STUDY ABROAD

ITBA Escuela de INNOVACIÓN
EVOLUCIÓN CONTINUA

Digital Manufacturing

LANGUAGE OF INSTRUCTION:

English

TERMS OFFERED:

Summer & Winter terms

PROGRAM OVERVIEW:

Course description:

This course is aimed at professionals and advanced students seeking to understand and apply the strategic potential of 3D printing in real-world innovation and product development processes.
Participants will explore how to use 3D printing not only for prototyping but also for the production of functional parts and low-volume final products. The approach is hands-on, focusing on decision- making grounded in technical, functional, and business criteria.

Course Structure:

The program is organized into five modules that progressively integrate design thinking, digital modeling, additive and subtractive manufacturing design for additive manufacturing and materialization. Through a blend of theoretical and intensive lab work, students engage in iterative development of real-world products, applying key strategies for agile prototyping.

LEARNING OUTCOMES:

By the end of the program, participants will be able to:

- Integrate 3D printing technologies into real design and product validation processes.
- Select appropriate prototyping strategies (additive or subtractive) based on project goals.
- Design products considering the constraints and advantages of 3D printing.
- Assess the technical and strategic feasibility of using 3D printing in real-world projects.
- Apply digital tools for modeling, scanning, and reverse engineering.

TEACHING METHODOLOGY:

The course blends short theoretical sessions with intensive lab work. The focus is on the iterative development of a real-world product, integrating design, technology, materials, and process decisions. Teamwork and critical analysis of real cases are encouraged.

ASSESSMENT METHODOLOGY:

- Module-based assessments: quizzes + practical assignments.
- Final individual or group project: comprehensive application of course content.
- Ongoing formative assessment based on participation and technical progress.

CONTENT BY UNITS:

Module 1: Design Thinking and Innovation Strategies

- Introduction to strategic design and innovation methodologies.
- Concurrent engineering and iterative thinking.
- Manual sketching and concept generation.
- Artificial Intelligence brainstorming tools and rapid ideation.
- Project initiation (individual or group).

Module 2: Digital Modeling and Visualization

- Parametric modeling and 3D file adaptation.
- Artificial Intelligence rendering tools for product visualization.
- Presentation of conceptual proposals.
- Initial decisions on design and materials.

Module 3: Additive and Subtractive Prototyping

- Types of prototypes: functional, visual, technical.
- Intro to additive manufacturing: FDM, SLA, SLS, etc.
- Intro to subtractive manufacturing: CNC, laser cutting, milling.

Technology and material selection by function and scale.

- File preparation (Simplify3D, GrabCAD, etc).

Module 4: Design for Additive Manufacturing

- Design principles specific to 3D printing.
- Geometric constraints and design freedoms.
- Post-processing and finishing techniques.
- Software for quality and print time optimization.

Module 5: Materialization and Validation

- Execution of the final project.
- Collaborative lab work.
- Washing, curing, assembling, and functional testing.
- Digital-to-physical comparison and final validation.

LEARNING REQUIREMENTS:

Professionals capable of using 3D printing as a strategic tool in product development projects, with technical expertise and an innovation-driven mindset. Equipped to lead iterative design processes, evaluate technological alternatives, and produce functional solutions in real contexts.

PROGRAM OUTLINE:

- Modality: In-person
- Duration of classes: 2.5 hours
- Teaching: Monday to Thursday, 9:00 a.m. – 11:30 .m.
- Duration: 40 hours spread over 4 weeks
- Total amount of hours :40

Course Schedule:

- **Winter 2026:** January 5 – January 29, 2026

  (Program start: December 2025 with welcome email).

- **Summer 2026:** July 2026 (exact dates to be confirmed).

  (Program start: Mid-June 2026 with welcome email).

BIBLIOGRAPHY:

Required Bibliography:

Enrique Canessa, Carlo Fonda and Marco Zennaro, “Low-cost 3D Printing for Science, Education & Sustainable Development”, The Abdus Salam International Centre for Theoretical Physics, Trieste, Italy. May 2013, First Edition. ISBN 92-95003-48-9.

Brian Underdahl, “Digital Manufacturing For Dummies®”, Proto Labs® International Edition, Published by John Wiley & Sons, Inc., 111 River St. Hoboken, NJ 07030- 5774 (2015).

Further Reading:

Ali Kamrani, Ph.D. and Emad Abouel Nasr, Industrial Engineering Department, “Rapid Prototyping: Theory and Practice” University of Houston, TX, USA (2006 Springer Science+Business Media, Inc).

Fundación Cotec para la Innovación Tecnológica, “30 Fabricación Aditiva”, Pza. Marqués de Salamanca 11, 2.º izqda. 28006 Madrid.(2011)

Bruno Munari, “Cómo nacen los objetos, apuntes para una metodología proyectual”, Editorial GG, España, (2016).

COURSE GRADING:

Final grades will be determined based on the following components:

- Module Assessments (Quizzes & Practical Assignments): 40%
- Final Project (Individual or Group): 40%
- Participation & Technical Progress: 20%