



# Fratelli Pesenti Master School

## Polytechnic of Milan

# MAIN ACTIVITIES





# Aims and Mission of the Master School

“From the Spring of Tech-Scientific and Cultural Tradition towards Innovation”

Traditions

## 1. Cultural Background

Italy is a country with excellences in Architecture, either Historic and Modern, as well as in the field of Structural Mechanic and Engineering design. The education in Engineering and Architecture in Polytechnic of Milan University is deeply characterized by these heritages. The Master School F.lli Pesenti was founded at the Polytechnic in 1927 to spread and develop this heritage, as source of innovation.

## 2. Economical Background

Milan is the second-largest city in Italy and the capital of Lombardy. Its urban area is the 5th largest in the Europe. Milan is the main industrial, commercial and financial centre of Italy and a leading global city.

## 3. Geographical Background

Italy's central location in the Mediterranean area, its shape, with large variety of climate and seismic activity, gives actual challenges to Engineers and Architects.





## School Historical facts

# 1927 - Historical date for the University of Engineering

## (R. Politecnico) Milano



New building at  
P.zza Leonardo da Vinci



On. Antonio Pesenti



Gr. Uff. ing. Cesare Pesenti



**Institute of the Foundation FRATELLI PESENTI for the insert of the :**  
***“Specialized School for the Reinforced Concrete Constructions”***  
Near the ***“Institute of Bridges and Great Special Structures”***

The Foundation of *F.lli Pesenti* was signed in the presence of the Director of the Polytechnic:

**prof. Fantoli**, and in the presence of the family representatives **Gr. Uff. ing. Cesare Pesenti** and **l’On. Antonio Pesenti**.

## In February of 1928 started the first Academic Year.

During the opening ceremony, **prof. ing. Jorini**, (first Director ) presented the main program of this Institution:

*“ (...) Beside aiming at the creation of high-levels scientific culture, necessary for future engineers, we must provide them with proper technical, artistic, economic conditions, so that they can become capable of immediate practical use of this techniques”*



prof. ing. F. A. Jorini



Sen. prof. ing. Gaudenzio Fantoli –  
Director of the Polytechnic





## School Historical facts

### 1931 – It starts the publications of the volumes: “ATTI RICERCHE STUDI”

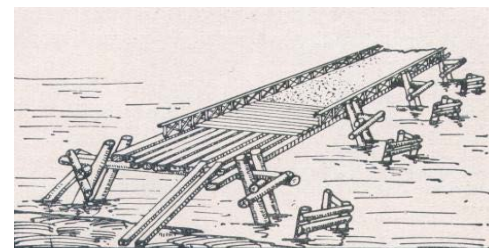


Figure: the activities of the Master School, viewed from two main perspectives, as lectures hold and as research program.

Significant and historic publication of prof. Santarella on: *Acts Research Studies*

And the precious monography:

“ART AND TECHNIQUE - EVOLUTION OF BRIDGES”

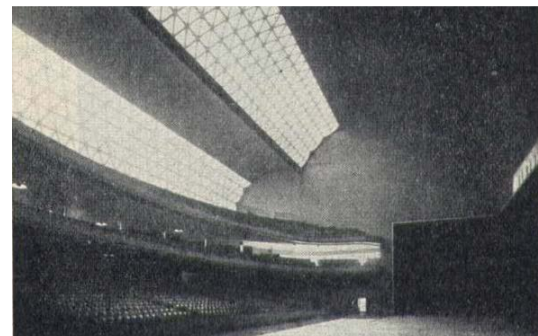
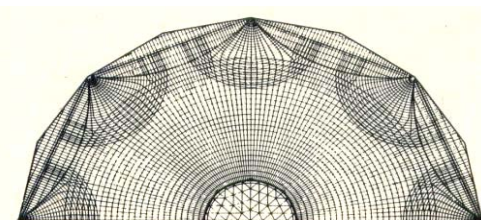
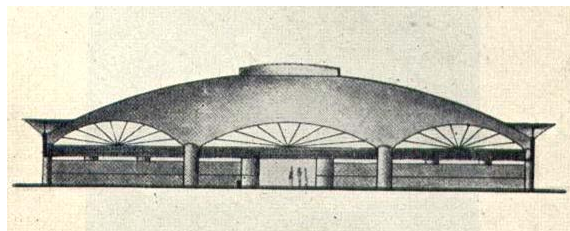


Figures: Reconstruction of the wooden bridge of Giulio Cesare, on Reno river – 55 a.C. De Bello gallico – Lib. IV-XVII

#### Publication of **prof. Luigi Santarella**

A description of the diversity and the importance of the courses held in the Master School.

In 1949 prof. Stabilini makes a discussions about the changes of the Master School, including use of concrete and the perfection of the courses, treating issues and problems that were not studied in such a detailed way by the other courses of the university.





## MASTER COURSES

- **COURSE DURATION: 12 months,**
- **ORGANIZED IN 3 PARTS:**

First part      lectures, theory + exercises

Second part      work-sites visit, tests, laboratories, seminars and presentation of the internships offered by firms and consulting offices

Third part      full immersion on the training stage, with two supervisors

- **FINAL THESIS**

The Master Diploma is achieved after a final thesis dissertation, which consist on the most significant experiences developed during the internship and the whole master course.



