

## Faculty of Civil Engineering

### Department of roads, airports and railways

#### Scientific field (Frascati Manual)

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Civil engineering

Municipal and structural engineering

Transport engineering

#### Brief description of expertise

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Consulting services in planning, design, construction and maintenance of railway infrastructure; Creation of case studies in the field of railway infrastructure; Professional support in the process of harmonization of bylaws in the field of railway infrastructure; Preparation of professional seminars to improve the knowledge of experts in practice in the field of railway infrastructure; Preparation of professional seminars to improve the knowledge of experts in practice in the field of railway infrastructure; Consulting services in the field of planning, design, construction and maintenance of road and airport infrastructure; Preparation of professional seminars to improve the knowledge of experts in practice in the field of road and airport infrastructure; Preparation of professional seminars to improve the knowledge of experts in practice in the field of CAD technology; Improvement of national regulations (policies) in the field of planning and design of roads and airports; Macrosimulation of traffic flows on non-urban road network; Assessment of indirect costs due to interruption of traffic caused by rehabilitation or reconstruction of road infrastructure facilities.

#### Keywords

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planning, design, construction, maintenance, railway infrastructure, road infrastructure, airports, maintenance management, financing, CAD

#### Commercial services

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Training through professional seminar courses for the application of the adopted standards "SRPS EN - Railway applications" in the design, construction and maintenance of railway infrastructure. Technical support for the implementation of interoperability requirements in the design, construction and maintenance of railway infrastructure; Technical assistance in the preparation of bylaws in the area of railway infrastructure; Consulting services in the field of planning, design, construction and maintenance of railway infrastructure; Technical control of project documentations for railway infrastructure; Creation of case studies for the railway infrastructure;

Preparation of professional seminars for improvement of civil engineering experts' knowledge in the field of CAD technology.

Control tests (ongoing and supervisory tests) during constructions works related to road infrastructure.

Making of Conceptual, Preliminary and Final designs of road and airport infrastructure projects.

Consulting services in the field of planning and design of road and airport infrastructure.

Consultancy services related to Public-Private Partnerships in transport infrastructure.

Feasibility studies for road infrastructure.

Technical verification of project documentation for all road and airport civil engineering facilities.

Studies for assessment of indirect cost due to partial or full closure of highway links caused by reahibilitaion or reconstruction work.

## Realized and current projects

### A) NATIONAL PROJECTS

Title	Project ID	Funding source	Duration
"Research of technical-technological, staff and organizational capacity of Serbian Railways, from the viewpoint of current and future European Union requirements" - in progress, Technological project funded by the Ministry of Education and Science of RS.	36012	Ministry of Education, Science and Technological Development	2011-2015
"Optimization of Highway Maintenance Management Systems", Technological project of the Ministry of Science and Technological Development of the Republic of Serbia, Head of Project: Prof. Aleksandar Cvetanović PhD. C.E. , University of Belgrade, FCE.	16032	Ministry of Education, Science and Technological Development	2008-2010

Title	Project ID	Funding source	Duration
"The planning and management of transport and communications using the methods of computational intelligence", Technological project of the Ministry of Science and Technological Development of the RS, Head of Project: Prof. Dušan Teodorović, Ph.D., T.E.	36002	Ministry of Education, Science and Technological Development	2011-2015
"The choice of methodology for dimensioning and optimization of technical solutions for gravitational marshallings yards".	NIP RZNS br. 5600	Republican Board of Science, Serbia.	1992
"The choice of typical station and connections with double track railway for speeds up to 160 km/h"	NIP RZNS T-183	Republican Board of Science, Serbia.	1988
"Research of the possibilities for application of waste and recycled materials in concrete composites, with the assessment of environmental impacts, in order to promote sustainable construction industry in Serbia"	36017	Ministry of Education, Science and Technological Development	2011-2015

Title	Project ID	Funding source	Duration
Development and application of improved performance concrete made with organic and inorganic binders for the purpose of technical and technological improvement of domestic construction industry.	16014	Ministry of Science and Technological Development of the Republic of Serbia	2008-2010

#### B) INTERNATIONAL PROJECTS

Title	Project ID	Funding source	Duration
2012 - 2013 Reconstruction and revitalization of railway infrastructure in accordance with regional development, Serbian-Slovak Science and Technology Co-operation,	No. 680-00-140/2012-09/10	Ministry of Science and Technological Development	2012 -2013
2010 -2012 "Provision of technical assistance to railway authorities in Bosnia and Herzegovina in harmonizing regulations for maintenance of railway infrastructure and rolling stock with the EU Directives", international project funded by EU	2009/218-973 (Ref. EuropeAid/127201/C/SER/BA)	The project was funded by the EU as EC external actions, financed from the budget of the European Commission to Bosnia and Herzegovina	2010 - 2012
BENEFIT - Business models for Enhancing Funding and Enabling Financing of Infrastructure in Transport (www.benefit4transport.eu)	grant agreement No 635973	HORIZON 2020, invitation: MOBILITY for GROWTH 2014-2015, Topic: Analysis of funding schemes for transport infrastructure, MG-9.3-2014	2014 - 2016

