Cím	**STRUCTURAL OPTIMIZATION**
Tárgykód	MSM407ANEP
Heti óraszám: ea/gy/lab	2/1
Kreditpont	4
Szak(ok)/ típus	**Structural Engineer (MSc)**
Tagozat	nappali
Követelmény	Félévközi jegy
Meghirdetés féléve	2
Előzetes követelmény(ek)	**Numerical Methods for Civil Engineering**
Oktató tanszék(ek)	**Prof Dr. Anikó CSÉBFALVI**
Tárgyfelelős és oktatók	**Prof Dr. Anikó CSÉBFALVI**

TANTÁRGY CÉLKITŰZÉSE

The subject of structural optimization provides a way for structural engineers to extend and generalize their basic knowledge to a computer supported structural analysis and design. The purpose of the subject is to introduce a new concept in structural design, construct more efficient structures, e.g. by making structures as light as possible yet able to carry the loads subjected to them. However, in the last two decades computational tools based on optimization theory have been developed that make it possible to find optimal structures more or less automatically.

Two textbooks are provided to help students to follow the teaching materials and understand the presented computational examples (see: at the end of the syllabus). These textbooks give an introduction to all three classes of geometry optimization problems of engineering structures: sizing, shape and topology optimization.

TARTALMA

Rövid leírás:

This course contains 14 units (listed below) of selected topics of structural optimization. In order to complete this course, you will need to work through each selected unit and all of its assigned materials in the book AN INTRODUCTION TO STRUCTURAL OPTIMIZATION (Authors: Peter W. Christensen and Anders Klarbring) and Structural Optimization, Fundamentals and Applications (Author: Kirsch, Uri) given in the Readings and Reference Materials.

Please give time to these; they are the best way to test your knowledge and learn.

Témakörök:

Előadás:

1. Modelling of Structural Optimization Problems. Classification of Structural Optimization Problems.
2. Structural Constraints. Structural modelling
3. Minimal Weight Design Subject to Stress Constraints,
4. Minimal Weight Design Subject to Stress and Displacement Constraints
5. Minimal Weight Design Subject to Buckling Constraints.
6. Minimal Weight Design of Three-Bar Truss Subject to Stress Constraints
7. Minimal Weight Design of Three-Bar Truss Subject to Stress and Displacement Constraints
8. Optimization of Elasto-Plastic Structures. Limit States.
9. Plastic Analysis of Continuous Beam
10. Plastic Analysis of Three-Bar Truss
11. Linear programming. Simplex Method
12. Linear Programming of 2D Problem.
13. Linear Programming of 3D Problem
14. Theory of Primal-Dual Linear Problems. The Dual Problem.

Gyak/Lab.:

1. Modelling of Structural Optimization Problems
2. Computation of Structural Constraints
3. Minimal Weight Design Subject to Stress Constraints
4. Minimal Weight Design Subject to Stress and Displacement Constraints
5. Minimal Weight Design Subject to Buckling Constraints
6. Minimal Weight Design of Three-Bar Truss Subject to Stress Constraints
7. Minimal Weight Design of Three-Bar Truss Subject to Stress and Displacement Constraints
8. Optimization of Elasto-Plastic Structures. Limit States.
9. Plastic Analysis of Continuous Beam
10. Plastic Analysis of Three-Bar Truss
11. Linear programming. Simplex Method
12. Linear Programming of 2D Problem.
13. Linear Programming of 3D Problem
14. Theory of Primal-Dual Linear Problems. The Dual Problem.

SZÁMONKÉRÉSI ÉS ÉRTÉKELÉSI RENDSZERE

Részvétel:

In order to take this course, you must: Have access to a computer, frequent broadband Internet access, and ability to download and save files and documents to a computer. Using your personal code, all of the computer skills are available in the course room: PTE MIK, A-117.

You will also need to complete two graded **Midterm Test Examples** (with grade).

General Course Description and Main Content:

Brief Syllabus: The purpose of this course is to introduce students to an advanced knowledge of structural optimization theory and learn its application for structural engineering problems. The selected topics are focusing for engineering problems and related computational methods. The solution methods are applied and demonstrated with help of Wolfram Mathematica (© 2015 Wolfram. All rights reserved). Legal licensed version available in room A 117. Student version: http://www.wolfram.com/solutions/education/students/.

Aláírás / Félévközi jegy feltétele:

Vizsga: írásbeli/szóbeli, eredményes: min.45.%

Grading will follow the course structure with the following weight: **1****st Midterm Test Example - 45%,** and **2****nd Midterm Test Example - 45%.** The remaining 10% will be assessed according to participation, progress, effort and attitude. Please note that attendance will adversely affect one's grade, both in direct grade reduction and in missing work in the development of a project.

Az érdemjegy kialakításának módja:

The final grade will be based on the following guidelines:

Grading Scale:

Numeric Grade:	5	4	3	2	1
Evaluation in points:	89%-100%	77%-88%	66%-76%	55%-65%	0-54%

KÖTELEZŐ ÉS AJÁNLOTT IRODALOM

1. **Kirsch**, Uri: Structural Optimization, Fundamentals and Applications, ISBN: 978-3-540-55919-1 (Print) 978-3-642-84845-2 (Online)
2. **Christensen**, Peter W. and **Klarbring**, Anders: An Introduction to Structural Optimization, Springer Science & Business Media, Oct 20, 2008 - Technology & Engineering - 214 pages

2018/2019. II. FÉLÉV		SZORGALMI IDŐSZAK, OKTATÁSI HETEK															VIZSGAIDŐSZAK				
		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	1.	2.	3.	4.	5.
Előadás tematika sorszáma																					
Gyakorlat/Labor sorszáma																					
Zárhelyi dolgozat										X					X						
Otthoni munka	kiadása																				
	beadási határidők																				
Jegyző-könyvek	beadási határidők																				
Egyebek	pl. beszámolók,																				
	stb.															X			Aláírás, félévközi jegy már nem pótolható		
Aláírás / Félévközi jegy megadása																a /fj					
Vizsgák tervezett időpontjai																					

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tantárgyfelelős

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