## 1st and 2nd Level SPECIALIZING MASTER (60 ETCS)

November:

**PROJECT MANAGEMENT OF CIVIL STRUCTURES  
AND INFRASTRUCTURES**



ON-SITE + ONLINE

**ENERGY MANAGER**



ON-SITE + ONLINE

**SUSTAINABLE BUILDINGS AND INFRASTRUCTURES**



ON-SITE + ONLINE

**DESIGN OF REINFORCED CONCRETE STRUCTURES**



ON-SITE + ONLINE



March:

## 1st and 2nd Level SPECIALIZING MASTER (60 ETCS)

**BIM MANAGER**



**ON-SITE + ONLINE**

**SEISMIC DESIGN FOR SUSTAINABLE BUILDINGS AND  
INFRASTRUCTURES**



**ON-SITE + ONLINE**

**ICM - PROJECT MANAGER IN INTERNATIONAL  
CONSTRUCTION SITES**



**ON-SITE + ONLINE**  
**Only 2nd Level**



## POSTGRADUATE PROGRAM (WITH ECTS) ONLINE

November/March:

**PROFESSIONIST SPECIALIZED ON SEISMIC RESPONSE OF CIVIL STRUCTURES AND INFRASTRUCTURES ACCORDING TO THE NATIONAL AND INTERNATIONAL ROLES**

**ASSESSING THE SEISMIC RISK FOR CIVIL STRUCTURES**

**BUILDING INFORMATION MODELING IN TECHNICAL OFFICES:  
MODELING AND PROJECT MANAGEMENT**

**PROJECT MANAGER AND SAFETY MANAGER: INTERNATIONAL CERTIFICATION  
CAPM AND PMP (PMI) AND IGC (NEBOSH)**

**BUILDING ENERGY MANAGEMENT**

**ENERGY AND ENVIRONMENTAL MANAGEMENT  
IN BUILDINGS AND INFRASTRUCTURES**

**PROFESSIONAL SPECIALIZATION IN THE DESIGN OF ARCHITECTURAL ACOUSTICS**





# Professional training courses (CFP Courses)

## Design Area

- The preliminary project with use of software structural
- Elements of engineering seismology applies to engineering
- Structural Analysis
- Precast structures
- Bridges
- Foundations and support works
- Existing Buildings
- Properties and potential of wood in architecture

## BIM Area

- Introduction at BIM Management (Building Information Modeling)
- The game changer “The Business Value of BIM Management”
- The BIM Based Design – The integrated process of BIM
- The new workflow in the design process and the new BIM jobs
- Health, Safety & Risk Management
- BIM legislation and BIM Guides
- BIM integrated process in the Architectural, Structural, MEP Authoring with the use of Allplan, Tekla, Solibri
- BIM in industrial application, BIM to FIELD and connection between structures, architectural and MEP design
- BIM Modelling in between Revit and analysis software
- BIM integrated processes for structures design
- BIM integrated processes for Mep DESIGN AND THE Building Performance Analysis
- BIM for model and rule checking, the use of Naviswork and application for the management of the project.

## Project Management Area

- Fundamentals of Engineering Management 2
- Site management, construction and the built
- Introduction to value investing
- The real estate investment and "Macroeconomics trends"
- The international competitions
- The developer in the management of a real estate project
- The profession in the fields of economic and management: principles of forensic engineering
- Decision making - to avoid mistakes and make the right choice
- Health and safety in the workplace
- Certification Project Management (CAPM® and PMP®)



# Professional training courses (CFP Courses)

## Energy and Sustainability Area

- Comparison between different protocols for certification of sustainability at different scales planning
- Development of diagnostic techniques in renovation
- Green Building Council and LEED
- Materials in architecture: durability and sustainability performance
- Software for BIM: basic - use through practical examples
- Acoustics applied to buildings to residential use
- Thermophysics building geometry, when and how, compared with the techniques for saving energy
- Professional accreditation for energy certifiers CENED and insights the environmental impact of buildings



# PROJECT MANAGEMENT OF CIVIL STRUCTURES AND INFRASTRUCTURES

**TRAINING OBJECTIVE:** Professional specialization in economic assessment of real estate investments and executive management of large building sites.

- UNITS:**
- Fundamentals of engineering management
  - NEBOSH IGC (International General Certificate)
  - An Introduction to Value Investing
  - Public Administration: rules and procedures
  - The Principal in the management of a real estate project
  - The Designer in a real estate project
  - Forensic Engineering
  - Certification on Project Management PMI (CAPM - PMP)
  - Decision Making

