SYLLABUS

1. Data about the program of study

1.1	Institution	The Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Constructions
1.3	Department	Railways, Roads and Bridges
1.4	Field of study	Civil Engineering
1.5	Cycle of study	Master of Science
1.6	Program of study/Qualification	Transport Infrastructure Engineering / Engineer
1.7	Form of education	Full time
1.8	Subject code	4.00

2. Data about the subject

2.1	Subject name			**High Performance Technologies in Infrastructure Works**				
2.2	Subject area			Civil Engineering				
2.3	Course responsible/lecturer			Senior Lecturer, Eng. Zsolt ORBAN, PhD - Zsolt.Orban@cfdp.utcluj.ro Senior Lecturer, Eng. Remus CIOCAN, PhD Remus.ciocan@cfdp.utcluj.ro				
2.4	Teachers in charge of seminars			Senior Lecturer, Eng. Zsolt ORBAN, PhD - Zsolt.Orban@cfdp.utcluj.ro Senior Lecturer, Eng. Remus CIOCAN, PhD Remus.ciocan@cfdp.utcluj.ro				
2.5 Year of study	I	2.6 Semester	1	2.7 Assessment	Exam	2.8 Subject category	DA/DI	

3. Estimated total time

3.1 Number of hours per week	3	of which: 3.2 course	2	3.3 applications:	1
3.4 Total hours in the curriculum	42	of which: 3.5 course	28	3.6 applications:	14
Individual study					hours
Manual, lecture material and notes, bibliography					38
Supplementary study in the library, online and in the field					17
Preparation for seminars/laboratory works, homework, reports, portfolios, essays					24
Tutoring					-
Exams and tests					4
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	Not applicable
4.2	Competence	Not applicable

5. Requirements (where appropriate)

5.1	For the course	• Room equipped with: blackboard, projector, flipchart • Students will not attend lectures, seminars / laboratories / projects with their mobile phones turned on. Also, telephone calls will not be tolerated during the course, nor will the students leave the classroom in order to take personal telephone calls; • Tardiness will not be tolerated; Cluj-Napoca, str. Observatorului, Nr. 72-74 - Amphitheatre A4, A5.
5.2	For the applications	• Room equipped with teacher's desk, tables and chairs; • The deadline for submitting the papers shall be determined by the Coordinator in mutual agreement with the students. Late submission of the papers shall result in the deduction of 1 point/day of delay ; Cluj-Napoca, Observator Building, Nr. 72-74 – O102, O5, O15, O13.

6. Specific competences

Professional competences	After completing the discipline, the students should know: • modern and high-performance technologies used in road construction; • new materials and processes for their implementation; • technical-economic analysis for roads; • Modern technologies and equipment for the execution of the underground and overground railway construction works. • High-performance technologies for the rehabilitation of concrete and metal bridges. • Current technologies for the construction of railway and road bridges in mixed steel-concrete structures. After completing the discipline, the students should be able: • To deepen their knowledge about the special technologies applied to the execution of roads; • To determine the most efficient technical solutions for the rehabilitation, modernization or construction of roads; • To size and verify road structures for designing new roads; • To assess route variants through technical-economic analysis; • To approach works of railway rehabilitation and modernization (infrastructure and superstructure) by knowing the stages and working technologies. • To determine the applicable technical solutions and choose the most efficient technologies for repairing the concrete structural elements for bridges. After completing the discipline, the students should be able: • To be able to apply the legislative norms in the field for design, execution and reception; • To elaborate the steps of a logical road design chart;

	• To be able to assess the inconsistencies in the calculations / execution; • To be able to execute a road through modern methods; • To use specific techniques, methods and equipment for track monitoring and diagnostics in railway works.
Cross competences	• Application of effective and responsible work strategies, punctuality, seriousness and personal responsibility, based on the principles, norms and values of professional ethics; • To do research in Romanian for professional and personal development, through continuing professional development and efficient adaptation to new technical specifications; • To carry out a rigorously documented overview paper, taking into account the efficient adaptation to the new technical specifications • To create and present a Calculation Method Summary Sheet; • To discuss the solutions of the colleagues in the working group (semigroup); dissemination of results.

