COURSE SYLLABUS

1. Program information

1.1	Institution	Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Electrical Engineering
1.3	Department	Electrotechnics and Measurements
1.4	Field of study	Electrical Engineering
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/ Qualification	Electrical System Cluj-Napoca in English language
1.7	Form of education	Full time
1.8	Subject code	25.00

2. Course information

2.1	Subject name				Strength of Materials	
2.2	Course responsible/ lecturer				Lecturer, PhD Eng.Adrian-Ioan BOTEAN, adrian.ioan.botean@rezi.utcluj.ro	
2.3	Teachers in charge of Seminars/ Laboratory/ Project				Lecturer, PhD Eng.Adrian-Ioan BOTEAN, adrian.ioan.botean@rezi.utcluj.ro	
2.4 Year of study		II	2.5 Semester	2	2.6 Type of assessment *(E – exam, C – colloquium, V – verification)*	E
2.7 Subject category		*DF – fundamental, DD – in the field, DS – specialty, DC – complementary*				DF
		DI – compulsory, DO – elective, Dfac – optional				DO

3.

3. Total estimated time

3.1 Weekly hours	**3**	of which	3.2 Course	**2**	3.3 Seminar	**-**	3.3 Laboratory	**1**	3.3 Project	**-**	3.3 Practice	**-**
3.4 Semester hours	**42**	of which	3.5 Course	**28**	3.6 Seminar	**-**	3.6 Laboratory	**14**	3.6 Project	**-**	3.3 Practice	**-**

3.7 Allocation of study time (hours per semester) for independent study and assessment:	
(a) Examination	**3**
(b) Study using the textbook, course handouts, bibliography and lecture notes	**10**
(c) Additional documentation in the library, on specialized electronic platforms and in the field	**5**
(d) Preparation for seminars / laboratories, assignments, papers, portfolios and essays	**15**
(e) Tutoring	**-**
(f) Additional activities	**-**
3.8 Total hours of individual study and assessment (sum of 3.7(a)…3.7(f))	**33**
3.9 Total hours per semester (3.4+3.8)	**75**
3.10 ECTS credits	**3**

4. Preconditions

4.1 curriculum prerequisites	**Algebra, Mathematical Analysis, Physics, Mechanics, Technical Drawing**
4.2 competency prerequisites	**Proper use of mathematical tools**

5. Requirements

5.1. course delivery conditions	Auditorium, whiteboard, projector

5.2. conditions for laboratory activities	Computer network, whiteboard, projector

6. Specific competencies acquired

Professional competencies	To know the basic concepts of the Strength of Materials discipline; To know the simple types of loading (axial, shear, bending, torsion) and the geometric characteristics of cross-sections; To understand how the discipline is applied, directly related to engineering calculations and numerous practical situations (applications); To understand practical situations translated into simple loading problems; To be able to interpret the results of various applied problems and propose engineering solutions for their improvement; To be able to solve strength calculation problems using the acquired concepts and engineering handbooks; To be able to reduce concrete practical situations to the specific calculation models of Strength of Materials; To know the practical methods (both experimental and numerical) for measuring deformations and stresses in mechanically loaded parts; Provides advice regarding the malfunctioning of machines; Conducts scientific research; Models, simulates and tests sensors.
Transversal competencie	Modelling and solving various Strength of Materials applications using MDSolids and RDM; Development of teamwork skills, oral and written communication skills, adherence to and development of professional values and ethics.

7. Expected learning outcomes

Knowledge	The student/graduate identifies and describes basic concepts, principles and methods of Strength of Materials; The student/graduate describes, identifies, summarizes engineering concepts and notions and how they apply to concrete problems of general use specific to the electromechanical engineering programme.
Skills	The student/graduate operates with basic concepts, principles and methods from the fundamental discipline of Strength of Materials; The student/graduate solves Strength of Materials problems with applicability in engineering and validates the obtained solution; The student/graduate performs engineering calculations of medium complexity and associates them with graphical representations (manual or specific to computer-aided design).
Responsibility and autonomy	The student/graduate applies the values of ethics and professional deontology of the engineering profession; The student/graduate practices logical reasoning, evaluation and self-assessment in decision-making; The student/graduate communicates effectively about engineering activities with a wide range of audiences; The student/graduate is engaged in lifelong learning to acquire and implement knowledge, as needed, using appropriate learning strategies; The student/graduate promotes dialogue, cooperation, respect for others and interculturality; The student/graduate works effectively as a team member or as a team leader.

8. Course objectives (derived from the framework of specific competencies acquired)

8.1 Overall course objective	Development of competencies in the field of Strength of Materials calculations, essential for an electromechanical engineer.
8.2 Specific objectives	Theoretical calculation of stresses and deformations in Mechanical Engineering; Experimental determination of stresses and deformations using electrical resistive strain gauging and photoelasticity; Use of specific software in Strength of Materials: MD Solids, RDM.

