FISA DISCIPLINEI

1. Date despre program

1.1	Institutia de invatamint superior	Technical University of Cluj Napoca
1.2	Facultatea	Civil Engineering
1.3	Departamentul	Constructions' Mechanics
1.4	Domeniul de studii	Civil Engineering
1.5	Ciclul de studii	Bachelor
1.6	Programul de studii/Calificarea	Civil, Industrial and Agricultural Buildings (English language)
1.7	Forma de invatamint	IF – full time
1.8	Codul disciplinei	19.00

2. Date despre disciplina

2.1	Denumirea disciplinei					Strength of Materials I					
2.2	Aria tematica (subject area)					Civil Engineering					
2.3	Responsabili de curs					Conf.dr. ing. Anca Gabriela Popa					
2.4	Titularul disciplinei					Conf.dr. ing. Anca Gabriela Popa					
2.5	Anul de studii	II	2.6	Semestrul	3	2.7	Evaluarea	Exam	2.8	Regimul disciplinei	Eng. From the field

3. Timpul total estimat

An/ Sem	Denumirea disciplinei	Nr. sapt.	Curs	Aplicaţii			Curs	Aplicaţii			Stud. Ind.	TOTAL	Credit
			[ore/săpt.]				[ore/sem.]						
				S	L	P		S	L	P			
II/3	Strength of Materials I	14	3	-	3	-	42	-	42	-	72	156	6

3.1	Numar de ore pe saptamina	6	3.2	din care curs	3	3.3	aplicatii	3
3.4	Total ore din planul de inv.	84	3.5	din care curs	42	3.6	aplicatii	42
Studiul individual								72
Studiul dupa manual, suport de curs, bibliografie si notite								30
Documentare suplimentara in biblioteca, pe platformele electronice si pe teren								10
Pregatire seminarii/laboratore, teme, referate, portofolii, eseuri								26
Tutoriat								2
Examinari								4
Alte activitati								-

3.7	Total ore studiul individual	72
3.8	Total ore pe semestru	156
3.9	Numar de credite	6

4. Preconditii (acolo unde este cazul)

4.1	De curriculum	-
4.2	De competente	Advanced Mathematics, Mechanics, Building Materials

5. Conditii (acolo unde este cazul)

5.1	De desfasurare a cursului	-
5.2	De desfasurare a aplicatiilor	Pocket calculator; design tables, access Lab 14, preparation of testing specimens

6 Competente specifice acumulate

Competente profesionale	Cunoştinţe teoretice, (Ce trebuie sa cunoască)	- schematization of strength elements and external actions, fundamental elements in the study of the deformable body (stresses, strains, displacements, constitutive relations, material constants, stress – strain diagrams and their design schematizations), fundamental hypothesis in Strength of Materials and general methods of calculation; - evaluation of the internal actions for straight bars and geometrical characteristics for current cross-sections; - determination of the state of stresses (in normal and inclined sections, extreme stresses), state of stains and displacements for simple actions (Tension / compression, shear, bending and free torsion); - formulation and interpretation of the strength conditions (verification, design and bearing capacity) for simple actions; - expression of the 3-D state of stresses and strains for a deformable body and particularization for the plane state.
	Deprinderi dobândite: (Ce ştie să facă)	After the study of the discipline, students are able to: - plot the diagrams of the internal actions for any type of statically determined system and identify the extreme values; - calculate the geometrical characteristics of current cross-sections, know the principal strength characteristics for usual materials and distinguish between the ductile and brittle materials; - develop correctly strength calculations for bars subject to axial action, simple bending and free torsion; - determine deflections and rotations in characteristic sections of bent beams; - use design tables for the strength calculations of catalogue and built-up sections; - calculate principal stresses and directions the spatial and plane case of action as well as for the bent beam;
	Abilităţi dobândite: (Ce instrumente ştie să mânuiască)	After the study of the discipline, students are able to: - use tables containing geometrical and material characteristics (from the bibliography in the field) in order to design a cross-section; - use efficiently the personal scientific calculator in order to perform mathematical calculations specific for Strength of Materials; - use of PC and software (based on FEM – Finite Element Method) for determine and compare the diagrams of the internal actions and the deformed shape of the statically determined beams.
Competenţe transversale		Elaboration and presentation of a technical report concerning the experimental determination of strength and deformation properties of the materials.

7 Obiectivele disciplinei (reiesind din grila competentelor specific acumulate)

7.1	Obiectivul general al disciplinei	Development of competences regarding the formulation and compliance of safety requirements for strength elements and structures of buildings.
7.2	Obiectivele specifice	Assimilation of theoretical and practical knowledge regarding the design / verification / determination of the capable load for a strength element or structure subject to a simple action.

8 Continuturi

8.1. Curs (programa analitica)		Metode de predare	Observatii
1	Introduction. Fundamental elements in the study of the deformable body. Classification of the strength elements. Necessary schematization: loads and supports. Displacements and strains.	Lecture	