**INTERNSHIP:** 550 h  
in companies leaders in their field for onsite students.



# PROJECT MANAGEMENT OF CIVIL STRUCTURES AND INFRASTRUCTURES

## Examples of Master Thesis and Internships

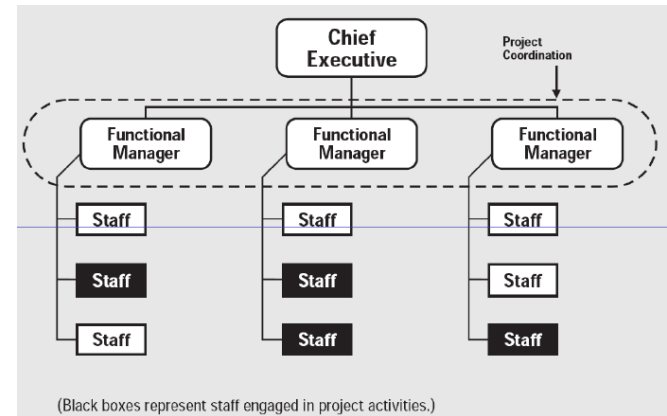
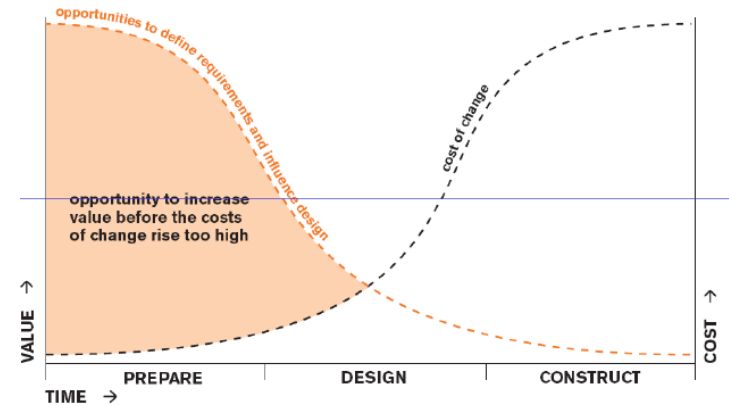
### Case study

### Construction Management of the project City Life in Milano, by CityEdge – Daniel Libeskind Local Partner



### Practical Diagrams

The start of the project is when most can be done to add value through careful preparation and adequate time for design





## ENERGY MANAGER

### **TRAINING OBJECTIVE:**

Professional specialization in design of high energy performance buildings and specialists in Energy management.

### **UNITS:**

- NZEB Design: High energy performance Buildings
- Energy certification of buildings in Lombardy (CENED) (on-line)
- Thermograph Energy diagnosis
- The contribution of renewable energy resources, energy management in building and urban scale
- Static and dynamic energy modeling
- Green Building Council and LEED
- ENVISION green infrastructure rating system
- Energy Manager: EGE and Energy Auditor
- LCA analysis
- Fire design
- Revit BIM Modelling (on-line)

**INTERNSHIP:** 550 h in companies leaders in their field for onsite students.





# ENERGY MANAGER



ENERGY



WATER



WASTE



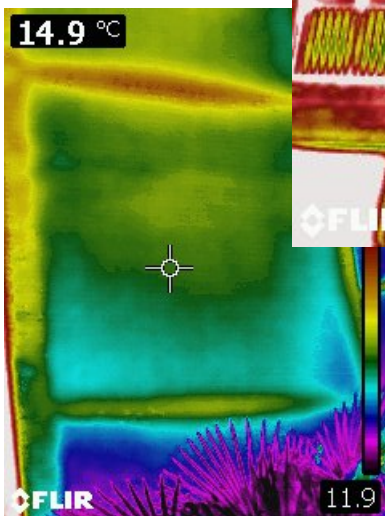
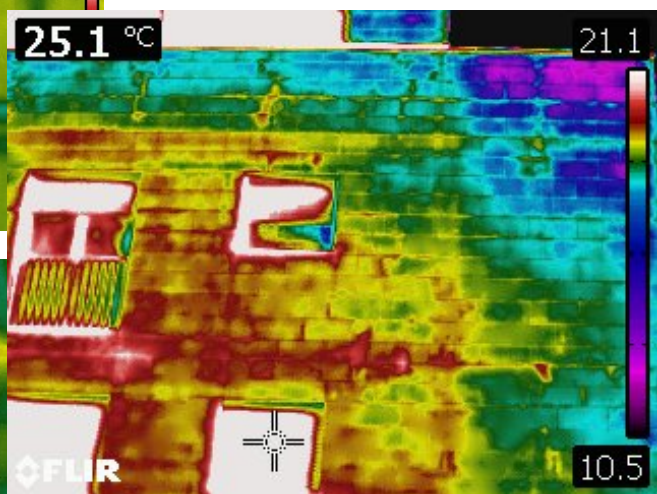
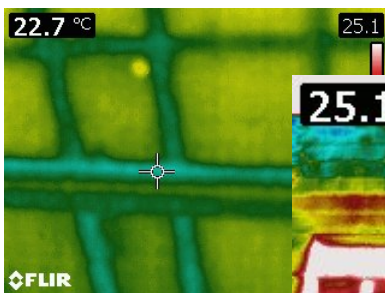
TRANSPORT



