

**I. Subject Specification****1. Basic Data***1.1 Title***3D CONSTRUCTIONAL MODELLING OF STRUCTURES***1.2 Code***BMEEOHSAS45***1.3 Type*

Module with associated contact hours

*1.4 Contact hours*

Type	Hours/week / (days)
Seminar	2

*1.5 Evaluation*

Midterm grade

*1.6 Credits*

3

*1.7 Coordinator*

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*1.8 Department*

Department of Structural Engineering

*1.9 Website*<https://epito.bme.hu/BMEEOHSAS45><https://edu.epito.bme.hu/course/view.php?id=447>*1.10 Language of instruction*

hungarian and english

*1.11 Curriculum requirements*

Compulsory in the Civil Engineering (BSc) programme

*1.12 Prerequisites*

Strong prerequisites:

- Steel Structures (BMEEOHSAT42)
- Reinforced Concrete Structures (BMEEOHSAT43)

*1.13 Effective date*

5 February 2020

## 2. Objectives and learning outcomes

### 2.1 Objectives

The aim of the course is to introduce the 3 dimensional detailing of steel-, reinforce concrete- and timber structures to the students. The course intends to develop basic practical skills by real 3D modelling of structures where the model is able to provide drawings and lists automatically for fabrication and construction processes. The course provides insight into the integration of the 3D constructional model of structures with other branches like architectural, mechanical, electrical and plumbing models into a BIM (Building Information Modelling) model. The students will learn the necessary knowledge and also obtain experience for the later project home works and diploma works by the help of presentations, small examples and a modelling home work.

### 2.2 Learning outcomes

Upon successful completion of this subject, the student:

#### A. Knowledge

1. knows the possibilities of 3D modelling of structures and current modelling and detailing directions in the industrial practice,
2. knows the basic concepts of Building Information Modelling (BIM),
3. knows the ability of connection to modelling software of other disciplines, knows the basic concept of Industrial Foundation Classes (IFC),
4. knows the basic drawing steps of reinforced concrete and steel structures,
5. knows the basic concepts of virtual construction.

#### B. Skills

1. is able to formulate a spatial structural problem in free-hand form,
2. is able to use a chosen constructional software for later project assignments and diploma work,
3. is able to deepen the knowledge of using the constructional software, acquire the ability of selflearning and self-development in this area,
4. is able to start the independent learning curve in the case of the other two software,
5. is able to prepare drawing documentation for different structure types,
6. become capable of conducting specialized co-operations based on IT tools.

#### C. Attitudes

1. is interested in the most up-to-date engineering procedures,
2. communicate electronically with his/her consultant during extension of his/her knowledge,
3. expand his/her knowledge by the help of independent, web-based resources and continuous learning,
4. is open to the use infocommunication tools,
5. strives to routinely use the selected software,
6. strives for accurate and error-free task solving,
7. welcomes the well-founded critical remarks,
8. critically examines the finished drawing documentation, which makes it understandable for external viewers while improving the mistakes and increasing their clarity and understanding of the drawings.

#### D. Autonomy and Responsibility

1. the modelling of the chosen structure is carried out independently by the known structure-specific knowledge, in accordance with the usual structural solutions and configurations,
2. expand his/her knowledge to be able to use the best design solutions with the simplest software supported methods,
3. is aware of the need to create drawings in a responsible way so that they are consistent with the calculation,
4. learns that he/she has to be aware of his/her engineering responsibility to create the drawings for the manufacturer and/or contractor,
5. uses the system-based approach for his/her thinking to reach error-freeness and cost-effectiveness.

**2.3 Methods**

Lectures, exercise classes, communication by information technology systems (devices and techniques) of the educational framework.

**2.4 Course outline**

<b>Week</b>	<b>Topics of lectures and/or exercise classes</b>
1.	Introductory lecture.
2.	Vision of 3D modelling of structures, virtual construction, budget, organization, concept of BIM.
3.	Software introductory presentations (Nemetschek, Revit, Tekla).
4.	Software introduction. Main objects in the 3D model: steel and reinforced concrete.
5.	Basic editing methods, manual detailing.
6.	Basic editing methods, reinforcement.
7.	Model check, clash check, objects lists.
8.	Consultation.
9.	Preparation for drawings, communication with drawings. Construction experiences.
10.	Create and modify drawings. Information for fabrication: steel.
11.	Create and modify drawings. Information for fabrication: reinforced concrete.
12.	Consultation.
13.	Virtual construction, organization, schedules. Data for budget, quantities and connection to budget software.
14.	Consultation.

The above programme is tentative and subject to changes due to calendar variations and other reasons specific to the actual semester. Consult the effective detailed course schedule of the course on the subject website.

**2.5 Study materials**

- a) Textbooks: 1. Textbooks for preliminary subjects (Steel and Reinforced Concrete Structures).  
b) Online materials: 1. Online video tutorials for each software in the Education Framework.

**2.6 Other information**

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**2.7 Consultation**

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Consultation dates: the dates and consultants are given in the Education Framework and homepage of the Department of Structural Engineering

*This Subject Datasheet is valid for:*

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**II. Subject requirements****Assessment and evaluation of the learning outcomes***3.1 General rules*

The assessment of the learning outcomes specified in clause 12.2. above and the continuous evaluation of student performance occurs via homework assignments, class questions and consultation.

*3.2 Assessment methods*

<b>Evaluation form</b>	<b>Abbreviation</b>	<b>Assessed learning outcomes</b>
1. homework	HW1	A.1; B.1; C.7; D.1, D.5
2. homework	HW2	B.2-B.3; C.1-C.7; D.2, D.5
3. homework	HW3	A.4; B.5; C.3, C.6-C.8; D.3-D.5
Class questions	CQ	A.2-A.3, A.5; B.4, B.6

The dates of deadlines of assignments/homework can be found in the detailed course schedule on the subject's website.

*3.3 Evaluation system*

<b>Abbreviation</b>	<b>Score</b>
HW1-3	75%
CQ	25%
<b>Sum</b>	<b>100 %</b>

The deadline of the evaluations are shown on the homepage of the subject. The criterion to fulfil the subject is to finish the home woks in time with higher than 0 point. The mistakes in the home works must be corrected in the final documentation otherwise the subject is failed – independently from the points.

*3.4 Requirements and validity of signature*

Signature is not gained in this Subject.

*3.5 Grading system*

<b>Grade</b>	<b>Points (P)</b>
excellent (5)	90%≤P
good (4)	75%≤P<90%
satisfactory (3)	65%≤P<75%
passed (2)	40%≤P<65%
failed (1)	P<40%

The subject is failed if one of the following is true: - The deadlines of the home works are missed or it get 0 points from the lecturer. - If it is proven that the home work is not the result of the student's own work. - If the mistakes are HW1-3+corrected to the final documentation. - The total number of points for the home works and class questions (HW1-3+CQ) is not reaching the 40% of the maximum points. The final grade is determined by the sum of the assessments in 3.3-ban (= HW1 + HW2 + HW3 + CQ).

*3.6 Retake and repeat*

1) The home works can be re-assigned in one week after the original deadline by paying the related fees. The deadlines of the home works can be found on the homepage of the subject.

2) The CQ class questions are not allowed to retake or reassigned but it can be replaced by department student work in the topic of the subject.

*3.7 Estimated workload*

<b>Activity</b>	<b>Hours/semester</b>
contact hours	14×2=28
homework	41
preparation for class questions	7
self-learning of the online materials	14
<b>Sum</b>	<b>90</b>

*3.8 Effective date*

5 February 2020

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