**General Information:**

**Name of the Course:** **Steel-Concrete Composite Structures**

**Course Code:**  **PMTSTNB051C**

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| **Semester:** | 1st |
| **Number of Credits:** | 4 |
| **Allotment of Hours Per week:** | 1 Lecture + 1 Practice/ Week |
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| **Evaluation:** | Midterm + Project Submission with an Interview |
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| **Prerequisites:** | Reinforced Concrete Structures Design (BSc), Steel Structures Design (BSc) |
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| **Instructor:** | **Tamás JUHÁSZ, Assistant Lecturer**  Office: 7624 Hungary, Pécs, Boszorkány u.2. Office No B-312  Email: juhasztam@mik.pte.hu  **Mohamad AL MAWALI, Assistant Teacher (Master Student)** |

**Introduction, Learning Outcomes:**

The Steel-Concrete Composite Structure Course will provide a new structural system thoughts to the students after the learning of the reinforced concrete structures design and the steel structures design.

The students will be able to understand, analyze, and design the steel-concrete composite elements such as beams and columns, with the assistance of structural engineering computer programs and FEM software.

The used standard for the course and the main reference is the Euro-Code for the composite structures design and its annexes (EN1994).

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

1. Decide when to choose and apply a composite system
2. Determine the type of the concrete slab in the composite system
3. Apply the necessary structural tests
4. Determine the plastic moment resistance for plastic-steel-composite-sections
5. Determine the plastic moment resistance for semi-compact and compact steel-composite sections
6. Calculate the contribution of a shear connection a choosing its type
7. Calculate the shear connections resistance
8. Determine the bending moment resistance in considering the connections contribution
9. Calculate the vertical shear resistance and the related (Final) bending moment resistance
10. Verify the longitudinal shear in the composite section
11. Determine the applied deflection of the beams and verifying it
12. Calculate the composite columns and checking their buckling circumstances
13. Determine the final resistance of composite columns
14. Use the computer programs for composite elements calculations (MIDAS GEN)

**Requirements for Completion:** This course includes 10 Lectures with 10 different topics to be covered, starting from the structural tests for the composite systems until the design of composite columns (considering the design of beams and slabs).

Slides and documents will be provided for students, however it’s important for a student to write down in the lecture and take his own notes and follow up with the lecturer, And at the end of the course, applications on programmed excel sheets will be used and an example for composite design using MIDAS GEN FEM Software will be given.

The materials of the course will be the slides of the instructor, and some handmade calculations by him as well and two books with the main Euro-Code for the composite structures:

1. EN1994 – Design of Composite Structures – General Rules
2. Composite Structures of Steel and Concrete (Volume-1), Beams, Slabs, Columns, And Frames for buildings – Second Edition – R.P. Johnson – Blackwell Scientific Publications
3. Structural Design of Steelwork to EN1993 and EN1994 – Third Edition – Lawrence Martin & John Purkiss (B/H)

**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 a graded **Midterm Test** and the **Final Interview (Oral Final Test) Related to the Design Project that will be given during the Semester.**

In case of improvement needed for the mark: there could be a **Final (Retake) Test,** but it will include the whole semester’s topics

Examples’ Solving in the course is manually, until the end of the course it will be by programmed excel sheets and by applying and example to MIDAS GEN 2018 which is accessible at the computers of PTE.

**Schedule:**

This course measures students’ progress in meeting the above objectives by requiring them to:

* Follow up with a design project during the whole semester which is similar to a one applied in the lectures by the instructor, each student will have different parameters for the projects
* Provide the reports of each week’s working in their projects (Weekly check)

Lectures Titles:

1. Week-1: Structural Engineering Memorizing and fundamentals (General Review)
2. Week-2: Introduction to Composite Structures
3. Week-3: Tests for composite structures
4. Week-4: Design of Composite Beams – Part (1) – Plastic moment resistance for plastic and compact steel composite sections
5. Week-5: Design of Composite Beams – Part (2) – Plastic moment resistance for semi-compact sections  
   and an example solving a ribbed parallel composite slab on a beam
6. Week-6: Design of Composite Beams – Part (3) – Shear Connections Resistance
7. Week-7: MIDTERM TEST
8. Week-8: Autumn Break
9. Week-9: Design of Composite Beams – Part (4) – Vertical and Longitudinal Shear Resistance
10. Week-10: Design of Composite Beams – Part (5) – Deflection Check
11. Week-11: Design of Composite Columns
12. Week-12: Design of Composite Slabs
13. Week-13: Students’ Projects Final Revision & Applications on MIDAS GEN and Excel
14. Week-14: ORAL TEST AND PROJECTS SUBMISSION
15. Week-15: RETAKE TEST (that includes the whole semester’s topics)

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

* **First Part** of the semester content is six lectures, starting from the first week until the sixth, this part will be ended by a midterm test in the seventh week
* **Second Part** of the semester starts from the ninth week until the 13th, it will be ended in the 14th week with an oral interview, and the retake will be in the 15th week

**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 and Grading:**

Grading will follow the course structure with the following weight:

* Attendance & Participation = 10%
* 1st Midterm = 40%
* Oral Test and an Interview along with the design project = 50%

And in case of a Retake Exam, its mark will be added to the final grade the student has got after the oral test

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:**

1. EN1994 – Design of Composite Structures – General Rules
2. Composite Structures of Steel and Concrete (Volume-1), Beams, Slabs, Columns, And Frames for buildings – Second Edition – R.P. Johnson – Blackwell Scientific Publications
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