LANDSCAPE



INFORMATION

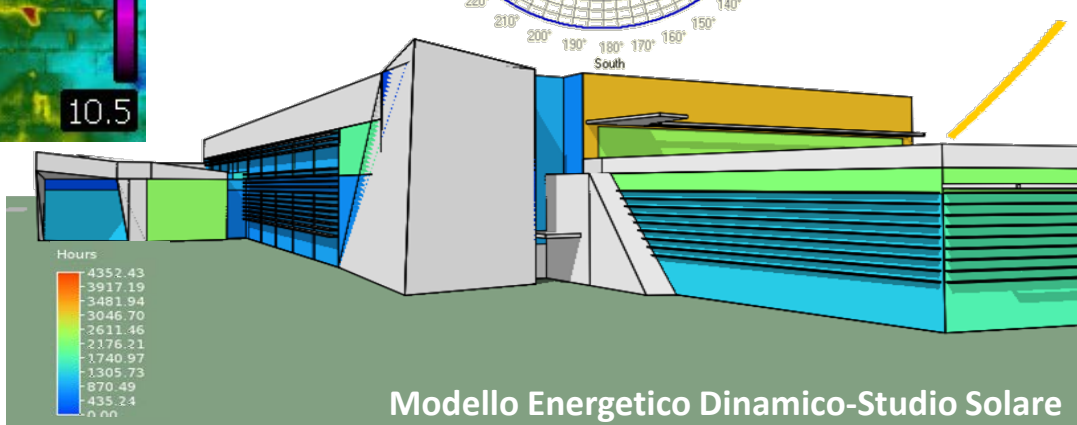
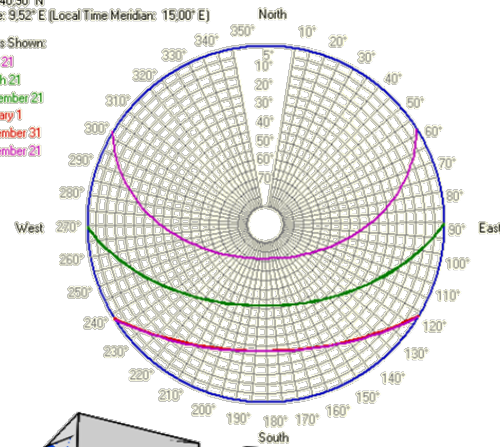


◀ Rilievi termografici in fase di diagnosi energetica

Location: Olbia/Costa Smeralda  
Latitude: 40.90° N  
Longitude: 9.52° E (Local Time Meridian: 15.00° E)

Sun Paths Shown:

- June 21
- March 21
- September 21
- January 1
- December 31
- December 21





# SUSTAINABLE BUILDINGS AND INFRASTRUCTURES

## TRAINING OBJECTIVE:

Professional specialization in high energy performance design of buildings and specialists in architectural acoustic design.

## UNITS:

- Energy certification of buildings in Lombardy (CENED) (on-line)
- NZEB Buildings (Nearly Zero Energy Buildings)
- The contribution of renewable energy resources, energy management in building and urban scale
- Static and dynamic energy modeling
- Green Building Council and LEED
- Fundamentals of acoustics and psychoacoustics
- Architectural and Environmental acoustic design
- Theory of vibration and acoustic aspects in work place
- Conceptual Design
- Materials construction in architecture (on-line)

## INTERNSHIP:

550 h

in companies leaders in their field for onsite students.





# SUSTAINABLE BUILDINGS AND INFRASTRUCTURES

## Examples of Master Thesis and Internships

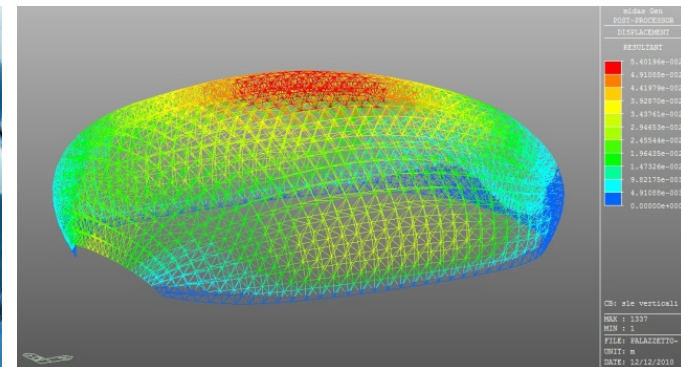
Case study  
Stefano Boeri's Urban Vertical Forest



Case study - Italcementi Group  
i.lab, the new Centre for Research and Innovation



Thesis and Internship at V.G.A. AND PARTNERS s.r.l.  
ETFE TECHNOLOGY ANALYSIS: CASE STUDY OF A SPORT ARENA ENVELOPE





# DESIGN OF REINFORCED CONCRETE STRUCTURES

**TRAINING OBJECTIVE:** Professional specialization in design, verification, testing, operation and maintenance of reinforced concrete constructions, according to the new rules and procedures in Europe.

- UNITS:**
- The materials in architecture: performance durability and sustainability
  - Finite Element Analysis
  - Il BIM (Building Information Modeling)
  - Structures in c.a.: NTC and EC2
  - Seismic design: NTC and EC8
  - Special structures
  - Case studies

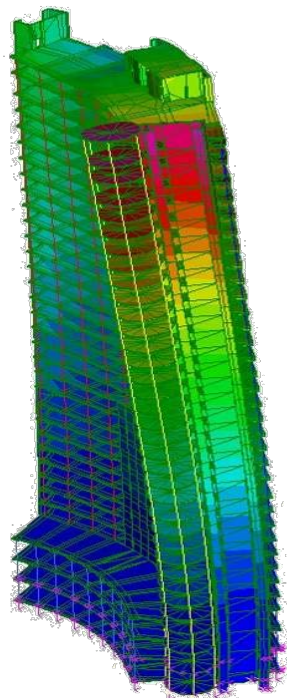
**INTERNSHIP:** 550 h  
in companies leaders in their field for onsite students.



