JÖNKÖPING UNIVERSITY
School of Engineering

PROGRAMME SYLLABUS

Sustainable Building Information Management (master), 120 credits

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Programme Code:	TASB2	Programmestart:	Autumn 2025
Confirmed:	Feb 01, 2025	Education Cycle:	Second-cycle level

Title of qualification

Degree of Master of Science (120 credits) with a major in Built Environment specialisation in Sustainable Building Information Management

Teknologie Masterexamen med huvudområdet Bebyggd miljö inriktning Sustainable Building Information Management

Programme overview

Main field of study

Research in the area of Built Environment is based on a holistic view of industrial product realization of complex products forming the Built Environment, ranging from complete buildings and sub systems such as lighting systems, to specific components e.g. windows and light fixtures. Also, it embraces an inclusive approach to the sustainable transformation of the Built Environment and consider all the stakeholders in the value chain to make changes happen. This is only possible through new ideas of design thinking, disruptive innovations, and new construction and business models.

In order to cope with the disruptive pace of digitalization and to capitalize on its potential, and the requirement of circular economy, there is need of a comprehensive approach that will encourage cross-disciplinary, cross-sectoral and cross-border collaboration. The Built Environment requires technical knowledge, strengthened by a scientific approach in Mathematics, Building Physics, Humanities-Social Science, Business Economics, Computer Science and Informatics, and Sustainability. Developed skills include the ability of analysing human/environmental needs, establish product and service requirements and specifications, create digital models, develop, test and optimize products, generate sustainable solutions and alternatives, and evaluate the final solutions with the purpose of creating better solutions in the future. The ability to work interdisciplinary, on practical and scientific level, and to apply a holistic perspective is central to cover the different phases of the product life cycle and to fulfil the needs of the various stakeholders.

Background

The built environment sector is the largest sector in most countries, and it is responsible for the realization of complex and individualized products that constitute the built environment itself, i.e. urban areas, buildings, lighting systems, infrastructure, etc.

The construction sector is a key factor in the process of creating sustainable value, both for the end-user's wellbeing and for the entire society. The building and construction sector is a key area that has significant impacts on economy and environment. According to recently published research studies, this sector contributes to the economy (about 9 % of the EU's Gross Domestic Product (GDP)), provides direct and indirect job opportunities (18 million direct jobs at the EU) and satisfies the people's needs for buildings and facilities. Moreover, this sector is one of the main consumers of resources such as raw materials, and energy.

Digitalization in the built environment has boosted major developments and new applications such as Building Information Models (BIM), Parametric Design, Digital Twins and Geographic Information Systems (GIS) have created the prerequisites for an industrialized construction process. The industrialized, digital, and therefore optimized process will lead to sustainability by, among the others, reducing time, costs, optimizing the use material and energy consumption.

Moreover, in the era of digitalization, much of the product development is done on digital models that, through analysis and simulations, enable elaborate predictions of the product's behaviour in all phases of its life cycle. Digitalization has led to both optimized products with better performances and shorter development times yet reducing the environmental impact and still allowing products' customization to better meet the end-user's needs.

Traditionally, BIM has been an acronym for Building Information Model (or Modelling). However, with the increase of awareness about the use of the embedded information's potential, the focus moved from the model to the process where models are developed and used, and the meaning of BIM changed from Building Information Model or Building Information Method to Building Information Management. Today it is commonly accepted that successful use of BIM can only be understood if it is part of a system where interactions among technology, people and the organizational context are considered.

Objectives

The above-described development has triggered a need for engineers who have specialist knowledge concerning the complexity of the built environment, and the implementation of digital technologies in the construction and product realization process. The master's program in Sustainable Building Information Management (SUS BIM) aims to provide a response to this need. The objective of the program is to provide the students with knowledge, skills and experience needed to develop, use and manage efficient product realization processes supported by digital technologies for the built environment sector. This includes modelling, simulation, analysis, optimization, visualization, sharing, communicating, organizing, and managing processes for digitally driven (sustainable-) value creation.

