

General Information:

Name of Course:	STRENGTHENING OF STRUCTURES
Course Code:	MSB392AN
Semester:	1 st
Number of Credits:	3
Allotment of Hours per Week:	2 Lectures + 1 Practical class /Week
Evaluation:	Signature (with grade)
Prerequisites:	None

Instructor: **Dr. Zoltan ORBAN, associate professor**
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Introduction, General Course Description:

This course is aimed to provide basic knowledge on the principles of the repair and strengthening of structures constructed from various types of materials. Topics covered by the course include: assessment of structures, deterioration of structural materials and structures, basic principles of structural repair and strengthening, concrete and masonry repairs, methods of strengthening steel, concrete and timber structures, introduction of specific technologies such as strengthening with shotcrete, strengthening with fibre reinforced plastics (FRP), near surface reinforcing systems, design examples and case studies on strengthening bridges, buildings and other civil engineering structures.

Learning Objectives:

Students will gain from this course:

- Basic knowledge on the principles of repair and strengthening of civil engineering structures,
- Understanding some of the deterioration processes of structural materials and structures,
- Overview on specific repair and strengthening methods of structures built from various construction materials.

Methodology:

- **Lectures:** will give the theoretical knowledge on repair and strengthening of structures via case studies.
- **Practical class (in group work):** Groups of 2-3 students each will be created. Each group will be assigned tasks to complete. These tasks may expand on design work and may have “research components” where students need to gather information required to complete a task.
- **Students’ presentations:** Each student will give a short presentation on a selected subject related to the repair or strengthening of structures.
- **Exams:** Accumulated knowledge is tested in midterm and final exam. It features multiple-choice, true-false or short essay questions.

Schedule:

Week	Topic of lecture
Week 1	Orientation.
Week 2	Basic terms. Principles of strengthening and repair.
Week 3	Deterioration and repair of concrete and reinforced concrete structures I.
Week 4	Deterioration and repair of concrete and reinforced concrete structures II.
Week 5	Strengthening with FRP materials

Week 6	Strengthening with near surface reinforcing systems
Week 7	Repair and strengthening of masonry structures
Week 8	Midterm exam. Submit of 1st assignment.
Week 9	<i>Break – no class</i>
Week 10	Strengthening of steel structures
Week 11	Strengthening of timber structures
Week 12	Strengthening of foundations
Week 13	Submit of 2nd assignment. Presentations.
Week 14	Final exam.
Week 15	Second exam (only if required). Presentations.

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.

Grading:

10% - Attendance
40% - Assignments
25% - Midterm Exam
25% - Final Exam

Grade:	5	4	3	2	1
Evaluation in percents:	85%-100%	70%-84.9%	55%-69.9%	40%-54.9%	0-39.9%

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:

IABSE: "Case Studies of Rehabilitation, Repair, Retrofit and Strengthening of Structures", ISBN 978-3-85748-124-6,

Externally bonded FRP reinforcement for RC structures, fib Bulletin 14., 2001.

EN 1504 European standard series.

Lecture slides, notes.