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

7.1	General objective	• Knowledge of high-performance technologies in infrastructure works • Developing skills related to compliance with safety requirements and sustainable behaviour of roads, bridges and railways, special technologies and a coherent and comprehensive system of norms, various design methods and specific execution elements.
7.2	Specific objectives	• Creating the skills required for using the best technologies in infrastructure works; • Assimilating theoretical knowledge regarding modern road construction solutions; • Assimilating the theoretical and practical knowledge related to activities of management, operation, maintenance and repairs in the field of road, bridge and railway construction.

8. Contents

8.1. Lecture (syllabus)	Teaching methods	Notes
High-performance technologies applied to earthworks.	Presentation, discussions Interactive teaching	Video-projector Edited materials
Use of modern geosynthetics in the execution of infrastructure projects.		
High-performance technologies applied to temporary, semi-permanent and permanent bituminous mixtures.		
Special technologies applied to rigid road pavements.		
Use of specific technologies, methods and specific performance equipment for track monitoring and diagnostics in railways.		
Railway rehabilitation and modernization works using special		

mechanized equipment		
Composition and behaviour of continuous welded rails.		
High-performance technologies for creating continuous welded rails.		
Modern technologies applicable to underground works - Tunnels.		
New solutions for the construction of the superstructures of urban lines		
Current trends in the construction of rail and road bridges in mixed steel-concrete structures - modular systems, integral and semi-integral bridges.		
High-performance technologies for the rehabilitation of concrete bridges: solutions for concrete technology, structural consolidation,		
Technologies for repairing concrete structural elements in bridges, efficient methods of waterproofing.		
Current technologies applied to the construction of bridges and upper and lower passages on highways.		

Bibliography

1. Ciocan R., Iliescu M. - Tehnologii performante aplicate la drumuri – Curs, Cluj-Napoca, 2015;
2. Iliescu – Trafic şi autostrăzi;
3. ILIESCU, M.: Drumuri. Volumul I.Proiectarea drumurilor. UTPRESS, Cluj, 2011;
4. ILIESCU, M.: Drumuri. Volumul II.Structuri rutiere. Infrastructura drumurilor. UTPRESS, Cluj, 2011;
5. ILIESCU, M.: Drumuri. Volumul III.Suprastructura drumurilor. UTPRESS, Cluj, 2011;
6. ILIESCU, M.: Proiectarea drumurilor.Teorie si practica. UTPRESS, Cluj, 2011;
7. ILIESCU, M., POP, M.: Indrumator pentru lucrari de laborator de drumuri. UTPRESS, Cluj, 2011;
8. BEURAN, M.,: Proiectarea şi construcția drumurilor. LITO I PCLUJ, 1977;
9. JERCAN, S. ,: Suprastructura şi întreținerea drumurilor, Ed. Didactică şi Pedagogică, 1981;
10. BEURAN, M., MOGA, I., ILIESCU, M.,: Proiectarea drumurilor. Aplicații privind utilizarea arcelor de clotoidă la racordarea aliniamentelor, IPCLUJ, 1987;
11. BEURAN, M., ILIESCU, M.,: Construcția drumurilor. Îndrumător de lucrări de laborator, IPCLUJ, 1995;
12. GUGIUMAN, Gh.,: Suprastructura drumurilor, Ed. Tehnică U.T. a Moldovei, Chişinău, 1996;
13. BELC, F. ,: Căi de comunicație terestră. Orizonturi Universitare, Timişoara, 1999;
14. LUCACI, Gh., COSTESCU, I., BELC, F. ,: Construcția drumurilor, Ed. Tehnică, Bucureşti, 2000;
15. HODA, G., ILIESCU, M.,: Căi de comunicație. UTPRESS, Cluj, 2009;

8.2. Applications/Seminars Calculation of structures with geosynthetics and calculation of resistance and stability of a retaining wall;	Teaching methods	Notes
Reinforcement of flexible, semi-rigid and rigid road structures	Presentation, applications, workshop	Projection guide, Video-projector, manual, norms
Cost-benefit analysis for major infrastructure works and modern supervision of large infrastructure works.		
Understanding the interpretation of the data / results provided by the rail's train bus and other high-performance diagnostic devices.		
Notions of continuous welded rail calculations		

Design of the resistance structure of the circular section in tunnels - bearing assessment. Determining the cross section.		and regulations
Principles of calculation of steel-concrete composite structures in the field of railway and road bridges.		

