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	Structures
1.4	Field of study	Civil Engineering
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	CCIA English/Engineerin
1.7	Form of education	Full time
1.8	Subject code	40.00

2. Data about the subject

2.1	Subject name			RC Structures I (Construcţii de beton armat I)			
2.2	Subject area						
2.3	Course responsible/lecturer			prof.dr.ing. Călin Mircea			
2.4	Teachers in charge of seminars			asist. Virag Jacint			
2.5 Year of study	III	2.6 Semester	2	2.7 Assessment	E	2.8 Subject category	DS

3. Estimated total time

3.1 Number of hours per week	5	3.2 of which, course:	2	3.3 applications:	3
3.4 Total hours in the curriculum		3.5 of which, course:	28	3.6 applications:	42
Individual study					24 hours
Manual, lecture material and notes, bibliography					-
Supplementary study in the library, online and in the field					-
Preparation for seminars/laboratory works, homework, reports, portfolios, essays					5 hours
Tutoring					2 hours
Exams and tests					3 hours
Other activities					-

3.7	Total hours of individual study	34
3.8	Total hours per semester	104
3.9	Number of credit points	4

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	-

5. Requirements (where appropriate)

5.1	For the course	Multimedia equipment
5.2	For the applications	IT laboratory

6. Specific competences

Professional competences	- basics of plastic analysis of RC structures; - introductory elements for structural dynamics; - basic knowledge concerning the safety and service of RC structures; - basics of durability design; - basic control of shrinkage and creep of concrete. - introductory abbilities for structural analysis and design; - reasoning for plastic analysis; - reasoning for dynamics of RC structures; - understanding long time behavior of RC structures.
Cross competences	- strength of materiales - reinforced concrete and prestressed concrete

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

7.1	General objective	Formation of competence in the field of sustenable design of RC structures	
7.2	Specific objectives	Gain general theoretical knoledge for the design of RC structures	

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
	Introduction to sustainable based design	Exposure	Multimedia equipment
	Plastic analysis of RC structures: plastic zone, plastic hinge, plastic mechanism of beams		
	Plastic analysis of RC structures: fundamental conditions for plastic analysis, theorems of plastic analysis, plastic mechanisms of frame structures		
	Yielding lines theory		
	Dynamics of RC structures: classification of vibrations, free vibrations		
	Dynamics of RC structures: lump mass method, free dumped vibrations		
	Dynamics of RC structures: dumping properties of RC structures		
	Durability design of RC structures: service life and safety level		
	Durability design of RC structures: mechanisms of steel corrosion		
	Durability design of RC structures: durability control by direct method and indirect method		
	Shrinkage effects upon RC structures: mechanisms and types of concrete contraction		
	Shrinkage effects upon RC structures: free concrete shrinkage strain and factors of influence		
	Shrinkage effects upon RC structures: cracking of RC structures due to restrained shrinkage		
1.	Sustainability of RC structures		
Bibliography			

1. MR Horne, Plastic Theory of Structures, 2nd edition, Pergamon, 1979.
JF Baker and J Heyman, Plastic Design of frames, Cambridge University Press, 1969.
2. A. Ionescu, C. Mircea, Manual pentru proiectarea placilor plane dreptunghiulare din beton armat, Editura RISOPRINT, Cluj-Napoca, 1999.
3. Inman, Daniel J., *Engineering Vibration*, Prentice Hall, 2001
4. Thompson, W.T., *Theory of Vibrations*, Nelson Thornes Ltd, 1996
5. Hartog, Den, *Mechanical Vibrations*, Dover Publications, 1985
6. EN 1992-1-1. Eurocode 2: Design of concrete structures - Part 1: General rules and rules for buildings.
7. C. Mircea, M. Filip, H. Nicoară; Study of Corrosion Damage on Reinforced Concrete StructuresProceedings of the 1st International Conference on Concrete Repair, Saint-Malo, France, 15-17 July 2003, vol. II, p. 705-712.
8. Mehta, P.K., Monteiro, J.M., *Concrete: Structure, Properties and Materials*, 2nd Edition, Prentice Hall, Inc., 1993, 548 pp.
9. C. Mircea, M. Filip, A. Ioani, *Investigation of Cracking of Mass Concrete Members Induced by Restrained Contraction*, American Concrete Institute Special Publication SP-246 Structural Implications of Shrinkage and Creep of Concrete (CD-ROM format), pp. 229-244, ISBN: 978-0-87031-250-25. Byfors, J., *Plain Concrete at Early Ages*, Swedish Cement and Concrete Research Institute, Report 3:80, 1980, 464 pp.
10. Hedlund, H., Stresses *in High Performance Concrete Due to Temperature and Moisture Variations at Early Ages*, Licentiate Thesis, Luleå University of Technology, Luleå, Sweden, 1996, 240 pp.
11. Mircea, C., *Overview Upon Cracking Induced by Restrained Shrinkage of RC Structures*, se va publica în Proceeding of the 3rd International Conference on Concrete Repair, Venice/Padua, Italy 29th June to 2nd July 2009., 8 p.
12. ACI Committee 207, 1992, *Prediction of Creep, Shrinkage, and Temperature Effects in Concrete Structures (ACI 209R-92)*, American Concrete Institute, Farmington Hills, MI, 47 pp.
13. ACI Committee 207, 1995, Effect of Restraint, Volume Change, and Reinforcement on Cracking of Mass Concrete (ACI 207.2R-95), American Concrete Institute, Farmington Hills, MI, 26 pp.

