General Information:

Name of Course:	**STRUCTURES 1**
Course Code:	MSM405AN

Semester:	1st
Number of Credits:	4
Allotment of Hours per Week:	2 Lectures + 2 Practises /Week
Evaluation:	Examination (with grade)
Prerequisites:	**Structural Analysis (BSc), Mathematics (BSc)**

Instructor:	**Prof Dr Anikó CSÉBFALVI, full professor**
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Introduction, Learning Outcomes:

The subject of advanced structural analysis provides a way for structural engineers to extend and generalise their basic knowledge to a computer supported structural analysis. Matrix method is implemented so that complex structural problems may be done by computers. Different types of statically determinate and indeterminate trusses, beams, and skeletal structures are considered using the matrix stiffness method. This course will provide you with an introduction to several of those analytical and numerical methods based on matrix formulation which you may then find opportunity to practice later in the curriculum.

Upon successful completion of this course, the student will be able to:

1. Determine deflections and forces in statically determinate and indeterminate truss structures using the matrix stiffness method;
2. Use an interpretation of stiffness matrices to assemble stiffness matrices analytically for 2D trusses;
3. Write and use computer programs which implement the matrix stiffness method for 2D trusses;
4. Apply knowledge of mathematics (linear algebra), and solve 2D trusses by computer programming;
5. Use an interpretation of stiffness matrices to assemble stiffness matrices analytically for 3D trusses;
6. Write and use computer programs which implement the matrix stiffness method for 3D trusses;
7. Apply knowledge of mathematics (linear algebra), and solve 3D trusses by computer programming;
8. Use an interpretation of stiffness matrices to assemble stiffness matrices analytically for 2D beams;
9. Write and use computer programs which implement the matrix stiffness method for 2D beams;
10. Apply knowledge of mathematics (linear algebra), and solve 2D beams by computer programming;
11. Use an interpretation of stiffness matrices to assemble stiffness matrices analytically for frames;
12. Write and use computer programs which implement the matrix stiffness method for frames;

Requirements for Completion: This course contains 13 units of selected topics of numerical methods listed above. In order to complete this course, you will need to work through each selected unit and all of its assigned materials in the book MATRIX ANALYSIS OF STRUCTURES (Author: Aslam Kassimali) Technology & Engineering, 2011, available on https://books.google.hu/books?id=YeyWBwgl9REC&source=gbs_navlinks_s. Please give time to these; they are the best way to test your knowledge and learn.

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** and the **Final Exam** (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 analysis and learn its application for 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/.

In order to tackle the different knowledge of students in mathematics and structural analysis, a short description is required about the related engineering problems.

However, chapters of the proposed book MATRIX ANALYSIS OF STRUCTURES (Author: Aslam Kassimali) Cengage Learning, Jan 1, 2011 Technology & Engineering, freely available, the attendance of the lectures and personal activity is obligatory.

With the usage of the settled computers, the students are able to follow of the topic of the recent presentation and its application as well.

Schedule:
This course measures students' progress in meeting the above objectives by requiring them to:
- Apply the matrix stiffness method to model the behavior of planar trusses, beams, and frames;
- Calculate deflections, reactions, and internal forces for planar trusses, beams, and frames using
- analytical and computer-based methods; and
- Extend the scope of linear static analysis to include geometric stability and dynamic effects.

Continuous learning of students is **controlled two times** during the semester. Therefore, two parts is distinguished and controlled:

- **First part** of the semester content modelling of 2D and 3D trusses, using matrix computations, solve linear equilibrium systems, subsequently unit 1-7 (Week 1-7).
- **Second part** of the semester content modelling of 2D beams, 2D and 3D frames using matrix computations, solve linear equilibrium systems, subsequently unit 8-12, (Week 10-14).

Each part closes with a graded **Midterm Test Example** from the predetermined topics of the given units. **Location** of the Midterm Test Example: Room A117. **Time**: Week 8 (**1st Midterm Test Example**) and Week 15 (**2nd Midterm Test Example**).

Methodology:
The course is based on individual computational skills with regular consultations and presentations.

Studio Culture:
The course is based on through collaboration, participation and discussions trough lessons. This is an interaction between Students and Faculty; used the teaching methods like 'Problem-based learning' and 'learning-by-doing'. The communication and work should be reflect a respect for fellow students and their desire to work with regard to noise levels, noxious fumes, etc – from each site of participants.

Attendance:
Attending is required all classes, and will impact the grade (max. 10%). Unexcused absences will adversely affect the grade, and in case of absence from more than 30% of the total number of lesson will be grounds for failing the class. To be in class at the beginning time and stay until the scheduled end of the lesson is required, tardiness of more than 20 minutes will be counted as an absence. In the case of an illness or family emergency, the student must present a valid excuse, such as a doctor's note.

Evaluation + Grading
Grading will follow the course structure with the following weight: **1st Midterm Test Example - 45%, 2nd 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. 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%

5. Outstanding work. Execution of work is thoroughly complete and demonstrates a superior level of achievement overall with a clear attention to detail in the production of drawings, models and other forms of representation. The student is able to synthesize the course material with new concepts and ideas in a thoughtful manner, and is able to communicate and articulate those ideas in an exemplary fashion in.

4. High quality work. Student work demonstrates a high level of craft, consistency, and thoroughness throughout drawing and modelling work. The student demonstrates a level of thoughtfulness in addressing concepts and ideas, and participates in group discussions. Work may demonstrate excellence but less consistently than an '5' student.

3 Satisfactory work. Student work addresses all of the project and assignment objectives with few minor or major problems. Graphics and models are complete and satisfactory, exhibiting minor problems in craft and detail.

2. Less than satisfactory work. Graphic and modelling work is substandard, incomplete in significant ways, and lacks craft and attention to detail.

1. Unsatisfactory work. Work exhibits several major and minor problems with basic conceptual premise, lacking both intention and resolution. Physical representation in drawing and models is severely lacking, and is weak in clarity, craft and completeness.

Students with Special Needs:
Students with a disability and needs to request special accommodations, please, notify the Deans Office. Proper documentation of disability will be required. All attempts to provide an equal learning environment for all will be made.

Readings and Reference Materials:

MATRIX ANALYSIS OF STRUCTURES (Author: Aslam Kassimali) Cengage Learning, Jan 1, 2011 - Technology & Engineering (https://books.google.hu/books?id=YeyWBwgl9REC&source=gbs_navlinks_s). This book takes a fresh, student-oriented approach to teaching the material covered in the senior- and first-year graduate-level matrix structural analysis course. Unlike traditional texts for this course that are difficult to read, Kassimali takes special care to provide understandable and exceptionally clear explanations of concepts, step-by-step procedures for analysis, flowcharts, and interesting and modern examples, producing a technically and mathematically accurate presentation of the subject.

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Additional versions of this product's ISBNs

- **ISBN10:** 1111426228
- **ISBN13:** 9781111426224

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