

**I. Tantárgyleírás****1. Alapadatok***1.1 Tantárgy neve***DIAGNOSTICS OF CONSTRUCTIONS***1.2 Azonosító (tantárgykód)***BMEEOEMMsFST01-00***1.3 Tantárgy jellege*

Kontaktórák tanegység

*1.4 Óraszámok*

| Típus                   | Óraszám / (nap) |
|-------------------------|-----------------|
| Előadás (elmélet)       | 2               |
| Laboratóriumi gyakorlat | 1               |

*1.5 Tanulmányi teljesítményértékelés (minőségi értékelés) típusa*

Vizsga

*1.6 Kreditszám*

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*1.7 Tárgyfelelős*

|          |                                                                    |
|----------|--------------------------------------------------------------------|
| név      | Dr. Nehme Salem Georges                                            |
| beosztás | Egyetemi docens                                                    |
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*1.8 Tantárgyat gondozó oktatási szervezeti egység*

Építőanyagok és Magasépítés Tanszék

*1.9 A tantárgy weblapja*[epito.bme.hu](http://epito.bme.hu)<https://edu.epito.bme.hu/course/view.php?id=5023>*1.10 Az oktatás nyelve*

magyar

*1.11 Tantárgy típusa*

Kötelező a Szerkezet-építőmérnök (MSc) szakon

*1.12 Előkövetelmények**1.13 Tantárgyleírás érvényessége*

2025. szeptember 1.

## **2. Célkitűzések és tanulási eredmények**

### *2.1 Célkitűzések*

During the course, master's students will acquire the methods of visual inspection, condition assessment and structural diagnosis of civil engineering structures and engineering works: data collection, on-site inspections, sampling, laboratory tests. The student will become familiar with the expert activities of the construction field and must be able to apply the above-mentioned methods when preparing an expertise, e.g. strength, physical and chemical tests of concrete, reinforced concrete, stone, masonry elements, steel and wooden structures.

Destructive and non-destructive tests. Diagnostics of structures. Diagnostics of building structures. Wetting and salt contamination of walls. Investigation of the causes of damage.

### *2.2 Tanulási eredmények*

A tantárgy sikeres teljesítése után a hallgató

#### A. Tudás

1. Has an overview of structural failures. 2. Can properly assess the condition of structures according to different inspection criteria. 3. Has an overview of on-site and laboratory tests. 4. Knows the aspects of safety assessment of structures. 5. Understands the advantages and disadvantages of inspection methods and the accuracy of mathematical estimation of the methods used. 6. Knows the nature and cause of defects. 7. Understands standards, regulations, and the need to take them into account from a qualification perspective.

#### B. Képesség

1. Professionally summarizes the topics of diagnostics. 2. Effectively applies the methods of acquiring knowledge (notes, sheets prepared in practical classes, catalogs, literature, online sources) during homework assignments. 3. Reliably evaluates the results of the applied methods. 4. Is able to judge the safety classification of buildings. 5. Is able to critically and thoughtfully apply theoretical knowledge when examining a given structure/structural element.

#### C. Attitűd

1. Collaborates with the instructor and fellow students in expanding their knowledge. 2. Expands their knowledge through continuous learning and is open to using new opportunities for information acquisition. 3. Strives to use precise professional terms.

#### D. Önállóság és felelősség

1. Independently carries out the processing of the chosen study/topic. 2. Openly accepts well-founded critical comments.

### *2.3 Oktatási módszertan*

Lectures, laboratory seminars, written and oral communication, optional individual and group assignments, work organization techniques.

### *2.4 Részletes tárgyprogram*

1. Introduction. Tasks of structural diagnostics. 2. Diagnostics of wooden structures. Condition assessment after biological pests. 3. Diagnostics of facade wall structures. 4. Diagnostics of damp basement and plinth wall structures. Diagnostics of windows and doors. Determination of layer order, measurement and registration of temperature and humidity, CO<sub>2</sub> measurement. 5. Types of cracks. Measurement and registration of crack width on the surface of the concrete structure and on the surface of the steel insert. Determination of crack depth. Waviness measurement, flatness measurement, load cell, stress measurement. 6. Diagnostics of steel structures. Endoscopic examination, thickness measurement, corrosion, welds, carbon content measurement, weldability, surface hardness measurement. 7. Destructive strength tests (preparation and evaluation of samples). Search for reinforcing steel, Determination of concrete cover and the effect of reinforcing steel on the fracture results of core samples. 8. Semi-destructive strength tests (disk tear-off test, pin pull-out test, core breakout test, probe penetration test, angle penetration test, dust sampling, CM concrete moisture test). 9. Non-destructive strength tests (Surface hardness test e.g. Schmidt hammer test, Poldi hammer test; Ultrasonic tests). 10. Tests of physical and chemical characteristics (porosity test, iron search, carbonation test - pH value determination - chloride ion content determination, CANIN test, .....). 11. Diagnostics of masonry structures, on-site tests, causes of cracks, testing of masonry mortar. 12. Testing of bauxite concrete structures. Laboratory tests. 13. Laboratory tests (chloride migration test, X-ray diffraction, derivatography, Scanning Microscope (SEM) test, SRT pendulum test: also on-site. 14. Semi-annual summary, Case studies

