

## EXTREME LOADING ANALYSIS OF PETROCHEMICAL PLANTS AND DESIGN OF METAMATERIAL-BASED SHIELDS FOR ENHANCED RESILIENCE

<http://r.unitn.it/en/dicam/xp-resilience>

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# Short Course on Introduction to High-performance computing and data science

3<sup>th</sup> and 4<sup>th</sup> of July 2019,

Institute of Structural Engineering, Earthquake Engineering and Construction IT,  
Faculty of Civil and Geodetic Engineering, University of Ljubljana  
Jamova 2, SI1000 Ljubljana, Slovenia

### Course objective

High-performance computing facilitates the simulations of the response of the built environment to hazards which threaten the quality of life of citizens and the functionality of the built environment. It enables to perform many simulations of the physics-based processes regardless of the level of the detail used for their description.

The course objective is to provide participating students with key concepts, tools and methodologies that would enable them to start developing unique solutions for their areas of research and development where knowledge of different computing environments, data science methodologies, and programming languages and tools are needed.

### Learning outcomes

Through the course the students will learn about:

- different computing environments (e.g. high-performance, high-throughput)
- basic methodologies in developing a software solution
- basic programming tools and libraries using Python programming language
- data science methodologies
- high-level overview of building information modelling (BIM) and Construction 4.0

### Who should attend

The short course is intended for graduate students of Engineering (primarily Civil Engineering), postdoctoral researchers and practitioners interested in simulations and solutions that require the use of different computing environments and/or novel data science requirements for seismic performance assessment of structures. Some topics may be interesting for undergraduate students of the 2<sup>nd</sup> Cycle Study Programmes related to Civil Engineering.

## Course schedule

Wednesday, 3<sup>th</sup> July 2019

Lectures		
		Introductory lectures
9:00 – 10:00	Matevž Dolenc,	Introduction to Building Information Modelling (BIM)
10:00 – 11:00	Matevž Dolenc	Construction 4.0
11:00 – 12:00	Matevž Dolenc	High-performance / High-throughput computing environments
Tutorials		
14:00 – 17:00	Matevž Dolenc	<b>Python programming</b> Introduction to programming Python programming Python libraries for data science

\* 45 min of effective lectures per hour

Thursday, 4<sup>th</sup> July 2019

Lectures		
9:00 – 11:00	Matevž Dolenc	HTCondor computing environment
11:00 – 12:00	Matjaž Dolšek	Applications of HPC / HTC for risk analysis and resilience estimation
Tutorials		
14:00 – 17:00	Matevž Dolenc, Jure Žižmond, Matjaž Dolšek	Using HPC / HTC environments for risk analysis and resilience estimation <ul style="list-style-type: none"><li>• HTCondor system</li><li>• Using remote access Linux</li><li>• Applications – IDA analysis, estimation of risk-targeted behaviour factor using web application, ...</li></ul>

## Suggested Readings

1. Cerovsek T, A review and outlook for a 'Building Information Model' (BIM): A multi-standpoint framework for technological development, Advanced Engineering Informatics, Volume 25, Issue 2, 2011, Pages 224-244, ISSN 1474-0346, <https://doi.org/10.1016/j.aei.2010.06.003>. <http://www.sciencedirect.com/science/article/pii/S1474034610000479>
2. Construction 4.0, <http://www.fiec.eu/en/themes-72/construction-40.aspx>
3. High Throughput Computing: An Interview With Miron Livny, <http://research.cs.wisc.edu/htcondor/HPCwire.1>
4. Python programming language, <https://python.org>
5. Python Anaconda, Recommended Python distribution, <https://www.anaconda.com/distribution/>
6. Dolšek M. Incremental dynamic analysis with consideration of modeling uncertainties. Earthquake Engineering & Structural Dynamics, 2009, 38(6):805-825.
7. Klinc R, Šebenik Ž, Dolšek M, Brozovič M, Dolenc M. A web-based system for the selection of characteristic ground motions, 2019, Advances in Engineering Software (in press).

## Registration

Please register by sending email to [mdolsek@fgg.uni-lj.si](mailto:mdolsek@fgg.uni-lj.si). The deadline for the registration is 10<sup>th</sup> of June 2019. There is no registration fee.

