Fragility assessment - BMEEOHSDT71

I. Tantárgyleírás

1. Alapadatok

1.1 Tantárgy neve

Fragility assessment

1.2 Azonosító (tantárgykód)

BMEEOHSDT71

1.3 Tantárgy jellege

Kontaktórás tanegység

1.4 Óraszámok

Típus	Óraszám / (nap)
Előadás (elmélet)	2

1.5 Tanulmányi teljesítményértékelés (minőségi értékelés) típusa

Vizsga

1.6 Kreditszám

3

1.7 Tárgyfelelős

név	Dr. László Gergely Vigh
beosztás	Egyetemi docens
email	vigh.laszlo.gergely@emk.bme.hu

1.8 Tantárgyat gondozó oktatási szervezeti egység

Hidak és Szerkezetek Tanszék

1.9 A tantárgy weblapja

http://epito.bme.hu/node/16225?language=en
https://edu.epito.bme.hu/course/view.php?id=2475

1.10 Az oktatás nyelve

magyar és angol

1.11 Tantárgy típusa

Ph.D.

1.12 Előkövetelmények

1.13 Tantárgyleírás érvényessége

2022. szeptember 1.

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2. Célkitűzések és tanulási eredmények

2.1 Célkitűzések

The motivation of the studies is to understand the meaning of „extreme event”, what is the failure probability/risk, what is the reliability of the structure, what is the acceptable risk, how to mitigate risk, development of standards for practicing engineers, assuring acceptable risk level, conventions for reliability analysis. The objective of the course is that the student shall understand and be aware of the principles and basis of fragility and risk assessment methods, fragility and hazard curves and the associated challenges, reliability analysis of complex systems, incorporation of time dependency, finding optimum risk, resilience assessment.

2.2 Tanulási eredmények

A tantárgy sikeres teljesítése utána a hallgató

A. Tudás

1. is aware of the principles and basic terms of statistics and probability theory, knows the basic statistical analysis and assessment methods,
2. knows the principles of fragility and risk assessment,
3. is aware of the uncertainties in engineering problems, the distribution functions that are typical in civil engineering problems, and the model development methods,
4. is aware of the terms of failure probability and reliability index, the principles of basic reliability analysis methods (FORM, SORM and Monte Carlo analysis),
5. knows the principles of resilience assessment

B. Képesség

1. identifies failure modes,
2. applies the statistical and analysis methods for assessment of measuring results,
3. solves reliability problems by FORM and Monte Carlo methods using specific softwares,
4. uses reliability analysis for systems,
5. completes fragility assessment,
6. creates fragility curve,
7. is able to present his/her results in proper written form,

C. Attitűd

1. follows the lectures, makes effort to understand the study material,
2. collaborates with the teacher in gaining knowledge,
3. is continuously gaining knowledge,
4. is open to the use of IT tools and equipments,
5. aims accuracy in his/her calculations/solutions,

D. Önállóság és felelősség

1. is independent in problem statements and solutions,
2. aims to understand the complexity, comprehensiveness of the problems and recognize the synergies

2.3 Oktatási módszertan

Theoretical lectures and practical seminars are basically not separated, but are held in hybrid way. Theoretical parts emphasize the principles; rigorous mathematical derivation is not addressed. Practical parts illustrate the practical application of the methods, incorporating the use of specific practical tools. Active involvement in and communication during the lectures are expected, helping the understanding of the study material. Homeworks help strenghtening the skills.

2.4 Részletes tárgyprogram

Week	**Topics of lectures and/or exercise classes**
1.	Introduction
2.	Reliability analysis (background lecture) - 1
3.	Reliability analysis (background lecture) - 2
4.	Problem statement, challenges in fragility assessment
5.	Challenges in fragility assessment
6.	Fragility curve
7.	Hazard curve
8.	Failure mode, systems
9.	Reliability analysis of systems
10.	Computational practice
11.	Time dependancy
12.	Partial factors, optimum risk
13.	Resilience assessment
14.	Resilience assessment

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

a) Textbooks, literature:

- Faber: Risk and safety in civil, environmental and geomatic engineering
- Sorensen: Structural reliability theory and risk analysis
- Rao, S.R.: Engineering optimization – Theory and practice. Fourth Edition. Wiley, 2009.

b) Online materials:: materials uploaded to the web site of the subject, e.g.:

- Lecture notes, electronic lecture notes,
- slides of lectures and practices,
- solved problems
- background materials on reliability analysis

2.6 Egyéb tudnivalók

2.7 Konzultációs lehetőségek

The instructors are available for consultation during their office hours, as advertised on the information system. Special appointments can be requested via e-mail. Consultation during lecture breaks is also available.

Jelen TAD az alábbi félévre érvényes:

Inactive courses

II. Tárgykövetelmények

3. A tanulmányi teljesítmény ellenőrzése és értékelése

3.1 Általános szabályok

The assessment of the learning outcomes specified in clause 2.2. above and the evaluation of student performance occurs via homeworks, class work (active involvement in lectures) and examination.

3.2 Teljesítményértékelési módszerek

Evaluation form	Abbreviation	Assessed learning outcomes
Homework	HW	A.1-A.5; B.1-B.7; C.1-C.5; D.1-D.2
active involvement in lectures	A	A.1-A.5; B.1-B.7; C.1-C.5; D.1-D.2
oral exam	E	A.1-A.5; B.1-B.7; C.1-C.5; D.1-D.2

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

Abbreviation	Score
HW	40%
A	10%
Total in semester	**50%**
E	50%
Sum	**100%**

There is no individual criteria for HW and A. To obtain successful grade, the sum of HW and A shall be equal to or exceed 50% of the achievable points, and E shall be equal to or exceed 50% of the achievable points.

3.4 Az aláírás megszerzésének feltétele, az aláírás érvényessége

To obtain signature, the sum of HW and A shall be equal to or exceed 50% of the achievable points.
In case of re-application for the subject the results obtained during the new semester overwrite the results obtained during any previous semesters (except for the examination course).
Semester results achieved earlier can be considered retroactively in the evaluation process of further semester in accordance to the rules of the Code of Studies and Exams (BME TVSZ).

3.5 Érdemjegy megállapítása

Grade	Points (P)
excellent (5)	85<=P
good (4)	75<=P<84,5%
satisfactory (3)	60<=P<74,5%
passed (2)	50<=P<59,5%
failed (1)	P<50%

3.6 Javítás és pótlás

1. Late submission of homework is possible till 12:00 on the last day of the supplementary week. For the effective schedule of the homework assignments and due dates, consult the detailed course schedule of

the course on the subject website.
2. “Active involvement in lectures” A cannot be repeated, cannot be substituted with other forms of activity.

3.7 A tantárgy elvégzéséhez szükséges tanulmányi munka

Activity	**Hours/semester**
contact hours	14×2=28
preparation for the lectures	14×0.5=7
homework	25
home studying of the written materials	5
preparation for the exam	25
Sum	**90**

3.8 A tárgykövetelmények érvényessége

2022. szeptember 1.

Jelen TAD az alábbi félévre érvényes:

Inactive courses