A félév közbeni munkaszüneti napok miatt a program csak tájékoztató jellegű, a pontos időpontokat a tárgy honlapján elérhető "Részletes féléves ütemterv" tartalmazza.

### 2.5 Tanulástámogató anyagok

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• Everett, Alan: Materials. Mitchel's building series. ISBN 0-7134-5442-3 • Mindess, Sidney: Concrete. Civil engineering and Engineering Mechanics series. ISBN 0-13-167106-5 • Construction Materials Their nature and behaviour Fourth edition Edited by Peter Domone and John Illston ISBN 0-203-92757-5 Master e-book ISBN • Wood Handbook - Wood as an engineering material Forest Products Laboratory. 1999. Wood handbook—Wood as an engineering material. Gen. Tech. Rep. FPL–GTR–113. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory. 463 p.

### 2.6 Egyéb tudnivalók

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### 2.7 Konzultációs lehetőségek

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As stated on the department's website, or by prior arrangement via e-mail (fenyvesi.oliver@emk.bme.hu).

*Jelen TAD az alábbi félévre érvényes:*

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## II. Tárgykövetelmények

### 3. A tanulmányi teljesítmény ellenőrzése és értékelése

#### 3.1 Általános szabályok

The learning outcomes stated in point 2.2 are assessed on the basis of a written closed book midterm test (MT), a homework assignment (HW), written and verbal examination and active participation in the lectures. At least 70% of the lectures and laboratory seminars must be attended.

#### 3.2 Teljesítményértékelési módszerek

| Assessment Name (Type)              | Code | Assessed Learning Outcomes   |
|-------------------------------------|------|------------------------------|
| 1 midterm test                      | MT   | A1.–A7. B1.-B5.              |
| 1 home assignment                   | HW   | A1.–A7. B1.-B5.              |
| Active participation on the classes | A    | C1. - C3.                    |
| Examination                         | E    | A1-A67 B1-B5, C1-C3, D1.-D2. |

A szorgalmi időszakban tartott értékelések pontos idejét, a házi feladatok ki- és beadási határidejét a "Részletes féléves ütemterv" tartalmazza, mely elérhető a tárgy honlapján.

#### 3.3 Teljesítményértékelések részaránya a minősítésben

| Code  | Weight |
|-------|--------|
| MT    | 20%    |
| HW    | 15%    |
| A     | 15%    |
| E     | 50%    |
| Total | 100%   |

#### 3.4 Az aláírás megszerzésének feltétele, az aláírás érvényessége

50% performance achieved separately in the MT and HW. In the case of an examination course registration (with valid signature), the better of the previous and recent mid-term results will be taken into account by the final evaluation. Previously obtained mid-term results in the subject that can be taken into account when determining the exam grade can be accepted retroactively for up to 6 semesters.

#### 3.5 Érdemjegy megállapítása

| Grade            | Score (P)          |
|------------------|--------------------|
| excellent (5)    | $85 \leq P$        |
| good (4)         | $74 \leq P < 85\%$ |
| satisfactory (3) | $63 \leq P < 74\%$ |
| pass (2)         | $50 \leq P < 63\%$ |
| fail (1)         | $P < 50\%$         |

#### 3.6 Javítás és pótlás

1) The midterm test assessment (MT) can be made up or improved free of charge during the academic period – for the first time – and for the second time during the make-up week, for an extra fee. 2) Active participation – due to its nature – cannot be made up, improved, or otherwise excluded or replaced. 3) Homework assignments can be submitted late, for a fee, until 4:00 PM on the last day of the repetition period.

#### 3.7 A tantárgy elvégzéséhez szükséges tanulmányi munka

| Activity                                         | Hours/Semester |
|--------------------------------------------------|----------------|
| participation in contact classes                 | 14x3=42        |
| mid-term preparation for classes                 | 14x0,5=7       |
| homework preparation                             | 10             |
| independent mastery of assigned written material | 10             |
| Midterm test preparation                         | 21             |
|                                                  |                |

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| Activity         | Hours/Semester |
|------------------|----------------|
| Exam preparation | 30             |

### 3.8 A tárgykövetelmények érvényessége

2025. szeptember 1.

*Jelen TAD az alábbi félévre érvényes:*