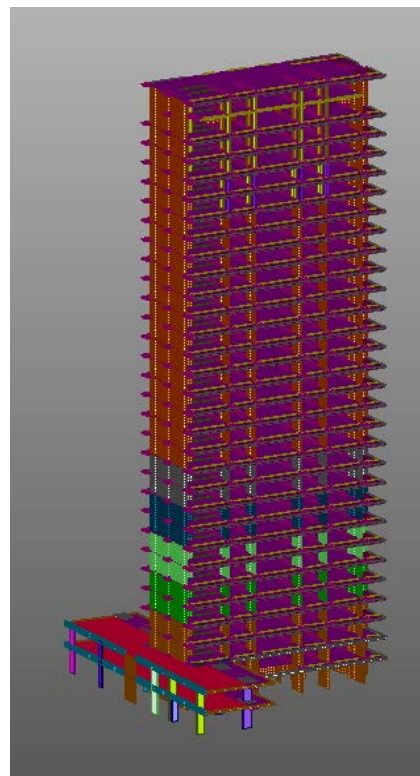
# DESIGN OF REINFORCED CONCRETE STRUCTURES

## Examples of Master Thesis and Internships

Effects of wind on Tower A  
in Garibaldi-Repubblica in Milan



Structural Analysis for  
an historic reinforced concrete building in Milan





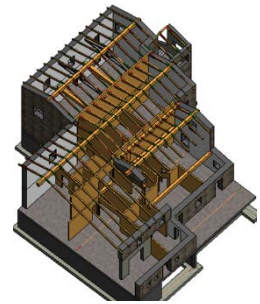
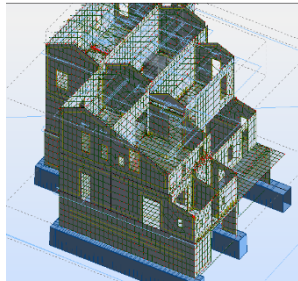
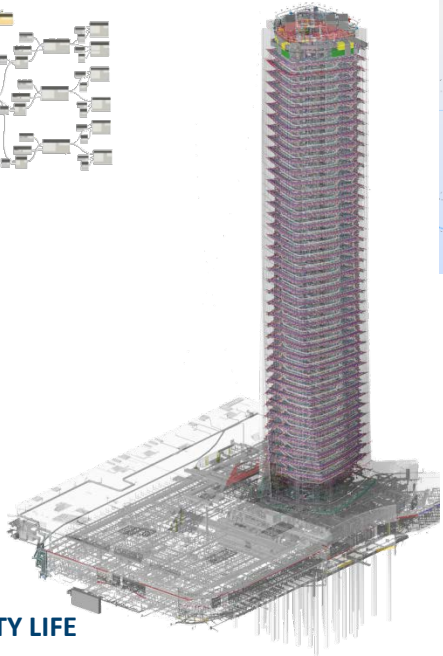
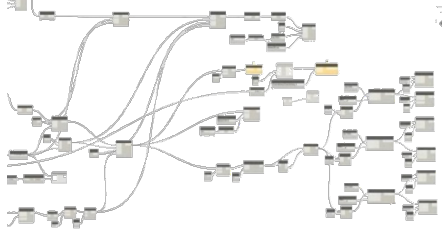


# BIM MANAGER

**TRAINING OBJECTIVE:** Professional specialization in management of process in designing and infrastructures and buildings. Starting from the BIM Guides to the practical application with use of the main BIM software.

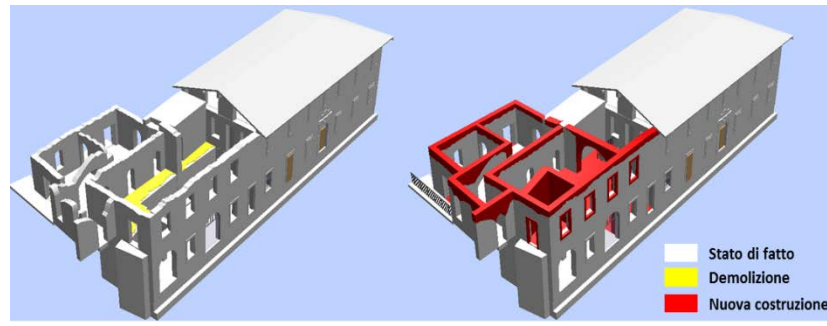
- UNITS:**
- Introduction (BIM, Integrated design, Program Management)
  - Regulatory Framework and BIM, the European directive on public procurement, BIM and public administrations
  - Data Management, the Building Information Exchange
  - BIM-based design
  - BIM modelling (Allplan and tools)
  - Software BIM (Tekla Structure, Vianova and DDS-CAD)
  - BIM modelling: introduction to Revit
  - Revit for integrated design: structures, infrastructures and systems
  - Energetic and environmental design
  - The coordination, the simulation of the building with the help of Navisworks, the model checking