	Internal forces: stresses and internal actions.		
2	Fundamental principles in solving the problems of Strength of Materials. Diagrams of the internal actions in the case of straight bars. Differential relationships between the internal actions and loads.		
3	Mechanical properties of the materials. Stretching test for the steel. Strain – stress diagram for ductile materials. Brittle materials. Behavior of the materials subject to other actions.		
4	Basic assumptions in Strength of Materials. Methods of calculation. Problems of Strength of Materials.		
5	Axial action: strains and stresses. Strength condition and particularization of the problems of Strength of Materials (verification / design / bearing capacity). Account for dead weight.		
6	Statically indeterminate structures subject to axial loads.		
7	Shear. The duality of the shear stresses. Riveted / bolted joints. Welded joints.		
8	Pure bending. Navier's formula.		
9	Simple bending: prismatic bars with symmetrical cross-section. Jurawsky's formula. Strength calculation of the beams.		
10	Bending of non-symmetrical cross-sections. The shear centre. Longitudinal shearing force.		
11	Bending deformations: strains and displacements. The differential equation of the deformed axis. Direct integration. Method of the conjugate beam.		
12	Free torsion of circular and ring-shaped bars. Rectangular cross-section. Thin-walled open and hollow sections		
13	State of stresses in 3-D. Principal stresses and directions. Extreme shear stresses. State of strains in space. Generalization of Hooke's law.		
14	Plane state of stresses. Particularization for bars		
8.2. Aplicatii (seminar/lucrari/proiect)		Metode de predare	Observatii
1	Schematization of elements and loads. Reactions in the supports of statically determined bars.	Lecture, Application solving, experimental testing	Design tables
2	Internal actions in the cross-section of statically determined bars. Simple diagrams of the internal actions		
3	Diagrams of the internal actions. Superposition of effects. Use of the symmetry and non-symmetry.		
4	Diagrams for columns, Gerber beams.		
5	Stretching test for the mild steel (experimental work). Strain –stress diagram. Determination of the mechanical characteristics: yielding stress, ultimate stress, modulus of elasticity, necking. Geometrical characteristics for plane figures.		
6	Axial action: verification, design and bearing capacity.		
7	Axial action: internal actions in statically indeterminate structures (loads, variation of temperature, inaccuracy of execution etc.).		
8	Riveted / bolted joints: verification, design, bearing capacity.		
9	Welded joints: verification, design, bearing capacity.		
10	Strength calculation for beams (verification, design).		
11	Bearing capacity of beams. Capable force. Diagrams of normal and shear stresses in a cross-section.		
12	Deflection of bent beams: the method of the conjugate beam. Synthesis problems for bending.		
13	Torsion: strength calculation for circular and ring-shaped cross-sections. Free torsion of thin-walled bars with open profile.		
14	Free torsion of bars with hollow cross-section. Recapitulation.		

Bibliografie

In biblioteca UTC-N

1. Bia, C., Ille, V., Soare, M. - *Rezistenţa Materialelor şi Teoria Elasticităţii*, E.D.P., Bucureşti, 1983.
2. Ille, V., Bia, C. - *Rezistenţa Materialelor (I)*, Litografia IPC-N, Cluj-Napoca, 1980.
3. Panţel, E., Ioani, A. M. - *Rezistenţa Materialelor - vol. 1*, Litografia IPC-N, Cluj-Napoca, 1985
4. Panţel, E., Ioani, A. M. - *Lecţii de Rezistenţa Materialelor (I)*, Ed. Napoca Star, Cluj-Napoca, 2002.
5. Gere, J. - *Mechanics of Materials*, Fifth edition, Brooks/Cole, Pacific Grove, CA, 2001.

6. Ille, V., Bia, C., şi alţii - *Rezistenţa Materialelor, culegere de probleme*, Litografia IPC-N, Cluj-Napoca, 1987.
7. Marţian, I., Cucu, H. L. - *Probleme de sinteză din Rezistenţa materialelor*; Ed. U.T. Pres, 2004.
8. Popa, A.G. - *Rezistenţa Materialelor (I). Îndrumător de lucrări*, Litografia UTC-N, Cluj-Napoca, 1998.

Materiale didactice virtuale şi din alte biblioteci

1. *Curs şi probleme de Rezistenţa Materialelor de la Universitatea Wiscounsin (SUA). http://physics.uwstout.edu/statstr/Strength/index.htm*
2. Curtu, I., Repanovici, D. - *Mecanică şi Rezistenţa Materialelor, Vol. 1 şi 2*, Ed. Infomarket, Braşov, 2000, ISBN 973-99827-7-8.
3. Simulescu, I. - *Lectures in Mechanics of Materials (I)*, Ed. Conspress, Bucureşti, 2004, ISBN 973-7797-25-6.
4. Vlad, I.M. - *Strength of Materials. Selected Problems*, Ed. Tehnopress, Iaşi, 2004, ISBN 973-702-028-6.

9. Coroborarea continuturilor disciplinei cu asteptarile reprezentantilor comunitatii epistemice, asociatiilor, profesionale si angajatori din domeniul aferent programului

Acquired competences are necessary for the civil engineers who activate both in design and execution enterprises.

10. Evaluare

Tip activitate	10.1	Criterii de evaluare	10.2	Metode de evaluare	10.3	Ponderea din nota finala
Course		Two theoretical subjects		Oral presentation and examination Duration: 1 hour		40%
Application		Three practical applications (problems)		Written examination Duration: 2 hours		60%

10.4 Standard minim de performanta

Minimum grade (medium note) for applications is 5 (five); the written examination is eliminatory.
Minimum grade (medium note) for the theoretical subjects is 5 (five); each subject has to be rated with 5 or more.
Final note consists in
0.6 (Application + Bonus) + 0.4 Theory.
The bonus is based on the activity of the student during the semester and has the value 0 … 1 point.

Data completarii
Octombrie 2014

Titularul de Disciplina
Conf. dr. ing.Anca Gabriela Popa

Responsabili de curs
Conf. dr. ing.Anca Gabriela Popa

Data avizarii in departament
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Director departament
Prof. dr. ing. mat. Cosmin Gruia CHIOREAN