Graduates from the SUS BIM program will enable changes and support businesses and organizations in integrating the different product and production chain's steps as well as supply the companies with expertise and strategies to be competitive both locally and globally.

Post-graduation employment areas

After completing the SUS BIM program, graduates will be qualified for strategic positions in private and public companies involved at any stage of the construction sector. Graduates' knowledge, skills, and experiences in the digital management of built environment's related information and process will enhance existing and create new career paths for young professionals, e.g., as a BIM engineer, BIM coordinator and BIM manager, Change manager, Digital coach. Many of these new roles are now considered key positions at several companies.

The program also serves as a preparation for scientific research, qualifying graduates for enrolment as Ph. D. students at universities or research institutes. Suitable research areas include applications related to the different aspects of the Built Environment, BIM, GIS, Parametric Design, organization and management, modelling, simulation, optimization, virtual reality, augmented reality, product development, additive manufacturing, Smart buildings and cities, etc.

Objectives

Common learning outcomes

After the completion of the programme, students must meet the intended learning outcomes, as described in The Higher Education Ordinance by Degree of Master (1-9), and also the intended learning outcome, as described by JTH:

Knowledge and Understanding

1. demonstrate knowledge and understanding in the main field of study, including both broad knowledge of the field and a considerable degree of specialised knowledge in certain areas of the field as well as insight into current research and development work
2. demonstrate specialised methodological knowledge in the main field of study

Competence and Skills

3. demonstrate the ability to critically and systematically integrate knowledge and analyse, assess and deal with complex phenomena, issues and situations even with limited information
4. demonstrate the ability to identify and formulate issues critically, autonomously and creatively as well as to plan and, using appropriate methods, undertake advanced tasks within predetermined time frames and so contribute to the formation of knowledge as well as the ability to evaluate this work
5. demonstrate the ability in speech and writing both nationally and internationally to clearly report and discuss his or her conclusions and the knowledge and arguments on which they are based in dialogue with different audiences
6. demonstrate the skills required for participation in research and development work or autonomous employment in some other qualified capacity

Judgement and Approach

7. demonstrate the ability to make assessments in the main field of study informed by relevant disciplinary, social and ethical issues and also to demonstrate awareness of ethical aspects of research and development work
8. demonstrate insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used
9. demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning
JTH. prove ability to embrace interdisciplinary approaches

Programme-specific learning outcomes
Upon completion of the program, the intended learning outcomes provided for programme must also be met.

Knowledge and Understanding
10. display knowledge of sustainable values in the built environment sector
11. display knowledge of different BIM-strategies
12. demonstrate an understanding of the basic concepts and theorems in the differential and integral calculus in several variables
13. display knowledge of common terms and concepts used in object-oriented programming

Competence and Skills
14. demonstrate the ability to independently use modern computing and information technology in the built environment sector to create sustainable values
15. demonstrate the ability to manage BIM-based building process
16. demonstrate the ability to assess the validity of the results from (digital) methods and tools in building projects

Judgement and Approach
17. demonstrate the ability to assess the validity of the results from (digital) methods and tools in building projects
18. demonstrate skills in proposing and evaluating modularization of products
19. demonstrate an understanding of the relation between platforms and product lifecycle management
20. demonstrate the ability to develop and implement simple programs and algorithms in a high-level programming language

Contents

Programme principles
The program consists of ten mandatory and six elective courses. The program begins with two fundamental courses: *Scientific Introduction to BIM and Sustainability* provides with scientific basis within the two main program's concepts and prepare the students for the scientific approach promoting academic reading and writing. The course *Analyses, Simulations and Assessment systems* provides fundamental knowledge and understanding concerning the use of sustainability systems and applicable BIM-tools. The course *Introduction to Script Programming* gives essential understanding of programming language/s used in parallel and following courses, such as *Parametric Design and BIM - Requirements and Specifications*. *BIM - Requirements and Specifications* focuses on the use of BIM to achieve goals and values in building projects. The outcome knowledge will be used in the course *BIM Management, Control and Evaluation*, where the students gain competences and skills in managing, control, and evaluate BIM-based projects. In the course *Implementation of Digital Technologies and the Construction Industry*, students will receive knowledge and understanding of the organizational and managerial aspects of implementing digital technologies in the building industry. This course will be open to practitioners' applicants.