**INTERNSHIP:** 550 h  
in companies leaders in their field for onsite students.

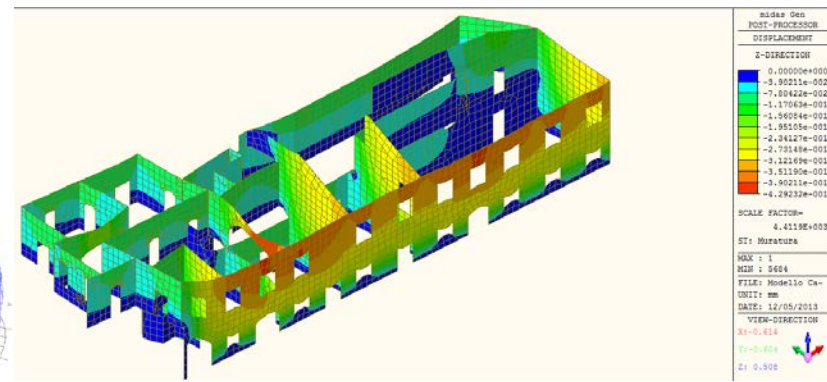


# BIM MANAGER

BIM in reuse of existing buildings: From survey to energy and structural analysis and construction



■ Stato di fatto  
 ■ Demolizione  
 ■ Nuova costruzione

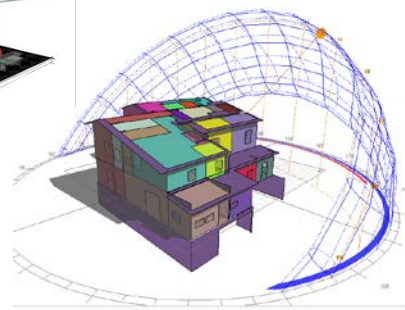
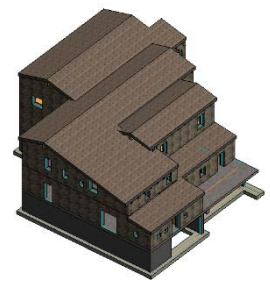


ZAHA HADID TOWER – CITY LIFE

**PRADA**



PRADA ZURIGO



BIM application in complex shapes and BIM for facility Management



# SEISMIC DESIGN FOR SUSTAINABLE BUILDINGS AND INFRASTRUCTURES

**TRAINING OBJECTIVE:** Professional specialization in design and seismic retrofit of buildings, bridges and special structures in reinforced concrete, masonry and mixed concrete, with reference to the Eurocodes and the most common international standards, in terms of sustainability.

- UNITS:**
- The materials in architecture
  - Elements of seismic engineering
  - Structural Analysis
  - Structural modeling
  - Building design
  - Precasted structures
  - The seismic isolation
  - Existing buildings
  - Bridges
  - Foundations and retaining

**INTERNSHIP:** 550 h  
in companies leaders in their field for onsite students.

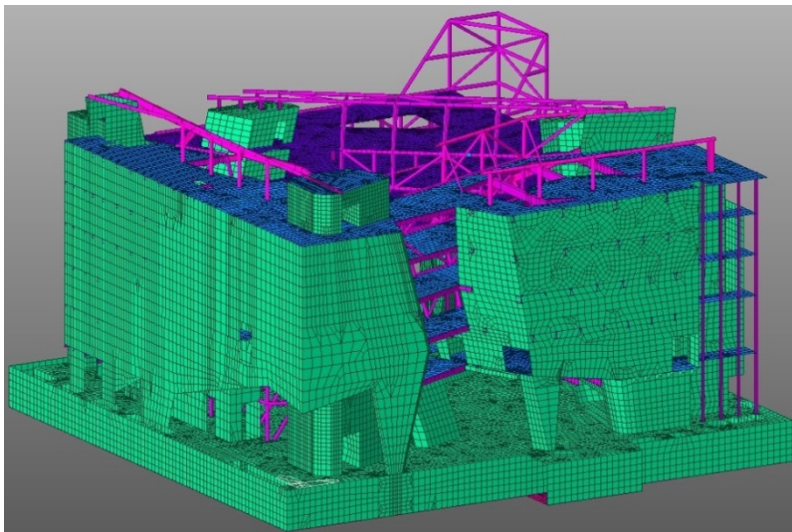




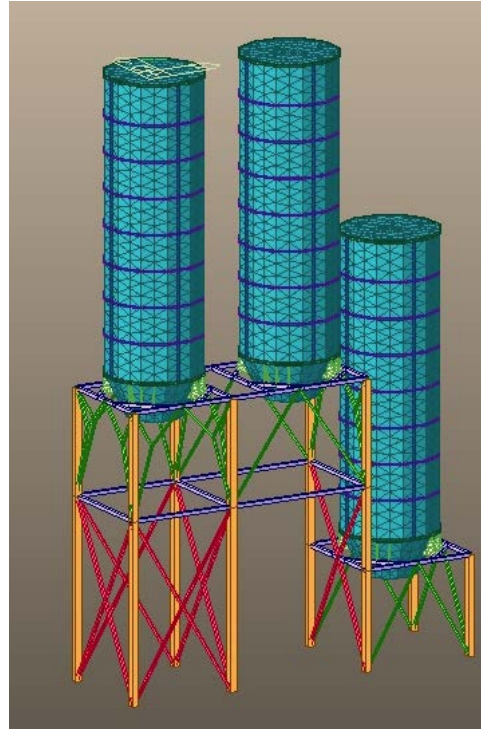
# SEISMIC DESIGN FOR SUSTAINABLE BUILDINGS AND INFRASTRUCTURES

