



UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Technological Transfer

2627-2-F552MI023

Learning area

Introduction to scientific and technological innovation processes in the context of Human-Centered AI, with reference to Physical AI, artificial intelligence, and robotics, as well as research and innovation policies, geopolitical dynamics, and technological sovereignty. The course addresses knowledge valorization, technology transfer, science–industry interaction, and innovation scale-up in the European and international context.

Learning objectives

The course aims to provide an understanding of scientific and technological innovation processes in the context of Human-Centered AI, fostering knowledge and understanding of the relationships between research, industry, and policy, with particular reference to Physical AI, neurorobotics, and technological sovereignty and geopolitical dynamics.

Through the analysis of case studies and innovation policies, students develop the ability to apply criteria for the design and evaluation of knowledge valorization processes, technology transfer, and innovation scale-up, including high-tech systems and biomedical and clinical applications.

The course promotes independent judgment regarding the role of science in public and private decision-making processes, with reference to research integrity, research security, and European innovation policies. It also develops communication skills through discussion of complex interdisciplinary cases, and the ability to learn in order to understand and interpret evolving dynamics between science, technology, industry, and society.

Contents

Introduction to scientific and technological innovation processes in the context of Human-Centered AI, with examples related to Physical AI, artificial intelligence, and robotics, and with reference to research policies, science

for policy, technological sovereignty, and geopolitical dynamics. Analysis of technology transfer and knowledge valorization mechanisms, including intellectual property and patents, science–industry interaction, public–private partnerships, and innovation scale-up processes.

In depth examination of the European research and innovation framework (Horizon Europe, ERC, EIC, Marie Skłodowska-Curie), scientific career pathways, and international cooperation. Study of technology development and validation processes, including clinical trials, research protocols, quality certification, risk analysis, and assessment of Technology Readiness Levels (TRL), with reference to biomedical systems and advanced applications.

Analysis of ethical, regulatory, and organizational aspects, including research integrity, research security, open science, research assessment (COARA), the European Open Science Cloud, research infrastructures, and the European Health Data Space. The course develops the ability to critically analyze innovation processes and their scientific, economic, and societal implications.

Detailed program

The course addresses scientific and technological innovation processes in the context of Human-Centered AI, with reference to Physical AI, neurorobotics, and the relationships between science, industry, and policy. The teaching activity is structured as follows:

1. Innovation, Human-Centered AI and global context (6 hours)
 - Models and paradigms of scientific and technological innovation
 - Human-Centered AI and Physical AI as drivers of innovation
 - Geopolitics of innovation and technological sovereignty
 - Science for policy and policy for science
2. Innovation ecosystems and European policies (6 hours)
 - European research and innovation policies
 - Horizon Europe, ERC, EIC
 - Marie Skłodowska-Curie Actions
 - International cooperation and global research context
3. Knowledge valorization and technology transfer (6 hours)
 - From research to innovation
 - Intellectual property and patents
 - Protection and valorization strategies
 - Science–industry interaction
 - Public–private partnerships
4. Innovation scale-up and industrial context (4 hours)
 - Startups and spin-offs
 - Deep-tech and Physical AI innovation
 - Interaction with large companies and private research
 - Market dynamics and innovation growth
5. Technology development and validation (6 hours)
 - Design and organization of research protocols
 - Clinical research and clinical trials
 - Quality certification and regulatory frameworks
 - Risk analysis and Technology Readiness Levels (TRL)
6. Biomedical innovation and advanced systems (4 hours)
 - Medical devices and biomedical applications
 - Digital therapeutics
 - Implantable and wearable systems
 - Physical AI applications in clinical contexts
7. Ethics, security and research integrity (4 hours)
 - Research integrity and research security

- Ethics and responsibility in research
 - Open science
 - Research assessment (CoARA)
 - European Open Science Cloud
8. Research infrastructures and data (4 hours)
- Research infrastructures in science and technology, with reference to life sciences
 - European Health Data Space
 - Data management, sharing and governance
 - Role of stakeholders in research (patient associations, foundations, civil society)
 - Co-design and co-creation approaches
 - Impact-driven and mission-oriented research
9. Project work and final discussion (8 hours)
- Definition of project topics and organization
 - Group work and project development
 - In-class discussion and feedback
 - Final presentations and critical discussion

Prerequisites

Students are expected to have a basic interdisciplinary background in scientific and technological fields, including general knowledge of artificial intelligence and cognitive science. Familiarity with research valorization processes and an interest in understanding their mechanisms in the context of innovation and science policy are beneficial. No specific prior knowledge in innovation or policy is required.

Teaching methods

The course is delivered in person and combines lectures with interactive activities. Each module includes both a lecture component, aimed at presenting key concepts and theoretical frameworks, and an interactive component, based on case study analysis, guided discussions, and active student participation. Special attention is given to the critical discussion of the topics covered and their application in interdisciplinary contexts. The final part of the course is dedicated to project work development, including group activities, support for project design, preparation and presentation of results, and in-class discussion.

Assessment methods

Assessment is based on a final project work carried out in groups of students, focusing on the analysis and discussion of a case study or topic related to innovation processes in the context of Human-Centered AI. The project is developed throughout the course, including interactive activities and in-class discussions, and is presented and discussed during the final sessions. The final grade is expressed on a 30-point scale and is based on the project work, taking into account the quality of the content and presentation, as well as the ability to engage in critical discussion.

Textbooks and Reading Materials

Reference materials include:

Books

- Carrozza M.C., Quanto vale la conoscenza. Scienza, innovazione e società, EGEA.
- Carrozza M.C., The Robot and Us. An 'Antidisciplinary' Perspective on the Scientific and Social Impacts of Robotics, Springer, 2019.

AI, innovation and policy

- European Commission, Horizon Europe Programme Guide

Available at:

<https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/how-to-participate/reference-documents> [ec.europa.eu]

- European Commission, Coordinated Plan on Artificial Intelligence

Available at:

<https://digital-strategy.ec.europa.eu/en/library/coordinated-plan-artificial-intelligence> [digital-st....europa.eu]

- European Commission – Joint Research Centre (JRC), AI Watch and policy reports

Available at:

<https://ai-watch.ec.europa.eu/> [ai-watch.e....europa.eu]

- European Commission – Joint Research Centre (JRC), JRC Publications Repository

Available at:

<https://publications.jrc.ec.europa.eu/> [publicatio....europa.eu]

- European Commission, European Innovation Council (EIC) and European Research Council (ERC) documentation

Available at:

https://ec.europa.eu/info/research-and-innovation_en

- OECD, AI Policy Observatory

Available at:

<https://oecd.ai/> [oecd.ai]

Additional materials, including research papers, JRC reports, and policy documents on AI, innovation, open science, and the European Health Data Space, will be provided during the course.

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING | QUALITY EDUCATION | INDUSTRY, INNOVATION AND INFRASTRUCTURE
