

ABDALLA BARONI Victor, CLIMACO BRITES FARINA Carol, ESQUIEU Corentin, REIA CATELAN João Victor, VAN BÜRK Tristan¹, INSA Tutor: ARAUJO Anna¹, DEL GIUDICE Luca, HASSAN Wae, KASA Mutuasafa, VALSECCHI Stefano, ARGERI Daniela², University of Trento Tutor: Paolo BOSETTI²

¹ INSA engineering students.
² University of Trento.

INTRODUCTION

Most used items

Most wanted features

PRINTING PROCESS OVERVIEW

Choice of printers → Errors estimation → Design adjustments → Printing

D&D BOX DESIGN

Tower, Cover locking system, Cover, Right wing, Support for shelves

Path of the dice, Dice pool Store the dice, Easy to handle, Rotation system

Shelves

- Support of the characters
- Hanging in the supports
- Playful design for the game
- Printing design

Left wing

- Revolute joint with the tower
- Cover for the dice
- Paper binder

Tablet support

- Removable support
- Linked to the left wing

External design

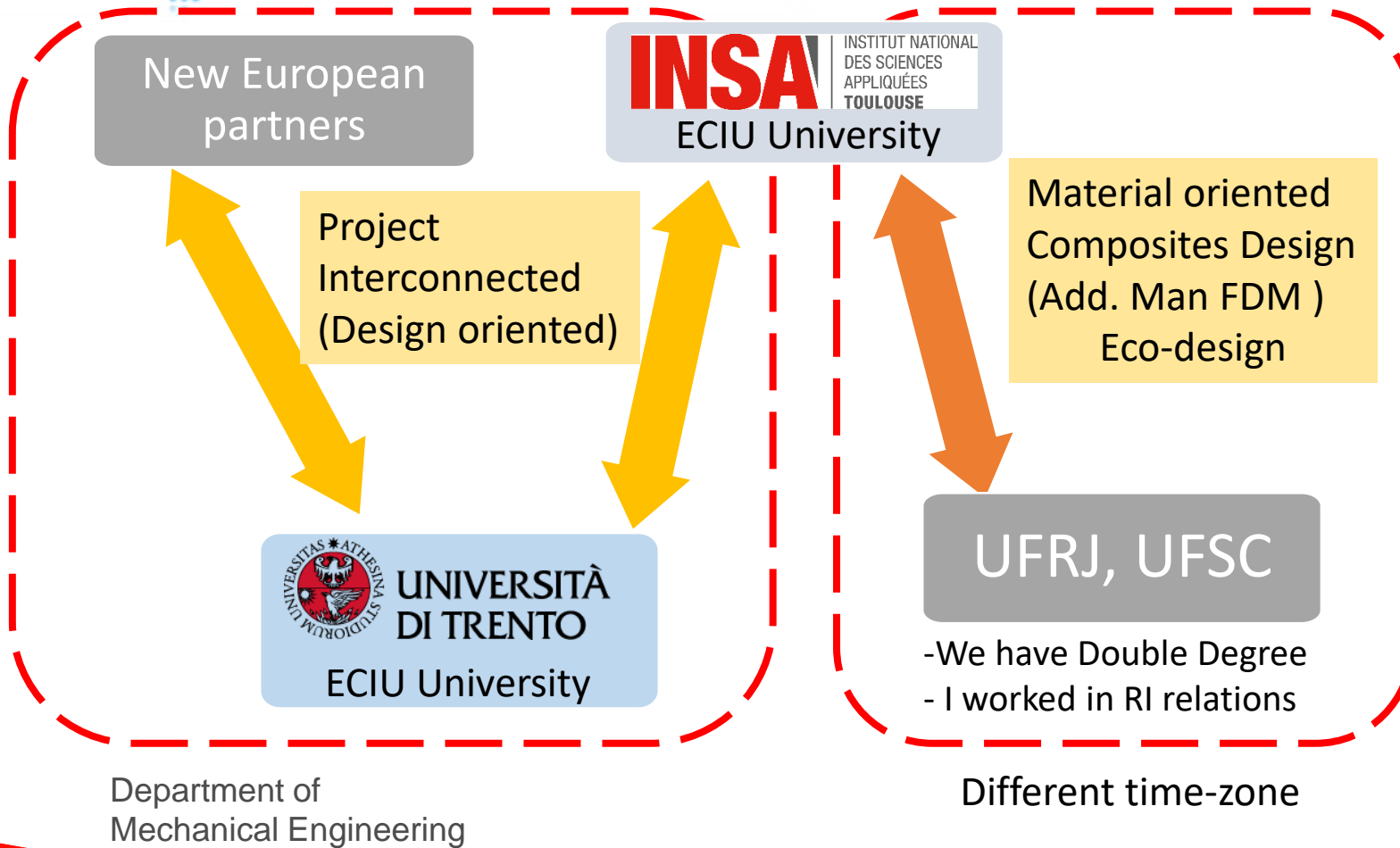
- Inspired in an old book appearance
- Used of curved and embossed shapes and patterns
- Game logo printed on the front cover

Male lock, Female lock

Simple design : cylindric contact
Use of the material's elasticity properties
Low force needed to open the box
Hollow on the side to help the user

2021 Virtual Mobility – What is previewed ?

- + Including new partners, forming a new network for additive manufacturing education with hybrid mobility (virtual+Physical)
- + Recognition of the mobility without double creation of courses



Thanks for your attention!

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