SYLLABUS [1]

1. Information about the program

1.1 Higher education institution	Politehnica University of Timisoara
1.2 Faculty[2]/ Department [3]	Faculty of Civil Engineering / Department of Steel Structures and Structural Mechanics
1.3 Chair	—
1.4 Field of study (name/code[4])	Civil Engineering /80
1.5 Study cycle	Bachelor
1.6 Study program (name/code/qualification)	Civil Engineering (in English)/10/Engineer

2. Information about the discipline

2.1 Name of discipline/ formative category[5]			Introduction to FEA / DD				
2.2 Coordinator (holder) of course activities			S. l. Dr. Ing. Nicolae Andrei Crisan				
2.3 Coordinator (holder) of applied activities[6]			S. l. Dr. Ing. Nicolae Andrei Crisan				
2.4 Year of study[7]	3	**2.5** Semester	6	**2.6** Type of evaluation	D	**2.7** Type of discipline[8]	DI

3. Total estimated time – hours / semester: direct teaching activities (fully assisted or partly assisted) and individual training activities (unassisted) [9]

3.1 Number of fully assisted hours / week	3 of which:	**3.2** course	2	**3.3** seminar / laboratory / project	1
3.1* Total number of fully assisted hours / semester	42 of which:	**3.2*** course	28	**3.3*** seminar / laboratory / project	14
3.4 Number of hours partially assisted / week	of which:	**3.5** training		**3.6** hours for diploma project elaboration	
3.4* Total number of hours partially assisted / semester	of which:	**3.5*** training		**3.6*** hours for diploma project elaboration	
3.7 Number of hours of unassisted activities / week	1 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			-
		hours of individual study after manual, course support, bibliography and notes			0.5
		training seminars / laboratories, homework and papers, portfolios and essays			0.5
3.7* Number of hours of unassisted activities / semester	14 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			-
		hours of individual study after manual, course support, bibliography and notes			7
		training seminars / laboratories, homework and papers, portfolios and essays			7
3.8 Total hours / week [10]	4				
3.8* Total hours /semester	56				
3.9 Number of credits	3				

4. Prerequisites (where applicable)

4.1 Curriculum	• Mechanics, Strength of materials – part 1 and 2; Mathematics III
4.2 Competencies	• Not applicable

[1] The form corresponds to the Discipline File promoted by OMECTS 5703 / 18.12.2011 and to the requirements of the ARACIS Specific Standards valid from 01.10.2017.
[2] The name of the faculty which manages the educational curriculum to which the discipline belongs
[3] The name of the department entrusted with the discipline, and to which the course coordinator/holder belongs.
[4] The code provided in HG no.140 / 16.03.2017 or similar HGs updated annually shall be entered.
[5] Discipline falls under the educational curriculum in one of the following formative disciplines: Basic Discipline (DF), Domain Discipline (DD), Specialist Discipline (DS) or Complementary Discipline (DC).
[6] Application activities refer to: seminar (S) / laboratory (L) / project (P) / practice/training (Pr).
[7] Year of studies in which the discipline is provided in the curriculum.
[8] Discipline may have one of the following regimes: imposed discipline (DI), optional discipline (DO) or optional discipline (Df).
[9] The number of hours in the headings 3.1 *, 3.2 *, ..., 3.8 * is obtained by multiplying by 14 (weeks) the number of hours in headings 3.1, 3.2, ..., 3.8. The information in sections 3.1, 3.4 and 3.7 is the verification keys used by ARACIS as: (3.1) + (3.4) ≥ 28 hours / wk. and (3.8) ≤ 40 hours / wk.
[10] The total number of hours / week is obtained by summing up the number of hours in points 3.1, 3.4 and 3.7.

5. Conditions (where applicable)

5.1 of the course	• Not applicable
5.2 to conduct practical activities	• Not applicable

6. Specific competencies acquired through this discipline

Specific competencies	• Acquire knowledge about applying Finite Element Analysis in structural engineering
Professional competencies ascribed to the specific competencies	• Design of structural elements in civil engineering, specific to graduated study programme
Transversal competencies ascribed to the specific competencies	• Documentation in Romanian and foreign language, in view of professional and personal development, via continuous learning and efficient adaptation to the new technical specifications

7. Objectives of the discipline (based on the grid of specific competencies acquired - pct.6)

7.1 The general objective of the discipline	• Understanding and applying Finite Element Analysis (FEA) in structural analysis
7.2 Specific objectives	• Learn basic principles of finite element analysis procedure • Learn the characteristics of finite elements that represent engineering structures • Learn and apply finite element solutions to structural analysis • Develop the knowledge and skills needed to effectively evaluate finite element analyses performed by others • Learn to model complex geometry problems and solution techniques

8. Content [11]

8.1 Course	Number of hours	Teaching methods [12]
1. Introduction. What is FEM? Short history. Types of FEM	2	Presenting and discussions
2. Types of FEA. Structural analysis.	2	
3. Basic concepts. Mechanic definitions. FEA definitions	2	
4. Basic concepts. Mathematics definitions. From FEM to FEA	2	
5. Errors in FEA. Linear vs. Non-linear analysis	2	
6. Analysis using one dimensional FE. FEA of a truss	2	
7. Analysis using one dimensional FE. FEA of a Beam element	2	
8. Shape functions. Interpolation in one dimension	2	
9. Shape functions. Polynomials in Two dimensions	2	

[11] It details all the didactic activities foreseen in the curriculum (lectures and seminar themes, the list of laboratory works, the content of the stages of project preparation, the theme of each practice stage). The titles of the laboratory work carried out on the stands shall be accompanied by the notation "(*)".
[12] Presentation of the teaching methods will include the use of new technologies (e-mail, personalized web page, electronic resources etc.).

