

<b>Name of the module (English):</b> ICT for Construction Projects and BIM					
<b>Module code (UP):</b> M23 (provisional)		<b>Name of the module (Portuguese):</b> TIC para Projetos de Construção e BIM			
<b>Module code (THM):</b> IMTM (provisional)		<b>Name of the module (German):</b> IKT für Bau- und BIM-Projekte			
<b>Module code (UC):</b> M23 (provisional)		<b>Name of the module (Spanish):</b> TIC para proyectos de construcción y BIM			
<b>Credits:</b> 6 ECTS	<b>Module status:</b> Obligatory	<b>Duration:</b> 1 semester	<b>Semester:</b> 2	<b>Year:</b> 1	<b>Frequency:</b> Every year
<b>Type of tuition:</b> Classroom-based		<b>Workload:</b> 180 h	<b>Attendance time:</b> 60 h	<b>Self-study time:</b> 120 h	
<b>Usability:</b> Master (Degree in Sustainable Design, Construction and Management of the Built Environment)			<b>Classification:</b> Engineering / Architecture	<b>Teaching language:</b> English	
<b>Module responsibility:</b> Joaquin Díaz (THM)		<b>Lecturers:</b> Christian Karl Baier (THM) João Pedro da Silva Poças Martins (FEUP)			
<b>Description / Observations:</b> Today construction projects are more complex and sophisticated than in the past. Due to an extreme heterogeneous network in construction projects, deadline pressure, last minute changes and missing communication between all parties involved construction projects running out of time and cost. With the application of 4D and 5D BIM process, engineers and architects are able to forecast time and costs before construction begins. Furthermore, the usage of parameters for sustainability (6D), as for thermal and acoustic comfort, allows important decision in a construction project in a very early phase. This eases the quality of the project and meet clients' requirements.					
<b>Recommended Requirements</b> Basic knowledge about sustainable concepts in design, construction and managements of buildings and infrastructures.					
<b>Basic competences:</b> <ul style="list-style-type: none"> <li>• Possess and understand knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, often in a research context.</li> <li>• Students are able to apply their acquired knowledge and problem-solving skills in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.</li> <li>• Students are able to integrate knowledge and deal with the complexity of making judgments based on information that is incomplete or limited, including reflections on the social and ethical responsibilities associated with applying their knowledge and judgments.</li> <li>• Students are able to communicate their findings and the ultimate knowledge and reasons behind them to specialist and non-specialist audiences in a clear and unambiguous manner.</li> <li>• Students possess the learning skills to enable them to continue studying in a largely self-directed or autonomous manner.</li> </ul>					
<b>Transverse competences:</b> Construction is a team working industry branch. There is a huge amount of people involved in the whole construction process. Thus the methodology together with the application of ICT will follow a usual life cycle phase in construction with a lot of participants in a project. Students will be able to carry out the 4D, 5D and 6D process in their professional life.					
<b>Specific competences:</b> Be able to apply the BIM methodology in the different phases of a project's life cycle and be able to evaluate the level of detail required in each of them.					

**Learning outcomes:**

On successful completion of this module, the students will be able:

- Fundamental usage of 5D-BIM
- Programming with Dynamo for building problems
- Modeling in 5D
- Information/data exchange

**Content:**

- Fundamentals of 3D, 4D and 5D-BIM modelling.
- Principles of BIM model-based tendering, awarding and accounting; awarding processes and the accounting process using Enterprise Resource Planning (ERP) systems.
- Principles of ICT-based project preparation: Project scheduling (4D) development, organization of projects, cost management (5D) and sustainable construction (6D).
- Modeling relations and main influencing factors of 3D-models.
- Fundamentals in collaborative working using Common Data Environment (CDE).
- Integration of Internet of Things (IoT) in building and construction.
- Visual programming for building problems.
- Decision making generating model design alternatives and engineering solutions.

**Teaching methodology:**

The module will be divided into lecturing and debriefing, workshop and collaboration.

During the lecturing facts and figures will be taught and students will be sensitized for problems in construction, its origin and possible solution.

With this factual knowledge students are able to understand the necessity of a change in construction. In workshops the different BIM approaches (4D, 5D and 6D) will be used practical with ICT.

**Training activities:**

	Number of hours	% Attendance
Theory	30	100
Classroom practice	30	100
Tutorials	5	100
Evaluation	5	100
Group work	30	0
Self-directed work	50	0

**Assessment method:**

	Minimum weighting	Maximum weight
Continuous classroom evaluation	15%	35%
Oral presentation	20%	40%
Practical exercises	35%	55%

**Grading system:**

	20	19	18	17	16	15	14	13	12	11	10	9	...	0
U.PORTO														
Portugal	Very Good with distinction			Good with distinction		Good		Sufficient			Fail			
U.CANTABRIA	10.0	9.9	9.0	8.9	...	7.0	6.9	...	5.0	4.9	...	0.0		
Spain	Sobresaliente			Notable			Aprobado			Suspenso				
THM	100	...	88	87	73	72	58	57	...	50	49	...	0	
Germany	Excellent			Good with distinction		Satisfactory		Sufficient			Fail			

**Bibliography:**

Scripts: BIM 5D, buildingSMART Documents, programming with Dynamo, Visual Basic, Python or Java