## Examples of Master Thesis and Internships

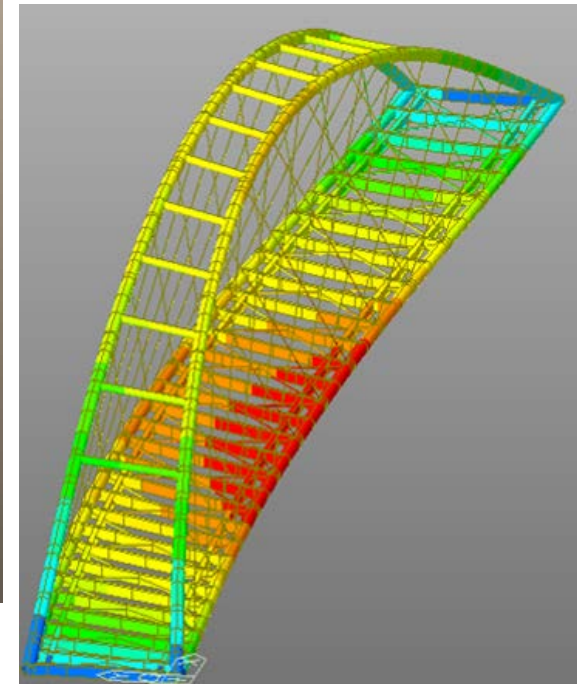
Structural analysis for Palazzo Italia EXPO 2015



Structural analysis for Dust and Lime Silos in England



Dynamic analysis for a new footbridge in Lombardia





# ICM - INTERNATIONAL CONSTRUCTION MANAGEMENT

**TRAINING OBJECTIVE:** The Master is an initiative sponsored by Salini - Impregilo SpA , which located in the F.lli Pesenti Master School the academic partner for the training of project managers in international construction sites.

## UNITS:

- Introduction and delivery methods
- Basic scheduling tools (Project, Tilos, Primavera)
- Fundamentals of engineering
- BIM - Software and design tools
- Management of the competitions at national and international calls
- The carrying out of a project
- Contractual and legal matters
- Environment control and Safety
- Cost Control
- Risk Management
- Construction site tools & machines
- Construction materials: their use and quality control procedures in large construction sites
- How the General Contractor is to manage provisional works
- The fundamentals of rock excavating
- Concrete structures and earth moving
- The fundamentals of tunneling





# PROJECT MANAGER IN INTERNATIONAL CONSTRUCTION SITES





# PROFESSIONAL SPECIALIZED IN ARCHITECTURAL ACOUSTICS:

## ADVANCED COURSE IN ACOUSTICS APPLICATION FOR TECHNICAL RESPONSIBLE FOR ENVIRONMENTAL ACOUSTICS IN SUSTAINABLE BUILDINGS AND INFRASTRUCTURES

**TRAINING OBJECTIVE:** Professional specialization in acoustic design in buildings and infrastructures.

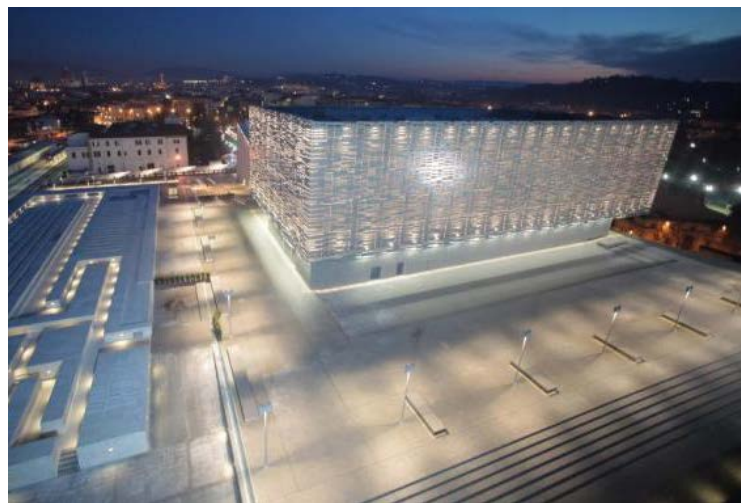
- UNITS:**
- Propaedeutic to the acoustic phenomena.
  - Reglements and examples to evaluate environmental acoustic impact.
  - Technical instruments
  - Environmental acoustics, definition of algorithms calculation, reference standards and acoustic classification of territory.
  - Instruments and software to evaluate environmental acoustic impact.
  - Conceptual design and corrective actions in indoor and outdoor spaces.
  - Practical training in the classroom





# PROFESSIONAL SPECIALIZED IN ACOUSTICS

Opera Theater, Firenze





## **New** from the Academic Year 2012/2013 **The Renewal of the Traditional teaching**



**POLITECNICO**  
MILANO 1863  
Scuola Master Fratelli Pesenti



Blackboard

## **THE HIGHEST LEVEL OF POSTGRADUATE STUDIES DIRECTLY AT HOME**

Blackboard is the **FIRST** platform most used in the academic world.