8.2. Applications/Seminars		Teaching methods	Notes
1.	Kinematic theorem - application	Exposure, aplications, workshop, Computer simulationa	IT laboratory
2.	Kinematic theorem - application		
3.	Static theorem - application		
4.	Static theorem - application		
5.	Torsioned RC beams – analysis Deep beams – analysis and design		
6.	Torsioned RC beams – analysis Deep beams – analysis and design		
7.	Vierendel beams –analysis and design		
8.	Vierendel beams –analysis and design		
9.	Deep beams – analysis and design		
10.	Deep beams – analysis and design		
11.	Beams stiffened by arches - analysis		
12.	Beams stiffened by arches - analysis		
13.	Arches stiffened by beams - analysis		
14.	Arches stiffened by beams - analysis		

Bibliography

1. MR Horne, Plastic Theory of Structures, 2nd edition, Pergamon, 1979.
JF Baker and J Heyman, Plastic Design of frames, Cambridge University Press, 1969.
2. A. Ionescu, C. Mircea, Manual pentru proiectarea placilor plane dreptunghiulare din beton armat, Editura RISOPRINT, Cluj-Napoca, 1999.
3. Inman, Daniel J., Engineering Vibration, Prentice Hall, 2001
4. Thompson, W.T., Theory of Vibrations, Nelson Thornes Ltd, 1996
5. Hartog, Den, Mechanical Vibrations, Dover Publications, 1985

6. EN 1992-1-1. Eurocode 2: Design of concrete structures - Part 1: General rules and rules for buildings.
7. C. Mircea, M. Filip, H. Nicoară; Study of Corrosion Damage on Reinforced Concrete Structures Proceedings of the 1st International Conference on Concrete Repair, Saint-Malo, France, 15-17 July 2003, vol. II, p. 705-712.
8. Mehta, P.K., Monteiro, J.M., Concrete: Structure, Properties and Materials, 2nd Edition, Prentice Hall, Inc., 1993, 548 pp.
9. C. Mircea, M. Filip, A. Ioani, Investigation of Cracking of Mass Concrete Members Induced by Restrained Contraction, American Concrete Institute Special Publication SP-246 Structural Implications of Shrinkage and Creep of Concrete (CD-ROM format), pp. 229-244, ISBN: 978-0-87031-250-25. Byfors, J., Plain Concrete at Early Ages, Swedish Cement and Concrete Research Institute, Report 3:80, 1980, 464 pp.
10. Hedlund, H., Stresses in High Performance Concrete Due to Temperature and Moisture Variations at Early Ages, Licentiate Thesis, Luleå University of Technology, Luleå, Sweden, 1996, 240 pp.
11. Mircea, C., Overview Upon Cracking Induced by Restrained Shrinkage of RC Structures, se va publica în Proceeding of the 3rd International Conference on Concrete Repair, Venice/Padua, Italy 29th June to 2nd July 2009., 8 p.
12. ACI Committee 207, 1992, Prediction of Creep, Shrinkage, and Temperature Effects in Concrete Structures (ACI 209R-92), American Concrete Institute, Farmington Hills, MI, 47 pp.
13. ACI Committee 207, 1995, Effect of Restraint, Volume Change, and Reinforcement on Cracking of Mass Concrete (ACI 207.2R-95), American Concrete Institute, Farmington Hills, MI, 26 pp.

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

Competencies for:
- design and consultancy offices
- construction companies

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
Course	Fulfilling requirements for 1 application and 2 theoretical subjects with marks over 5 (on a scale from 1 to 10)	Written exam – duration 2 hours	75 %
Applications	**7** works declared admissible, with marks over 5 (on a scale from 1 to 10)	Verification and discussion	25 %
10.4 Minimum standard of performance			
Minimum mark 5 for every subject of the written exam, at least mark 5 for the 7 lworks			

Date of filling in
September 2016

Teachers in charge of seminars

Date of approval in the department

Head of department