Title	Project ID	Funding source	Duration
X-ARA – Cross-Asset Risk Assessment	-	CEDR Transnational road research programme, Topic A: Ageing Infrastructure	2014 - 2016
COST Action TUD 1001 – Public Private Partnerships in Transport: Trends & Theory P3T3 <a href="http://www.ppptransport.eu/">http://www.ppptransport.eu/</a>	COST TU1001	COST – European cooperation in Science and Technology (www.cost.eu)	2010 - 2014
InteMat4PMS - Integration of material-science based performance models into life-cycle-analysis processed in the frame of pavement management systems	-	Cross-border funded ERANET ROAD (www.eranetroad.org) joint research programme “Design: Rapid and Durable Maintenance Methods and Techniques”	2011 - 2013
EVITA - Environmental Indicators for the Total Road Infrastructure Assets	-	Cross-border funded ERANET ROAD (www.eranetroad.org) joint research programme “ENR04 – Effective asset management meeting future challenges”, <a href="http://e-kpi.fehrl.org/?m=64">http://e-kpi.fehrl.org/?m=64</a>	2010 - 2012
COST 354 - Performance indicators for Road Pavements	COST 354	COST – European cooperation in Science and Technology (www.cost.eu)	2004 - 2008
COST 351 – WATMOVE - Water Movements in Road Pavements and Embankments	COST 351	COST – European cooperation in Science and Technology (www.cost.eu)	2004 - 2008

## Applicable research results

### PROTOTYPE

Title	Basic characteristics	Beneficiary
Strategic study with the medium-term plan and program of construction, reconstruction, maintenance and preservation of state roads 2010 - 2015	Work program of construction interventions on the Serbian road network for the period 2010 - 2015.	Public Enterprise: "Roads of Serbia"

Title	Basic characteristics	Beneficiary
Development of a framework and guidelines for the implementation of Public-Private Partnerships in financing of road infrastructure projects.	Guidelines for the implementation of PPP projects in road infrastructure	Public Enterprise: "Roads of Serbia"

#### TECHNICAL SOLUTION

Title	Basic characteristics	Beneficiary
Database of legal and technical regulations in the field of railway infrastructure	MS Access database for fast searching which contains European directives, TSIs and EN standards, as well as domestic legal and technical regulations in the field of railway infrastructure	Faculty of Civil Engineering, University of Belgrade, Railways of Serbia.
Technical solutions for application of fly ash from silos and landfills of TE JP EPS	The use of fly ash and slag in TE JP EPS for construction of railway substructure	Railways of Serbia, Electric Power Industry of Serbia.

Title	Basic characteristics	Beneficiary
Defining the Cause and Mechanism of Track Widening Phenomenon on Reconstructed Sections Trebaljevo - Kolašin and Mijatovo Kolo - Mojkovac On Rail Line Vrbnica - Bar. 2013; Branch of foreign company Costruzioni Linee Ferroviarie S.p.A. Podgorica	Determining the cause and mechanism of expansion track in curves of small radius of 300-500 m under the influence of a three axle bogie with a large length of the rigid base (2x2,70 m).	Railways of Montenegro for Infrastructure, ZGOP Novi Sad, Branch of foreign company Costruzioni Linee Ferroviarie S.p.A. Podgorica
Regulations for chemical treatment of weeds and bushes on Railways in BiH.	By-law for the maintenance of railway infrastructure	Railways of Bosnia and Herzegovina
Regulations for heat treatment of switch parts and ends of the rail for insulated rail joints, BiH.	By-law for the design, construction and maintenance of railway infrastructure.	Railways of Bosnia and Herzegovina
Regulations for insulated rail joints in railway superstructure.	By-law for the design, construction and maintenance of railway infrastructure.	Railways of Bosnia and Herzegovina
Regulations for maintenance of railway superstructure, BiH.	By-law for the design, construction and maintenance of railway infrastructure.	Railways of Bosnia and Herzegovina
Regulations for maintenance of railway substructure, BiH.	By-law for the design, construction and maintenance of railway infrastructure.	Railways of Bosnia and Herzegovina