- Online lectures (Blackboard LEARN)
- Synchronized Lectures (Blackboard COLLABORATE)



## Why we choose to keep introducing new teaching tools...

- ... to **CONTINUE** the traditional teaching - a worldwide recognized learning experience
- ... to give Students of all Masters (on-site and on-line) an effective **ONLINE SUPPORT**, clear, comprehensive and easily accessible
- ... to offer high quality and excellent **ONLINE MASTER** courses of the Master School of the Polytechnic of Milan to whomever decides to live and study abroad
- ... make them benefit from the **SAME SERVICES** provided to students on-site, without having to move to Milan while letting them go on with their work activities.





## International Master Courses

“New engineering education paradigm “

Practical intelligence

Analytical intelligence

Creative intelligence

*“A four/five years engineering curriculum can no longer do the job of training future engineers at the time when new knowledge in science and engineering is exploding...*

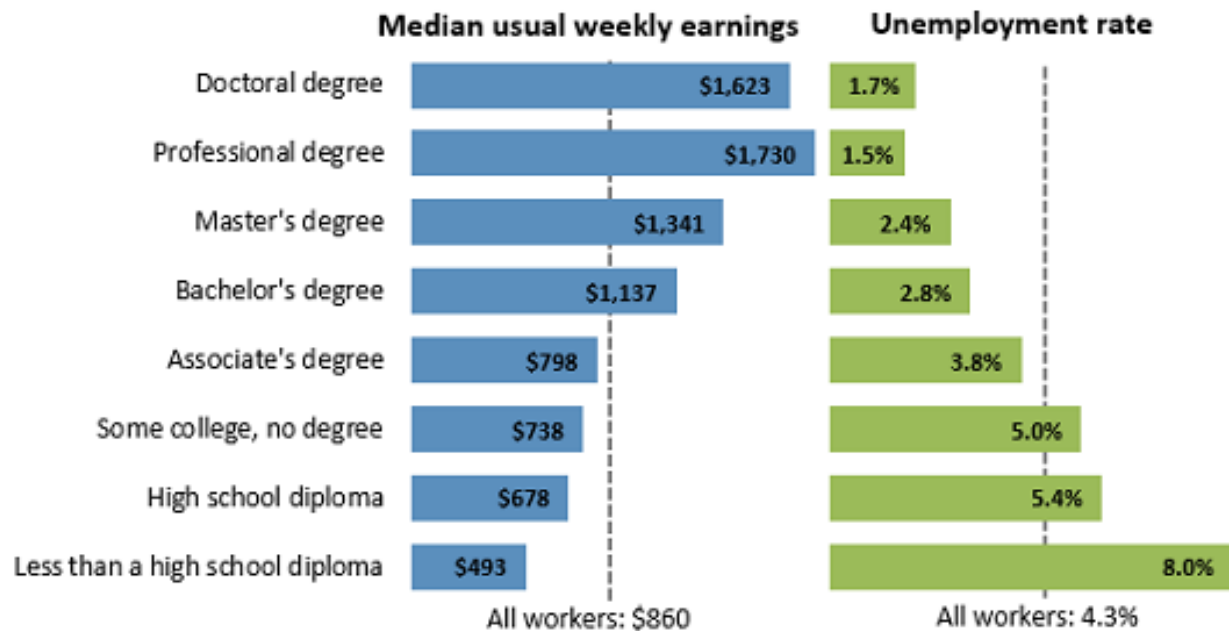
*other professions have moved ahead : it now takes nine years to train a doctor, seven years to educate a lawyer, etc”.*

*Delon Hampton, ASCE’S President*

**What about engineers and architects?!**

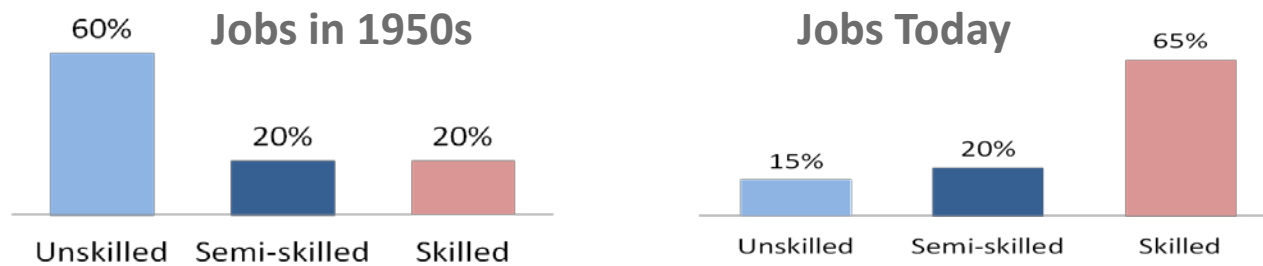


## Earnings and unemployment rates by educational attainment, 2015



Note: Data are for persons age 25 and over. Earnings are for full-time wage and salary workers.

Source: U.S. Bureau of Labor Statistics, Current Population Survey





## We believe that:

