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]	Dynamics and Earthquake Engineering / Domain Discipline (DD)						
2.2 Coordinator (holder) of course activities	Conf.dr.ing. Aurel Stratan						
2.3 Coordinator (holder) of applied activities[6]	As.dr.ing. Adriana Chesoan						
2.4 Year of study[7]	3	**2.5** Semester	6	**2.6** Type of evaluation	E	**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	4 of which:	**3.2** course	2	**3.3** seminar / laboratory / project	2
3.1* Total number of fully assisted hours / semester	56 of which:	**3.2*** course	28	**3.3*** seminar / laboratory / project	28
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	2,5 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			1,25
		training seminars / laboratories, homework and papers, portfolios and essays			1,25
3.7* Number of hours of unassisted activities / semester	35 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			17,5
		training seminars / laboratories, homework and papers, portfolios and essays			17,5
3.8 Total hours / week [10]	6,5				
3.8* Total hours /semester	91				
3.9 Number of credits	4				

4. Prerequisites (where applicable)

4.1 Curriculum	• Mathematics III

[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.

	• Mechanics • Structural Analysis 2
4.2 Competencies	• -

5. Conditions (where applicable)

5.1 of the course	• Engaging in phone calls or personal discussions that may distract the attention of other participants are not allowed.
5.2 to conduct practical activities	• Engaging in phone calls or personal discussions that may distract the attention of other participants are not allowed. Deadlines for submitting homework are strict.

6. Specific competencies acquired through this discipline

Specific competencies	• Acquire knowledge on dynamic response of civil engineering works, with emphasis on seismic action
Professional competencies ascribed to the specific competencies	• Recognizing typical structures and structural elements, specific to the graduated study programme • 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	• Introduction to basic structural response under dynamic actions specific to civil engineering works, with emphasis on seismic action; • Introduction to principles of seismic design of structures
7.2 Specific objectives	• Acquirement of knowledge on dynamic response of single and multi degree of freedom systems, in case of free and forced vibrations; • Understanding the influence of stiffness, strength and damping on seismic response of structures; • Determination of the effects of seismic action on structures, according to design codes, and understanding of principles of conceptual design and seismic – resistant design of structures.

8. Content [11]

8.1 Course	Number of hours	Teaching methods [12]
Dynamics of single degree of freedom systems (equations of motion and problem statement, solution methods; free vibrations; forced vibrations)	6	Lecturing, conversation,

[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.).

Basics of engineering seismology (causes and effects of earthquakes; intensity and magnitude; seismic activity worldwide and in Romania)	2	explication, demonstration
Seismic response of single degree of freedom systems (computation of seismic response; elastic response spectra; seismic response of inelastic systems)	2	
Multi degree of freedom systems (equations of motion and problem statement; free vibrations; damping in structures; dynamic analysis and response of linear systems)	6	
Seismic analysis and design of structures (seismic action; methods of elastic analysis; conceptual design of structures; importance classes; combination of actions in the seismic design situation; design concepts; verification at the ULS and SLS)	2	
Seismic design of steel structures (principles of design; ductility of steel structures; moment resisting frames; concentrically braced frames; eccentrically braced frames)	2	
Seismic design of reinforced concrete structures (principles of design, ductility classes; ductility of reinforced concrete structures)	2	
Seismic design of bridges (fundamental requirements and principles of design; ductility and conceptual design of bridges)	2	

Bibliography [13]

1. Stratan, A. Dinamica structurilor şi inginerie seismică, Ed. Orizonturi Universitare, Timişoara, 2007.
2. Chopra, A.K. Dynamics of Structures: Theory and applications to earthquake engineering. Prentice Hall, New Gersey, 1995.
3. P100-1/2013. Cod de proiectare seismică - Partea I - Prevederi de proiectare pentru clădiri".
4. W.F. Chen and C. Scawthorn (eds.) Earthquake Engineering Handbook, CRC Press, 2003, ISBN 0849300681.

8.2 Applied activities [14]	Number of hours	Teaching methods
Dynamic response of single degree of freedom systems - Derivation of equation of motions for single degree of freedom systems. Solution methods. - Free vibrations of single degree of freedom systems. Determination of damping ratios from free vibrations tests. - Forced vibrations of single degree of freedom systems: analytical solution. - Free and forced vibrations of single degree of freedom systems. Solution using a computer program.	8	Explication, example, experiment, simulation, problematization
Seismic response of single degree of freedom systems - Computation of time history response of elastic single degree of freedom systems using a computer program. - Computation of time history response of inelastic single degree of freedom systems using a computer program. - Determination of elastic response spectra.	6	
Multi degree of freedom systems - Determination of eigenvalues and eigenmodes of multi degree of freedom systems using analytical methods. - Modal response spectrum analysis.	6	
Seismic response of structures - Determination of eigenvalues and eigenmodes of multi degree of freedom systems using computer program. - Determination of seismic response using the lateral force method. - Modal response spectrum analysis of a moment resisting frame. - Modal response spectrum analysis of a concentrically braced frame.	8	

[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".

Bibliography [15]

1. Stratan, A. Dinamica structurilor şi inginerie seismică, Ed. Orizonturi Universitare, Timişoara, 2007.
2. Chopra, A.K. Dynamics of Structures: Theory and applications to earthquake engineering. Prentice Hall, New Gersey, 1995.
3. P100-1/2013. Cod de proiectare seismică - Partea I - Prevederi de proiectare pentru clădiri".
4. W.F. Chen and C. Scawthorn (eds.) Earthquake Engineering Handbook, CRC Press, 2003, ISBN 0849300681.

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

- Course content provides essential knowledge for training of structural engineers: structural response under dynamic actions in general, and especially under seismic action. Given that Romania is a seismic country, the course ensures acquisition of knowledge and skills that are in line with expectations of representatives of epistemic community, professional associations and representatives of employers.

10. Evaluation

Type of activity	**10.1** Evaluation criteria [16]	**10.2** Evaluation methods	**10.3** Share of the final grade
10.4 Course	Correct and complete answer to theoretical subjects and correct problem solving	Written exam, composed of five theoretical subjects and two-three problems	60%
10.5 Applied activities	**S:**		
	L: Solutions of problem and correct carrying on of laboratory works	Homework and in-class assignments during the term	40%
	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])			
• Accumulating a score of 50%			

Date of completion	**Course coordinator (signature)**	**Coordinator of applied activities (signature)**
26.01.2018	……	……
Head of Department (signature)	**Date of approval in the Faculty Council [19]**	**Dean (signature)**
……	12.02.2018	……

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