

## SYLLABUS

### 1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Civil Engineering
1.3	Department	Mecanica constructiilor
1.4	Field of study	Civil Engineering
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	Civil, Industrial and Agricultural Buildings /Engineer (English language)
1.7	Form of education	Full time
1.8	Subject code	29.0

### 2. Data about the subject

2.1	Subject name	Rezistentă materialelor II					
2.2	Course responsible/lecturer	Sl.Dr.Ing. Mociran Horatiu Alin- Horatiu.Mociran@mecon.utcluj.ro					
2.3	Teachers in charge of seminars	Sl.Dr.Ing. Mociran Horatiu Alin- Horatiu.Mociran@mecon.utcluj.ro					
2.4	Year of study	2	2.5	Semester	2	2.6	Assessment
						E	2.7
						Subject category	
						DID/DI	

### 3. Estimated total time

3.1	Number of hours per week	6	3.2	of which, course:	3	3.3	applications:	
3.4	Total hours in the curriculum	84	3.5	of which, course:	42	3.6	applications:	
Individual study								hours
Manual, lecture material and notes, bibliography								15
Supplementary study in the library, online and in the field								10
Preparation for seminars/laboratory works, homework, reports, portfolios, essays								35
Tutoring								3
Exams and tests								3
Other activities								0
3.7	Total hours of individual study	66						
3.8	Total hours per semester	150						
3.9	Number of credit points	6						

### 4. Pre-requisites (where appropriate)

4.1	Curriculum	-
4.2	Competence	In-depth knowledge of Strength of Materials (I), Mechanics (I and II) and Special Mathematics.

### 5. Requirements (where appropriate)

5.1	For the course	Lecture room with blackboard and multimedia devices (laptop, video projector, projection screen).
5.2	For the applications	Classroom with blackboard, access in the lab 'Actions on buildings and structures' to conduct experiments, scientific calculators.

## 6. Specific competences

Professional competences	<p>C1.1 Identification of the structural role of the members of the building.</p> <p>C1.3 Graphical representation and modelling of different types of structural members and structures.</p> <p>C2.1 Identification of the building materials and the types of structures used in construction.</p> <p>C2.3 Use of computation methods specific to different types of structures and the appropriate design methods of structural members of civil, industrial, and agricultural buildings with the aim of elaboration of a specific technical documentation.</p> <p>C2.4 Evaluation, selection and optimal use of different building materials that are used for structural members.</p>
Cross competences	<p>CT1. Application of effective and responsible work strategies, punctuality, seriousness, and personal responsibility, based on the principles and values of professional ethics.</p> <p>CT3. Documentation in English, for professional and personal development, through continuous training and efficient adaptation to the new technical developments.</p>

## 7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Developing abilities to identify, formulate and solve structural engineering problems.
7.2	Specific objectives	Developing abilities to design or check structural members to fulfil strength, stiffness and stability requirements.

## 8. Contents

8.1. Lecture (syllabus)	Teaching methods	Notes
1. Combined actions: biaxial bending (caused by coplanar inclined loads or by non-planar loads).	Lectures with discussions.	Blackboard and multimedia devices.
2. Combined actions: axial force and bending; case of materials which can't withstand tensile stresses.		
3. Energy methods: basic energy concepts.		
4. Energy methods: energy theorems.		
5. Failure theories.		
6. Plastic analysis: plastic analysis of cross-sections.		
7. Plastic analysis: plastic analysis of structures.		
8. Buckling: flexural buckling. Buckling of bars under axial compression. Euler's formula for pin-ended bars.		
9. Buckling: practical calculation for buckling. Extension of Euler's formula to bars with other end conditions. The effect of shear force on the elastic critical column load.		
10. Buckling: battened built-up columns.		
11. Buckling: lateral-torsional buckling. Compressed bent bars.		
12. Impact loading.		
13. Variable actions. Fatigue.		
14. Beams on elastic foundation.		
Bibliography		

## Bibliography

- In the Library of TUCN:

1. Pantel, E., Ioani, A., Popa, A., Nedelcu, M., Strength of Materials. Theory and Problems, Part II, Edit. Napoca Star, 2009.
2. Pantel, E., Ioani, A., Turda., D., Popa A., Lessons of Strength of Materials. Theory and Problems, Part II, Cluj-Napoca, 2004.

- In other libraries:

1. Gere, J.M, Goodno, B.J., Mechanics of Materials, Eighth edition, Edit. CENGAGE Learning, 2012.
2. Hibbeler, R.C., Mechanics of materials, Eighth edition, Pearson Prentice Hall, 2011.
3. Beer, F. P., Johnston Jr., E.R., DeWolf, J.T., Mazurek, D.F., Mechanics of materials, Sixth edition, McGraw-Hill, 2012.
4. Megson, T.G.H., Structural and stress analysis, Second Edition, Elsevier Butterworth-Heinemann, 2005.
5. da Silva, V. D., Mechanics and strength of materials, Springer-Verlag, 2006.
6. Boresi, A.P., Schmidt, R.J., Sidebottom, O.M., Advanced mechanics of materials, Fifth Edition, John Wiley & Sons, Inc., 1993.

8.2. Applications/Seminars	Teaching methods	Notes
1. Simple actions: review.	Lectures with discussions.	Blackboard and multimedia devices.
2. Biaxial bending caused by coplanar inclined loads (verification, design, capable force, normal stresses, and neutral axis).		
3. Biaxial bending caused by non-planar loads (diagrams of internal forces and moments, verification, design, normal stresses and neutral axis).		
4. Axial force and biaxial bending (diagrams of axial force and bending moments, diagrams showing the distribution of total normal stresses over the cross-section, normal stresses, and neutral axis).		
5. Axial force and biaxial bending (diagrams of axial force and bending moments, diagrams showing the distribution of total normal stresses over the cross-section, normal stresses, and neutral axis).		
6. Axial force and uniaxial bending: checking the retaining walls.		
7. Computations of displacements of structural members by means of Castigliano’s second theorem and Maxwell-Mohr’s method (structural members subjected to simple actions).		
8. Computations of displacements of structural members by means of Maxwell-Mohr’s method (structural members subjected to combined actions). Menabrea’s theorem for statically indeterminate beams.		
9. Plastic analysis of systems of axially loaded bars in a nutshell.		
10. Plastic analysis of statically determinate and indeterminate beams by using kinematic method.		
11. Buckling: lateral-torsional buckling. Compressed bent bars.		
12. Buckling of the straight columns with batten-plates: verification, design, bearing capacity.		
13. Verification at vertical and horizontal impact. Experimental test.		
14. Review and synthesis problems.		
Bibliography		
Bibliography		
• In the Library of TUCN:		

1. Pantel, E., Ioani, A., Popa, A., Nedelcu, M., Strength of Materials. Theory and Problems, Part II, Edit. Napoca Star, 2009.
  2. Pantel, E., Ioani, A., Turda., D., Popa A., Lessons of Strength of Materials. Theory and Problems, Part II, Cluj-Napoca, 2004.
- In other libraries:
1. Hibbeler, R.C., Mechanics of materials, Eighth edition, Pearson Prentice Hall, 2011.

**9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field**

Acquired competences will be needed for civil engineers who work in design and buildings firms and are fundamental for those who will attend master and doctoral programmes in the field of Civil Engineering.

**10. Evaluation**

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	2 theory subjects.	Written examination (T) consisting of 2 theory subjects, with the duration of 1 hour (closed books), and an oral examination, respectively. The mark obtained in the written examination can be increased, maintained or decreased depending on the student's answers at the oral examination.	40%
10.5 Applications	3 problems.	Written examination (A) consisting of 3 problems, with the duration of 2 hours (closed books).	60%

**10.6 Minimum standard of performance**

- a) The condition of attending and doing the homework for admission to the examination: the attendance at min. 10 (ten) laboratory works and min. 10 (ten) full homework submitted in time. If the condition is not fulfilled the students cannot take the exam and must re-contract the discipline in the next academic year.
- b) If the previous condition is fulfilled, the application mark from the electronic catalogue (EA) is calculated with the following relationship:  $[(\text{no. of attendances at the laboratory works} / \text{no. of works}) + (\text{no. of submitted homework} / \text{no. of given homework})] \times 10/2$ . If (EA) mark is not min. 5 (five), students cannot take the exam and must re-contract the discipline in the following academic year.
- c) The mark of the written exam (A): min. 5 (five) and the correct solving in proportion of min. 50% of the problem from combined actions. If these criteria are not simultaneously fulfilled, the student is not allowed to take the oral exam and doesn't pass the exam. The written exam score (A) is calculated by summing the points obtained in each of the 3 problems, plus an ex officio bonus point. The mark of the written exam (A) is not recognized in the autumn session or in the next academic years sessions.
- d) The mark of the theory exam (T): min. 5 (five). The mark of the theory exam (T) represents the average of the marks of the 2 subjects. The minimum mark for each of the theory subject must be minimum 5, to pass the theory exam (T).
- e) The final mark of the exam can be favorably influenced by the activity of the student during the semester (attendance at laboratory work, submitted homework, attendance at courses, engagement in class debates etc.).

Date of filling in:		Title Surname Name	Signature
	Lecturer	Sl.Dr.Ing. Mociran Horatiu Alin	
	Teachers in charge of application	Sl.Dr.Ing. Mociran Horatiu Alin	

Date of approval in the department ..... 19/06/2025	Head of department conf.dr.ing. Anca-Gabriela POPA
Date of approval in the faculty ..... 25/06/2025	Dean prof.dr.ing Daniela Manca