9. Contents

9.1 Course	No. of hours	Teaching methods	Remarks
Introductory concepts: Purpose and problems of the Strength of Materials discipline, Materials (classification, characteristic curve, material selection), Classification of bodies in Strength of Materials, External loads acting on parts, Types of stresses.	2	Classical lecture, multimedia presentations	Teaching also uses multimedia means, demonstrations with laboratory equipment, the teaching style being interactive. The teacher-student partnership plays an important role, aiming to attract students to participate in lectures and applications, as well as in student scientific research activities. Consultations are provided both during the semester and before examinations.
Supports and reactions. Applications for the calculation of reactions (axial loading, bending, torsion).	2		
Internal forces. Applications for the calculation of internal forces: axial loading, bending - differential relations between internal forces and distributed load q(x) -, torsion.	2		
Mechanical stresses. Deformations and displacements. Allowable stresses. Basic hypotheses in Strength of Materials. Sizing conditions in Strength of Materials problems.	2		
Stresses and deformations in axially loaded bars.	2		
Statically indeterminate problems in tension and compression..	2		
Stresses and deformations in elements subjected to shear.	2		
Strength calculation of detachable and non-detachable joints.	2		
Static moments and moments of inertia of plane surfaces.	2		
Stresses in beams subjected to plane bending.	2		
Deformations of beams subjected to bending.	2		
Torsion of bars with circular and annular cross-section.	2		
Calculation of transmission shafts subjected to torsion.	2		
Experimental and numerical methods in Strength of Materials.	2		

Bibliography

[1] ***Lecture and laboratory notes
[2] Educational web platform: rezistentamaterialelor.blogspot.com
[3] Botean Adrian - Ioan, *Metode numerice de calcul în Rezistenţa Materialelor. Îndrumător*, Editura U.T.Press, Cluj-Napoca, 2006.
[4] Botean Adrian - Ioan, *Rezistenţa Materialelor.Solicitări simple*, Ediţia I, Editura U.T.Press, Cluj-Napoca, 2017.
[5] Botean Adrian - Ioan, *Rezistenţa Materialelor.Solicitări simple*, Ediţia a II-a, revizuită şi adăugită, Editura U.T.Press, Cluj-Napoca, 2019.

9.2 Laborator	No. of hours	Teaching methods	Remarks
Laborator 1 - Noţiuni Introductive din Rezistenţa Materialelor.	2	Classical lecture, multimedia presentations	The applications will be solved both analytically (based on the mathematical models presented in the lecture) and numerically (using the MDSolids software).
Laborator 2 – Solicitări axiale (reacţiuni, eforturi, tensiuni şi deformaţii).	2		
Laborator 3 – Solicitări la forfecare (calculul de rezistenţă pentru asamblarea cu bolţ).	2		
Laborator 4 – Solicitări la încovoiere (reacţiuni, eforturi şi tensiuni).	2		
Laborator 5 – Solicitări la încovoiere (deformaţii unghiulare şi liniare).	2		
Laborator 6 – Solicitări la răsucire (tensiuni şi deformaţii).	2		
Laborator 7 - Metode experimentale utilizate în Rezistenţa Materialelor	2		

Bibliography

[1] ***Lecture and laboratory notes
[2] Educational web platform: rezistentamaterialelor.blogspot.com
[3] Botean Adrian - Ioan, *Metode numerice de calcul în Rezistenţa Materialelor. Îndrumător*, Editura U.T.Press, Cluj-Napoca, 2006.
[4] Botean Adrian - Ioan, *Rezistenţa Materialelor.Solicitări simple*, Ediţia I, Editura U.T.Press, Cluj-Napoca, 2017.
[5] Botean Adrian - Ioan, *Rezistenţa Materialelor.Solicitări simple*, Ediţia a II-a, revizuită şi adăugită, Editura U.T.Press, Cluj-Napoca, 2019.

10. Corroboration of the course content with the expectations of representatives of the epistemic community, professional associations and representative employers in the field related to the programme.

The competencies acquired within the Strength of Materials discipline are essential for engineers in the fields of Mechanical Engineering, Industrial Engineering, Electrical Engineering, Medical Engineering.

11. Examination

Type of activity	**11.1 Assessment criteria**	**11.2 Assessment methods (and assessment type: continuous/summative)**	**11.3 Percentage of final grade**
11.4 Course	Multiple-choice test (theory and applications) with 10 questions (T) 2 problems to solve (P1 and P2)	Written test	**T - 50%** **P1 – 25%** **P2 – 25%**
11.5 Laborator	Submission of a file with 5 individually solved applications (correctly and completely): Pass/Fail		
11.6 Minimum performance standard Submission of a file with 5 individually solved applications (correctly and completely) - D Theory – T, Applications – P1 and P2 Assessment of lecture activity, assignments – A (maximum 2 points) Grade calculation formula - N N = (T + P1 + P2)/3 + A Passing conditions: T ≥ 5, P1 ≥ 5, P2 ≥ 5, D Condition for obtaining credits: N ≥ 5 + D			

Date of completion:	**Teaching staff**	**academic rank, title First name LAST NAME**	**Signature**
September 2025	Lecture	*Lecturer, PhD Eng.* ***Adrian-Ioan BOTEAN***	
	Applications	*Lecturer, PhD Eng.* ***Adrian-Ioan BOTEAN***	

Date of approval in the ETHM Department Council January 2026	**Head of Department:** Prof. Eng. MICU Dan Doru, PhD
Date of approval in the Faculty of Electrical Engineering Council February 2026	**Dean:** Assoc. Prof. Eng. CZIKER Andrei, PhD