10. Analysis using two-dimensional FE. Plane stress elements.	2	
11. Analysis using two-dimensional FE. Plane strain elements.	2	
12. Analysis using two-dimensional FE. Constant strain triangle element	4	
13. Analysis using two-dimensional FE. Linear Quadrilateral element	2	

Bibliography [13] 1] •A. Crisan Introduction to Finite Element Method, "Orizonturi Universitare", ISBN 978-973-638-550-6, 2015
[2] Yijun Liu, „Lecture Notes: Introduction to the Finite Element Method" CAE Research Laboratory, Mechanical Engineering Department, University of Cincinnati, Cincinnati, OH 45221-0072, U.S.A
[3] K. Bathe, Finite Element Procedures, 1st Ed., Prentice Hall, 1996.
[4] T.R. Chandrupathla, Introduction to Finite Elements in Engineering, 2nd Ed, Prentice Hall, 1997.
[5] A. Askenazi, V. Adams, Building Better Products with Finite Element Analysis, 1997.
[6] R.D. Cook, et al., Concepts and Applications of Finite Element Analysis, 1996

8.2 Applied activities [14]	Number of hours	Teaching methods
1. Simple spring systems – direct approach	5	Applications, workshop, Presenting
2. Simple spring systems – FEA step-by-step	2	
3. Simple truss girder – direct approach	3	
4. Cantilever beam with tip load	2	
5. Simple frame structure loaded with concentrated load	2	

Bibliography [15] [1] •A. Crisan Introduction to Finite Element Method, "Orizonturi Universitare", ISBN 978-973-638-550-6, 2015
[2] Yijun Liu, „Lecture Notes: Introduction to the Finite Element Method" CAE Research Laboratory, Mechanical Engineering Department, University of Cincinnati, Cincinnati, OH 45221-0072, U.S.A
[3] K. Bathe, Finite Element Procedures, 1st Ed., Prentice Hall, 1996.
[4] T.R. Chandrupathla, Introduction to Finite Elements in Engineering, 2nd Ed, Prentice Hall, 1997.
[5] A. Askenazi, V. Adams, Building Better Products with Finite Element Analysis, 1997.
[6] R.D. Cook, et al., Concepts and Applications of Finite Element Analysis, 1996.

9. Corroboration of the content of the discipline with the expectations of the main representatives of the epistemic community, professional associations and employers in the field afferent to the program

- Obtained competencies will be necessary for the future employees in Construction Company, in particular for those with most of activities in design of structures.

10. Evaluation

Type of activity	**10.1** Evaluation criteria [16]	**10.2** Evaluation methods	**10.3** Share of the final grade
10.4 Course	Theoretical concepts and application to be solved	Written exam	50%
10.5 Applied activities	**S:** Solutions to the seminar problems and homework submission	Written tests, homework evaluation and presentation of results	50%
	L:		
	P[17]**:**		
	Pr:		
10.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified [18])			

[13] At least one title must belong to the discipline team and at least one title should refer to a reference work for discipline, national and international circulation, existing in the UPT library.
[14] Types of application activities are those specified in footnote 5. If the discipline contains several types of applicative activities then they are sequentially in the lines of the table below. The type of activity will be in a distinct line as: "Seminar:", "Laboratory:", "Project:" and / or "Practice/training".
[15] At least one title must belong to the discipline team.
[16] Syllabus must contain the procedure for assessing the discipline, specifying the criteria, methods and forms of assessment, as well as specifying the weightings assigned to them in the final grade. The evaluation criteria shall be formulated separately for each activity foreseen in the curriculum (course, seminar, laboratory, project). They will also refer to the forms of verification (homework, papers, etc.)
[17] In the case where the project is not a distinct discipline, this section also specifies how the outcome of the project evaluation makes the admission of the student conditional on the final assessment within the discipline.
[18] It will not explain how the promotion mark is awarded.

- The answers to the exam subjects must accumulate a minimum score of 4.5 points out of 9 possible as well as for seminary work

Date of completion	**Course coordinator (signature)**	**Coordinator of applied activities (signature)**
22.01.2018	……	……
Head of Department (signature)	**Date of approval in the Faculty Council [19]**	**Dean (signature)**
……	12.02.2018	……

[19] The endorsement is preceded by the discussion of the board's view of the study program on the discipline record.