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/Engineer
1.7	Form of education	Full time
1.8	Subject code	

2. Data about the subject

2.1	Subject name			Steel Structures II			
2.2	Subject area			Structural Engineering			
2.3	Course responsible/lecturer			Associated Professor Ioan Petran			
2.4	Teachers in charge of seminars			Lecturer Catalin Moga			
2.5 Year of study	IV	2.6 Semester	VII	2.7 Assessment	Exam	2.8 Subject category	

3. Estimated total time

3.1 Number of hours per week	6	3.2 of which, course:	3	3.3 applications:	3
3.4 Total hours in the curriculum	84	3.5 of which, course:	42	3.6 applications:	42
Individual study					hours
Manual, lecture material and notes, bibliography					30
Supplementary study in the library, online and in the field					9
Preparation for seminars/laboratory works, homework, reports, portfolios, essays					28
Tutoring					2
Exams and tests					3
Other activities					

3.7	Total hours of individual study	72
3.8	Total hours per semester	156
3.9	Number of credit points	6

4. Pre-requisites (where appropriate)

4.1	Curriculum	
4.2	Competence	

5. Requirements (where appropriate)

5.1	For the course	N/A
5.2	For the applications	N/A

6. Specific competences

Professional competences	Advantages and disadvantages of steel structures Standard tests on steel material Bolted connection types, characteristics, position Welded connections types and technology of welding Cross section types for steel elements Steel elements subjected to axial loads
Cross competences	Sizing and checking for a steel element subjected to tension and centric compression force European buckling curves and buckling resistance elements Bukling of uniform built-up members Restrained beams in bending Unrestrained members in bending Elements in bending and compression(beam-column) Plated structural elements

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

7.1	General objective	Developing ability to design steel elements
7.2	Specific objectives	Sizing and checking steel elements subjected to compression, bending, torsion and shear force

8. Contents

8.1. Lecture (syllabus)	Teaching methods	Notes
1.Failure of a structural member through buckling.Buckling due to elastic instability.Elasto-plastic buckling.Buckling coefficients	Presentation	Design of pitched roof steel portal frame structure Video-projector
2.The background of the European buckling curves.Buckling resistance of members		
3.Lateral torsional buckling.Buckling of uniform built-up members in compression		
4.Restrained beams in bending.Moment resistance of a beam(cross-section), shear and torsion		
5.Elements in torsion.Uniform members in torsion EN 1993.Buckling resistance of members (lateral torsional buckling)		
6.Unrestrained members in bending according to EN-1993.Lateral torsional buckling curves		
7.Elements in bending and compression(beam-column).Types of loading.Types of cross-sections		
8.Elements in bending and compression(beam-column).Cross-sectional behavior		
9.Design of members in compression and axial bending.Lateral-torsional behaviour of beam-columns		

10.Plated structural elements EN 1993-1-5.Stiffeners.Behavior of plated structural elements with slender web		
11.Design of plated structural elements in bending.Web buckling verification.Shear buckling coefficients		
12.Plastic analysis of steel structures.Conditions for the application of plastic analysis.Elasto-plastic behaviour and design of elements		
13.Fatigue strength of structural steel elements.Fatigue strength.Fatigue verification		
14.Recapitulation		

Bibliography

1.Ioan Petran, Roland Mihai Senila – Design of pitched roof steel portal frame structure, Ed. Mediamira, Cluj-Napoca, 2017

2.SR EN 1993-1-8 Eurocode 3:Design of steel structures, 2006

3.ECCS No 126, TC 10 Structural Connections, European Recommendations for de design of Structural connections according to Eurocode 3, 2003

4.Arcelor profiles-Beams, channels and merchant bars, Arcelor Group, 2005

8.2. Applications/Seminars	Teaching methods	Notes
1.Design of a Single Bay Portal Frame.Geometry definition.Loads evaluation.Dead loads.Snow loads	Presentation, workshop, applications	Design of pitched roof steel portal frame structure Eurocode 3
2.Loads evaluation.Wind loads.Seismical loads.Purlins design		
3.Main transversal frame.Load cases.Loads combination.ULS combination.SLS combination		
4.Presizing beam and columns.Results of the elastic analysis.Serviceability limit states.Ultimate limit states		
5.Column verification.Classification of the cross-section. Resistance of cross-section.Verification for shear force, axial force and bending moment		
6.Column verification.Buckling resistance, buckling about y-y, buckling about z-z.Lateral-torsional buckling.Calculation factor $C_{my,0}$		
7.Column verification.Lateral-torsional buckling.Calculation factors C_{my} and $C_{m,LT}$.		
8. Column verification.Lateral-torsional buckling.Calculation factors C_{yy}, C_{zy}, k_{yy} si k_{zy}.Verification with interaction formulae		
9.Beam verification.Classification.Resistance of cross-section.Shear, compression and bending		
10.Beam verification.Buckling resistance.Buckling about y-y, buckling about z-z.Lateral-torsional buckling		
11.Beam verification.Lateral-torsional buckling.Calculation factors $C_{my,0}$, C_{my}, $C_{m,LT}$, C_{yy}, C_{zy}, k_{yy} and k_{zy} .Verification with interaction formulae		

12.Erection details, shop and erection drawings		
13.Erection details, shop and erection drawings		
14.Recapitulation, applications		

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

Skills for the future engineers in a frame of design companies and building companies

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	5 question theory problems	Written exam – 2 hours	60%
10.5 Applications	Design problem solving	Written testing – 45 minutes	40%
10.6 Minimum standard of performance			
Every position must be ≥ 5 mark, including course and portal bay project design			

Date of filling in: dd.mm.yyyy		**Title Surname Name**	**Signature**
	Lecturer	Associated Professor Ioan Petran, Phd	
	Teachers in charge of application	Lecturer Catalin Moga, Phd	

Date of approval in the department ……..

Head of department
Conf.dr.ing Attila Puskas

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Date of approval in the faculty ……

Dean
Conf.dr.ing Nicolae Chira

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