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	Railway, Roads and Bridges
1.4	Field of study	Civil engineering
1.5	Cycle of study	Bachelor of Science
1.6	Program of study/Qualification	IIT/Engineer
1.7	Form of education	Full time
1.8	Subject code	16.00

2. Data about the subject

2.1	Subject name			STEEL-CONCRETE COMPOSITE BRIDGES			
2.2	Course responsible/lecturer			Assistant Professor PhD Ştefan I. Guţiu – stefan.gutiu@cfdp.utcluj.ro			
2.3	Teachers in charge of seminars			Assistant Professor PHD Ştefan I. Guţiu – stefan.gutiu@cfdp.utcluj.ro			
2.4 Year of study	2	2.5 Sem	1	2.6 Assessment	Exam	2.7 Subject category	DA DI

3. Estimated total time

3.1 Number of hours per week	3	3.2 of which, course:	2	3.3 applications:	1
3.4 Total hours in the curriculum	42	3.5 of which, course:	28	3.6 applications:	14
Individual study					hours
Manual, lecture material and notes, bibliography					28
Supplementary study in the library, online and in the field					28
Preparation for seminars/laboratory works, homework, reports, portfolios, essays					20
Tutoring					
Exams and tests					7
Other activities					

3.7	Total hours of individual study	83
3.8	Total hours per semester	125
3.9	Number of credit points	5

4. Pre-requisites (where appropriate)

4.1	Curriculum	N/A
4.2	Competence	N/A

5. Requirements (where appropriate)

5.1	For the course	Large capacity room. Support materials: laptop, video-projector, projection screen, blackboard/whiteboard
5.2	For the applications	Seminar room, computers, blackboard/whiteboard

6. Specific competences

Professional competences	Acquire practical skills necessary to design steel-concrete composite bridges. Recognizing typical structures and structural elements, specific to the graduated study programme. Design of structural elements in bridge engineering, specific to graduated study programme. Advanced design of steel-composite bridges. Research and development activities in the domain of bridge engineering structures. At the end of the course the student will be able to realize a full structural analysis and design of a steel-concrete composite bridges.
Cross competences	Documentation in Romanian and foreign language, in view of professional and personal development, via continuous learning and efficient adaptation to the new technical specifications. Elaboration and presentation of a technical report concerning the composite bridges. To apply accumulated skills in order to improve the performance in team working, on site or in a design office; To develop own and responsible strategy following the principles, codes and professional ethics.

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

7.1	General objective	Development of competences regarding the formulation and compliance of safety requirements for composite steel-concrete bridges. The course aims to develop the theoretical and practical skills necessary to design steel-concrete composite bridges using EUROCODES
7.2	Specific objectives	The course focuses on the calculation and design of composite elements made of steel profiles attached to concrete elements – composite beams used for simply supported or continuous bridges. At the end of the course, the student must be able to imagine and design such composite steel-concrete bridges

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1	Types of steel–concrete composite bridges	Presentation and discussions	Video projector, internet, design software, blackboard/whiteboard
2	Design codes. Eurocodes. National annexes		
3	Loads and actions. Traffic loads on road bridges. Actions during construction. Temperature. Wind. Earthquake.		
4	Basis of design. Modeling and methods for global analysis		
5	Structural materials. Concrete. Structural steel. Stud shear connectors		
6	Classification of cross sections		
7	Resistance to bending of composite cross sections. M^+		
8	Resistance to bending of composite cross sections. M^-		
9	Resistance to shear. Interaction of bending with shear for composite cross sections		
10	Steel-Concrete Connection		
11	Structural bearings, dampers, and expansion joints. Fabrication and erection of the steel-concrete structure		
12	Computer aided design. Optimization of steel-concrete composite bridges		
13	CAD. Optimization of steel-concrete composite bridges		
14	CAD. Sustainability		

<table>
<tr><td colspan="4">Bibliography
1. GUŢIU, Şt. : Poduri. Structuri compuse oţel – beton. UTPRESS 2012
2. GUŢIU, Şt., MOGA, C.: Structuri compuse oţel – beton. UTPRESS 2014
3. MOGA, P., GUŢIU, Şt., MOGA, C,: Construcții și poduri metalice. Bazele proiectării. UTPRESS 2018
4. VAYAS, I., ILIOPOULOS, A.: Design of Steel-Concrete Composite Bridges to Eurocodes, CRC Press
5. LEBET, Jean Paul, HIRT, Manfred: Steel Bridges. Conceptual and structural design, CRC Press, 2013
6. SR EN 1990, SR EN 1991, SR EN 1993
7. https://sections.arcelormittal.com/design_aid/design_software/EN: ACOBRI, AMECO</td></tr>
<tr><td colspan="2">8.2. Applications/Seminars</td><td>Teaching methods</td><td>Notes</td></tr>
<tr><td>1</td><td>Presentation of the structure to be designed. Road/ railway/highway composite bridge</td><td rowspan="7">Presentation and practice</td><td rowspan="7">Computers, design software, video projector, blackboard/whiteboard</td></tr>
<tr><td>2</td><td>Effective width of concrete flanges. Modular ratios. Elastic and plastic properties of cross-sections</td></tr>
<tr><td>3</td><td>Calculation of stresses under positive bending moments</td></tr>
<tr><td>4</td><td>Calculation of stresses under negative bending moments</td></tr>
<tr><td>5</td><td>Design of connections. Studs</td></tr>
<tr><td>6</td><td>Optimization of steel-concrete composite bridges.</td></tr>
<tr><td>7</td><td>Optimization of steel-concrete composite bridges. Sustainability.</td></tr>
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1. GUŢIU, Şt. : Poduri. Structuri compuse oţel – beton. UTPRESS 2012
2. GUŢIU, Şt., MOGA, C.: Structuri compuse oţel – beton. UTPRESS 2014
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4. MOGA, P., GUŢIU, Şt.: Poduri metalice. Ghid de proiectare. UTPRESS 2016
5. SR EN 1990, SR EN 1991, SR EN 1993
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9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Accumulated skills will be necessary for those employees who will be involved in private or public institutions activities dealing with construction works, project management or quality assurance for residential or industrial constructions.
The content was updated to keep in touch with the requirements of the work market.
The employers appreciate positively the level of knowledge of master programme graduates.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Ability to talk about subjects presented during lectures	Written test. The evaluation consists in the knowledge verification (Problem solving and theory - 1,5 hour evaluation)	60% (T)
10.5 Applications	Ability to analyze a real structure by computer aid	Analysis of written and drawn parts. Project presentation (10 min/student)	40% (P)
10.6 Minimum standard of performance			
P≥5 and T≥5; N = 0.5·T + 0.5·P ≥5.00			

Date of filling in:		Title Surname Name	Signature
15.10.2019	Lecturer	Assistant Professor PhD Ştefan I. Guţiu	
	Teachers in charge of application	Assistant Professor PhD Ştefan I. Guţiu	

Date of approval in the department October 2019	Head of department Conf.dr.ing. Gavril Hoda
Date of approval in the faculty October 2019	Dean Conf.dr.ing. Nicolae Chira