The course *Parametric Design* prepares the students with knowledge regarding automatized technic for design and automatization and their industrial applications. *Advanced Building Information Delivery* focuses on the present and future development of BIM and the demands that this development gives concerning the role of engineers and continuous ongoing learning. The course *Research Methods for the Built Environment* prepares the students with scientific approaches and knowledge about the research methods relevant in the field of study and to be applied in the *Final Project Work in Built Environment.*

Elective courses play a pivotal role in elevating the proficiency in mathematical concepts to a master's level while also augmenting competencies in *Urban Information Management* pertaining to the integration of Building Information Modeling (BIM) and Geographic Information Systems (GIS), as well as data modeling and analysis on an urban scale. The *Industrial Placement Courses* within the Built Environment discipline offer opportunities for students to apply acquired knowledge and skills within pertinent industry settings, with the duration of such placements contingent upon the course's structure and potential incorporation of supplementary optional modules.

Research basis
The research area in the Built Environment focuses on understanding the industrial processes involved in creating and maintaining key components such as buildings, lighting systems, and water and sewer networks. This research seeks to add value for stakeholders throughout the entire lifecycle of these systems, from initial development to ongoing management.

One of the main strengths of this research lies in the study of lighting products and the application of digital technologies to drive innovation in the construction industry. Tools such as Building Information Modeling (BIM) and Geographic Information Systems (GIS) are integral to enhancing value for end-users and clients while enabling more efficient and digitally-supported value creation processes.

The collaboration with other research areas within the School of Engineering strengthens the overall effort, promoting a multidisciplinary approach to advancing knowledge and driving innovation in the Built Environment.

Recognizing the growing importance of well-being and performance in buildings - especially through the use of advanced lighting systems - and the role of digital technologies, the Department of Construction Engineering and Lighting Science is establishing a new field of study at both the master's and doctoral levels.

Research in this area encompasses methods and techniques that provide a comprehensive view of product development and maintenance, focusing on enhancing the socio-technological value of the built environment. This includes promoting health, well-being, and sustainability. Digital tools such as simulation, optimization, planning, and insights from environmental psychology are essential for developing and verifying products and services. Given these products' extended lifespan and complexity, digital transformation offers a cost-effective and sustainable means to improve performance and better understand user behavior. However, challenges like digital disruptions and evolving business relationships in construction must be addressed as this digital revolution continues.

Equal terms, gender equality and diversity
The School of Engineering (JTH) strives in all its activities to ensure that all individuals are given equal opportunities and treated equally. At both the JU and JTH levels, this is reflected in governing documents concerning organizational and personnel matters, the establishment and delivery of programmes and courses, as well as the monitoring of educational quality. At JTH, student influence is also ensured through student representation in various educational and industry councils.

The programme fosters an inclusive learning environment, encouraging equal participation in group projects, discussions, and assignments. Teachers ensure balanced group dynamics, valuing all voices in collaborative settings. Guest lectures and industry activities emphasize diverse perspectives, featuring speakers of different genders to enrich insights on BIM and construction practices.

Study abroad
JTH has internationalization as a focus area where the educational programmes include opportunities for both international experiences at home as well as various opportunities to do internships and study abroad, giving students valuable experiences and skills to prepare them for a global labour market.

Semester 3 of the programme is intended as exchange semester. The student must find substitute courses for two compulsory courses of the programme, Advanced Building Information Delivery, 7,5 ECTS and Research Methods for the Built Environment, 7,5 ECTS. The student also chooses 15 credits (two courses) in the subjects of Architectural Engineering or Engineering and digitalization or equivalent. The choice of courses is made in consultation with the programme manager via Jönköping University's internal system for study abroad.