Title	Basic characteristics	Beneficiary
Regulation of technical measures for determining vehicle loading and categories of railway bridges, culverts and other, BiH	By-law for the design, construction and maintenance of railway infrastructure.	Railways of Bosnia and Herzegovina
Regulation of technical norms for the construction of railway bridges, BiH	By-law for the design, construction and maintenance of railway infrastructure.	Railways of Bosnia and Herzegovina
Regulations of measures for traffic safety and the worker safety during construction works on the railway, BiH.	By-law for the design, construction and maintenance of railway infrastructure.	Railways of Bosnia and Herzegovina
Regulations of railway level crossing schemes, BiH	By-law for the design, construction and maintenance of railway infrastructure.	Railways of Bosnia and Herzegovina
Regulations for the categorization of railways, BiH.	By-law for the design, construction and maintenance of railway infrastructure.	Railways of Bosnia and Herzegovina
Instructions for mechanized maintenance works, maintenance of railway superstructure, BiH.	By-law for the design, construction and maintenance of railway infrastructure.	Railways of Bosnia and Herzegovina
Instructions for installing and maintenance of rails and switches for CWR, BiH.	By-law for the design, construction and maintenance of railway infrastructure.	Railways of Bosnia and Herzegovina
Instructions for the delivery and reception of crushed stone for ballast in BiH.	By-law for the design, construction and maintenance of railway infrastructure.	Railways of Bosnia and Herzegovina
Instructions for providing safety traffic during the winter, BiH.	By-law for the design, construction and maintenance of railway infrastructure.	Railways of Bosnia and Herzegovina
Instructions for the production, control and reception of prestressed concrete sleepers on the BiH railway network.	By-law for the design, construction and maintenance of railway infrastructure.	Railways of Bosnia and Herzegovina
Instructions for reception of wooden sleepers and control of their impregnation, BiH.	By-law for the design, construction and maintenance of railway infrastructure.	Railways of Bosnia and Herzegovina

Title	Basic characteristics	Beneficiary
Instructions for uniform criterias for control of the state of BiH rail network.	By-law for the design, construction and maintenance of railway infrastructure.	Railways of Bosnia and Herzegovina
Instructions for calculation and embedding of continuous welded rails on bridges, BiH.	By-law for the design, construction and maintenance of railway infrastructure.	Railways of Bosnia and Herzegovina
Instructions for the technology for protection against corrosion of rails, switches, bridges, cranes, BiH.	By-law for the design, construction and maintenance of railway infrastructure.	Railways of Bosnia and Herzegovina
Instructions for the preparation, control and implementation of clamps for rail S-49 and UIC 60 on the rail network of Bosnia and Herzegovina.	By-law for the design, construction and maintenance of railway infrastructure.	Railways of Bosnia and Herzegovina
Lectures at the seminar "Modern construction of superstructure"	Lectures on modern rail fastening systems for different tracks subgrades, electronic material on CD.	Serbian Railways, Institute of Transportation CIP, ZGOP Novi Sad, Railway Transport of Montenegro.
Study of wheel-rail contact and the basis of amendments to regulations BiH railways in that area.	Study of wheel-rail contact as the basis for the drafting of by-laws for the design, construction and maintenance of railway infrastructure.	Railways of Bosnia and Herzegovina
CSC - Cross section constructor, March and May in 2008.	Mass processing of cross sections of road infrastructure facilities.	Road and airports designers from the former Yugoslav republics and users of the GCM software.
GCMx64 - December 2008	Introducing users to the new version of the GCM software package.	Road and airports designers from the former Yugoslav republics and users of the GCM software.
3D Printing in GCM - September 2010	3D printing of models made with GCM software	Road and airports designers from the former Yugoslav republics and users of the GCM software.
GCM++ - July 2012	Introducing users to the new version of the GCM software package.	Road and airports designers from the former Yugoslav republics and users of the GCM software.



## Intellectual property

### SOFTWARE

Title	Owner	Inventor	Reg. No
Gavran Civil Modeller, GCM	Assistant Prof. Dejan Gavran, PhD. C.E.	Assistant Prof. Dejan Gavran, PhD. C.E., an Authorized Autodesk Developer	ADN DECS1525

## Licenses

Name	Last name	Type of license	License No
Zdenka	Popović	315 senior designer for roads and railways	315 N755 14
Goran	Mladenović	315 responsible (chief) designer of roads, railways and pavements	315 8866 04
Sanja	Fric	315 responsible (chief) designer of roads and railways	315 J47810

## Industry group (according to "Gazette RS", No. 54/10)

Construction of roads and railways

Management consultancy activities

Architectural and engineering activities and related technical consultancy

Technical testing and analysis

Research and experimental development on natural sciences and engineering

Higher education

## Accredited laboratories

Title	Contact person
Laboratory for pavements	Goran Mladenović

## PhD thesis within the unit done according to the industry needs

Name	Last name	Title	Year	Mentor
Sanja	Fric	Theoretical and experimental investigation of limit trajectories of driving in rural road curves	2014	Prof. Goran Mladenović, PhD C.E.

Name	Last name	Title	Year	Mentor
Goran	Mladenović	Optimization of pavement maintenance	2009	Prof. Aleksandar Cvetanović, PhD C.E.

#### Staff list within the unit

Name	Last name	Teaching/scientific title
Zdenka	Popović	Associate professor
Luka	Lazarević	Research and Teaching Assistant - PhD student
Milica	Vilotijević	Research and Teaching Assistant - PhD student
Goran	Mladenović	Associate professor
Marko	Orešković	Research and Teaching Assistant - PhD student
Dejan	Gavran	Assistant professor
Vladan	Ilić	Research and Teaching Assistant - PhD student
Filip	Trpčevski	Research and Teaching Assistant - PhD student
Sanja	Fric	Assistant professor