

# Sustainable Building using BIM

01	The built environment of tomorrow	
Compulsory	Semester : M1S2	ECTS credits : 5
	Lectures : 40h	Recommended personal work : 73h

## Expected Learning Outcomes

The student should be able to

- Identify and describe the basic components of the urban built environment (different type of facilities such as buildings, area networks, urban infrastructure, communications, ...) and how these are interconnected
- Identify new trends in urban development and restate conclusions from recent case studies and experimentations
- Identify and describe basic area network and discuss solutions for reducing the environmental impact of these

## Content

Introduction to architecture, city planning and urban sociology – history and trends	4
Urban facility management	8
Transformation and Adaptive Re-Use of Existing Buildings and Districts	4
Area networks (energy, water, waste and communications)	8
Sustainable construction and the use of recycled materials	8
Infrastructures maintenance and refurbishment	8

## Prerequisites

The Built and the Natural Environment or equivalent.

## Related SDGs



02	Building Design Processes and Methods	
Compulsory	Semester : M1S2	ECTS credits : 5
	Lectures : 65h	Recommended personal work : 61h

## Expected Learning Outcomes

The student should be able to

- Discuss circular innovation in different economic sectors with a particular focus on business symbiosis in the construction industry
- Define the LEAN concept and describe how it is applied in construction
- Use different tools like Line of Balance, Weekly Work Plan and Benchmarking for different phases of a construction project
- Define key concepts of Building Information Modelling (BIM)
- Use a design authoring software in the BIM context
- Define key concepts and describe current methods in building pathology
- Explain and illustrate the terms: Research, Development and Innovation
- Describe the legal framework for protecting intellectual property
- Explain research funding mechanisms in the EU and state the contents of a research proposal
- Describe the method of Design of Experiments and give some examples of how it is used

## Content

Circular innovation in different economic sectors	8
Lean Construction	12
Building information modelling and management	12
Project management in a BIM environment	12
Building pathology, maintenance and retrofitting	12
Research methods in civil engineering	9

## Prerequisites

The Natural and the Built Environment, Construction and Procurement, Economics of the Built Environment, Structure Design, Applied Geotechnical Engineering and Research and Engineering Project or equivalent.

## Related SDGs



03	Buildings – A Functional Approach	
Compulsory	Semester : M1S2	ECTS credits : 5
	Lectures : 68h	Recommended personal work : 61h

## Expected Learning Outcomes

The student should be able to

- Express an architectural programme using a functional diagram
- Identify the functions of the building envelop and how they interact
- List and define different building typologies
- Explain and give examples of how the interaction between space and structure
- Discuss accessibility from different points of view
- Characterize the indoor microclimate according to space type and give example of design solutions
- Identify the functions of the superstructure and the infrastructure of a building and describe different structural systems
- Define the key concepts of System Reliability and how they apply to a building
- Identify the hazards that a building may be subject to and illustrate how they might be handled

## Content

Spaces (function, comfort, accessibility, light, sound, ...)	8,0
Building Physics	8,0
Envelope (aesthetics, energy, air, water, vapor, sound, ...)	8,0
Advanced Technologies for Positive Energy Buildings and Communities	16,0
Superstructures	8,0
Infrastructure and foundations	4,0
Dealing with hazards (fire, earthquakes, flooding, ...)	4,0
Reliability and Failure Prognostics in Civil Engineering Application	12,0

## Prerequisites

The Built Environment, Structure Design and Applied Geotechnical Engineering.

## Related SDGs



04	Advanced Structure Design	
Compulsory	Semester : M1S2	ECTS credits : 5
	Lectures : 64h	Recommended personal work : 61h

## Expected Learning Outcomes

The student should be able to

- Identify the different load bearing members and the load paths of a complex building structure
- Describe bracing systems for different types of building structures
- Identify relevant design criteria and verify simple timber structure members and assemblies
- Identify relevant design criteria and verify complex timber structures and composite timber – concrete and timber – steel structures
- Discuss the sustainability of different construction materials taking into account the specific context of a construction project
- Describe the handling of construction waste and identify processes for re-use and recycling
- Asses and design reinforced concrete and masonry structures for seismic actions
- Explain the interest of using prestressed concrete in building structures

## Content

Intuitive analysis of complex building typologies	8
Recycling, Sustainable materials and wood-concrete composites	8
Earth and bio sourced construction	12
Composite structure for BIM design	8
Timber structure for BIM design	8
Numerical modelling and design of RC and masonry structures for seismic actions	16
Prestressing for buildings	4

## Prerequisites

The Natural and the Built Environment and Structure Design or equivalent.

## Related SDGs



05	Integrated Design Project	
Compulsory	Semester : M1S2	ECTS credits : 5
	Lectures :	Recommended personal work :

## Expected Learning Outcomes

## Content

Research Methods in Civil Engineering	8,0
Integrated Design Project	18,0
Social responsibility and Ethics	9,0
Functional analysis and user-oriented design approaches	6,0
English for the construction world	6,0
Portfolio	3,0

## Related SDGs



06	Workshop – Sustainable Building Engineering	
Compulsory	Semester : M1S2	ECTS credits : 5
	Lectures and tutorials : 100h	Recommended personal work : 150h

## Expected Learning Outcomes

After completion of the module the students should be able to:

Elaborate a preliminary design proposal for a real or realistic invitation to tender concerning a new construction or the conversion of an existing building using an information modelling driven and integrated design approach supported by a well-defined collaboration strategy in a multi-disciplinary team. More precisely the students should be able to :

- Establish, implement and continuously evaluate and adapt project organization, information management and collaboration strategy documented in a BIM execution plan
- Use design authoring software associated and relevant analysis tools in order to assess design alternatives and validate solutions
- Perform multi-criteria evaluation of design alternatives and argument choices
- Use structure analysis and thermal simulation, life-cycle analysis and cost estimation software in early design phases to produce a solid base for making decisions
- Include and assess social, societal and environmental impacts as key indicators for the viability of a construction project
- Identify and give example of techniques and methods for retrofitting, refurbishment and/or conversion of existing buildings
- Make an argumentative oral presentation of a project to a panel of AEC professionals

## Content

Lectures on specific topics related to the Scope of Work	25h
Tutorials and reviews	50h

## Related SDGs



## Glossary

Conversion : change of use or a change in function from a building's current usage

Refurbishment : work such as painting, repairing, and cleaning that is done to make a building look new again (Cambridge Dictionary)

Rehabilitation : the process of returning something to a good condition: (Cambridge Dictionary)

Retrofitting : the addition of new technology or features to older systems (Wikipedia)

Renovation : the act or process of repairing, renewing, or restoring something, especially a building, to a better condition or state

07	Optional Contest	
Compulsory	Semester : M1S2	ECTS credits : 5
	Lectures :	Recommended personal work :

Expected Learning Outcomes

Indicative content

Optional Contest	
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Prerequisites

Glossary