The students who choose not to go on a study abroad programme follow a predetermined course package at the School of Engineering.

Programme progression
The programme contains two different lines of progression:
• BIM Strategy
• Scientific approach for the Built Environment

BIM Strategy constitutes the core of the program promoting a holistic view on the use of digitalization in the development of the products for the built environment. Product development theories provide the students with knowledge about different environmental, economic, and social aspects that must be taken into consideration in all stages of the construction process; BIM strategies are used to accomplish this.

Other courses provide knowledge of requirements and specifications concerning BIM that are necessary to drive BIM strategies and to obtain the information needed in the construction process. This knowledge will

be used directly in the course such as *BIM – Management, Control and Evaluation*, where the students will gain competences and skills in how to manage, control and evaluate BIM-based projects. Together with knowledge concerning organizational and management aspects related to BIM strategies' implementation, in courses as *Implementation of Digital Technologies and the Construction Industry* the students understand and learn how to implement the current BIM strategies in the construction industry. The course *Parametric Design* aims to teach the students tools and procedures to optimize buildings' design and performances.

The BIM Strategy progression ends with the course *Final Project Work in Built Environment*, where the students can focus on developing new BIM strategies applying scientific approaches.

The Scientific approach for the Built Environment line begins with the course *Scientific Introduction to BIM and Sustainability*, where the students use research methods to gain basic knowledge concerning the major topics addressed in the program and further used the acquired knowledge to evaluate BIM based projects in the course *BIM- Management, Control, and Evaluation*. *Research methods for the Built Environment* develops this further, focusing on how research methods can be used to produce new knowledge in Built Environment subject and in the two department's areas of excellence: Well-being and performance in buildings through lighting, and Barriers and drivers for a digitally driven development of the built environment sector.

Courses

Course changes can occur, as long as they do not substantially affect the programme's content and learning goals.

Teaching and examination

The academic year is divided into two semesters, and the semesters into two study periods. In each study period two courses are generally taken in parallel. Assessment is part of each course or module. Modes of assessment and grades are shown in each course syllabus.

Entry requirements

The applicant must hold the minimum of a bachelor's degree (i.e., the equivalent of 180 ECTS credits at an accredited university) with at least 90 credits in construction engineering, civil engineering, built environment, architecture engineering, product development (with relevant courses in lighting design) or equivalent. The bachelor's degree should comprise a minimum of 15 credits in mathematics and 7,5 credits in BIM or CAD 3D, or equivalent. Proof of English proficiency is required.

Continuation Requirements

In order to begin the second year, at least 37,5 credits from the programme's first year must be completed.

Qualification Requirements

To obtain a Degree of Master of Science (120 credits) with a major in Built Environment, specialisation in Sustainable Building Information Management, students must complete a minimum of 120 higher education credits in accordance with the current programme syllabus, at least 60 of which must be in the main field of study Built Environment and 21 credits in Mathematics. In addition a Degree of Bachelor of Science in Engineering/Degree of Bachelor of Science or an equivalent Swedish or foreign qualification is required.

Quality Development

At JTH, systematic quality assurance is carried out within JU's established quality system. This system, based on the requirements of the Higher Education Act, the Higher Education Ordinance, and the Standards and Guidelines for Quality Assurance in the European Higher Education Area, has been reviewed and approved by the Swedish Higher Education Authority.

Active and continuous course evaluation, including student feedback through course surveys, forms one of the cornerstones of this system. Annual programme evaluations and student representation in JTH's various educational and industry councils are two additional examples.

Other Information

Admission is under ‘Admission regulations for first- and second cycle courses and study programmes at Jönköping University (Admission regulations)’.

This syllabus is based on ‘Regulations and guidelines for first-, second- and third-cycle education at Jönköping University’.