Bibliography

1. Project: Railway rehabilitation Campina – Predeal, Component of the IV Pan-European Corridor, ISPA 2003/RO/16/P/PT/007/02/02/02 Project, Bridges Lot
2. Project: Construction of Orastie-Sibiu Highway, Lot nr.1, km. 0+000 - km. 24+110
3. Project: Railway rehabilitation Brasov- Simeria, Component of the IV Pan-European Corridor, for trains with a maximum speed of 160 km / h, Coşlariu-Simeria Segment, Lot 1 Vintu de Jos – Simeria
4. Presentations of the various companies producing modern equipment for track diagnosis, respectively mechanized equipment for railway rehabilitation and modernization;
5. Solutions for underground and subterranean constructions - presentations of innovative products used in construction works for railways, bridges and tunnels - additives, special mortars, etc. products from companies in the field.
6. Petru Moga – Poduri. Suprastructuri metalice şi compuse oţel-beton, U.T. Press, Cluj-Napoca, 2011
7. New Integral and Semiintegral Bridge Solutions for the Romanian Highways and Motorways. Bridges in Danube Basin, EDIS, University of Zilina, ISBN 978-80-554-1249-8, pp. 111-112
8. Suprastructura căii ferate, Köllő G., nr. pag.188. UTC-N Publishing House, 1999
9. Căi ferate, Elemente geometrice, Al. Herman, L. Kazinnczy, G. Kollo, MIRTON Timişoara Publishing House, 2011
10. Köllő, G., Tuneluri si Metropolitane, Incitato Publishing House, 2004
11. SR EN 1994-2:2006/AC:2008, “Eurocode 4 - Design of composite steel and concrete structures - Part 2: General rules and rules for bridges.”
Virtual teaching materials.

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

The acquired skills will be necessary for the employees who carry out their activity in the field of road research, design and execution. The content of the discipline is correlated with the needs of employers in the field of civil engineering. In order to identify the needs and expectations of the employers in the field, to establish the content of the course was discussed with other professors within the faculty, with representatives of professional associations and with graduates of the study program. The content and complexity of the notions taught are permanently correlated with those of the related disciplines in the curriculum and adapt to the evolution of the knowledge needed in the field of master's studies.

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Written examination (2 hours)	Written examination – theoretical assessment Duration of examination 2 hours	66.67%
10.5 Applications	The project is assessed	The project is defended and	16.67%

	and graded	submitted. Duration 1 hour	
	Submission of applications	Defence of applications	16.66%
10.6 Minimum standard of performance			
a) Eligibility condition for acceptance to examination: attendance to no less than 12 (twelve) test sessions and submission of papers (project) *before deadline*. The grade obtained for the tests * (will be recorded in the electronic gradebook): **(P): min. 5 (five)** **(b) Grade for applications (A): min. 5(five)** **(c) Grade for theoretical knowledge(T): min. 5(five)**			

Date of filling in:		**Title Surname Name**	**Signature**
24.09.2019	Lecturer	Senior Lecturer, Eng. Zsolt ORBAN, PhD - Zsolt.Orban@cfdp.utcluj.ro Senior Lecturer, Eng. Remus CIOCAN, PhD Remus.ciocan@cfdp.utcluj.ro	
	Teachers in charge of application	Senior Lecturer, Eng. Zsolt ORBAN, PhD - Zsolt.Orban@cfdp.utcluj.ro Senior Lecturer, Eng. Remus CIOCAN, PhD Remus.ciocan@cfdp.utcluj.ro	

Date of approval in the department ……..

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Head of department
Gavril HODA, EngD, Reader

Date of approval in the faculty ……

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Dean
Nicolae CHIRA, EngD, Reader