## Short Biography of lecturers

<b>Matevž Dolenc</b>	<b>Assistant Professor of Civil and Environmental engineering at Faculty of Civil and Geodetic Engineering, University of Ljubljana, Slovenia</b>
 <p>Univerza v Ljubljani</p> 	<p>Dr. Matevž Dolenc (<a href="http://matevzdolenc.com">http://matevzdolenc.com</a>), holds B.Sc. and Ph.D. in Structural Engineering from the Faculty of Civil and Geodetic Engineering, University of Ljubljana, Slovenia and a member of research program E-Construction. He was an invited speaker at several international conferences and is a visiting lecturer at Cork University where he lectures on computer-mediated communication. His academic interests include construction information technology, design communication, the Web and grid/cloud computing. He has technical expertise in client-server systems, component-based and service-based software development, grid/cloud technology, high-throughput and high-performance computing systems, open standards, and open source technologies. He participated in many national and EU projects, including IntelliGrid (Interoperability of Virtual Organizations on a Complex Semantic Grid, EU FP 6, IST-2004, <a href="http://inteligrid.eu-project.info">http://inteligrid.eu-project.info</a>) and ISES (Intelligent Services For Energy-Efficient Design and Life Cycle Simulation, EU FP 6, FP7-ICT-2011-7, <a href="http://ises.eu-project.info">http://ises.eu-project.info</a>) among others.</p>
<b>Matjaž Dolšek</b>	<b>Professor of Civil and Environmental engineering at Faculty of Civil and Geodetic Engineering, University of Ljubljana, Slovenia</b>
 <p>Univerza v Ljubljani</p> 	<p>Matjaž Dolšek is Professor of Civil Engineering and Environmental Engineering at Faculty of Civil and Geodetic Engineering, University of Ljubljana, Slovenia, and Head of research program Earthquake Engineering. He has participated in several European projects (SPEAR, LESSLOSS, SERIES, STREST, NEWREBAR, XP-RESILIENCE) and was the project leader of three national basic research projects. He is the project leader of the research project Seismic stress test of the built environment. He is a member of the Slovenian Chamber of Engineers, a member of the Slovenian and the European Association for Earthquake Engineering. He was a member of Project Team 1 (CEN/TC250/SC8-PT1) who drafted the second generation of standard for earthquake-resistant design of structures - Eurocode 8 and a member of technical committees of Slovenian Institute for Standardization. He is the (co)author of more than 100 publications in peer-reviewed Journal or Conference proceedings. He participated in around 30 consulting projects in the field of evaluation of the seismic resistance of structures, determination of earthquake parameters for the design of structures and fragility analysis including for structures important for nuclear safety.</p>
<b>Jure Žižmond</b>	<b>Assistant of Civil and Environmental Civil Engineering at Faculty of Civil and Geodetic Engineering, University of Ljubljana, Slovenia</b>
 <p>Univerza v Ljubljani</p> 	<p>Jure Žižmond is Assistant of Civil Engineering and Environmental Civil Engineering at Faculty of Civil and Geodetic Engineering, University of Ljubljana, Slovenia, and member of research program Earthquake Engineering. His current research is focused on the development of methods for risk-targeted force based designed and evaluation of the impact of the new type of reinforcing steel (dual-phase steel) on seismic performance of a structure. He has participated in research projects Design of structures for tolerable seismic risk using non-linear methods of analysis and Seismic stress test of the built environment, founded by Slovenian Research agency, and European projects SERIES and NEWREBAR. He published several papers in national and international journals and participated in the industry project focused on the development of risk-based seismic design rules for energy-efficient houses. Recently he has worked as part of a consultancy team from the Faculty of Civil and Geodetic Engineering, involved in the independent evaluation of project documentation for designing of a new and upgrading existing facilities of Nuclear Power Plant Krško. He is a member of the Slovenian Chamber of Engineers.</p>

## Registration

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## Information about the venue and accommodation

### Venue

The meeting and the workshop will be held at the **Faculty of Civil and Geodetic Engineering** (see Figure 1). It is located on **Jamova cesta 2, Ljubljana (46.0457525, 14.4949470)**, about 20 minutes walking from Grand Hotel Union. For instructions click [here](#) (see also Figures 2 and 3).



Figure 1: Faculty of Civil and Geodetic Engineering

It is recommended that you arrive from Jamova cesta as indicated in Figures 2 and 3. In this case, you will see the building of the Faculty on your right-hand side (as shown in Figure 1). The signs inside the building will show the direction to the lecture room.

### Parking

If you arrive by car, a few parking places will be available at the Faculty (ring the bell in front of the entrance to the parking and say that you are attending the short course). In case there is no place left, there is a public parking lot 100 m north from the Faculty building (Figure 2).

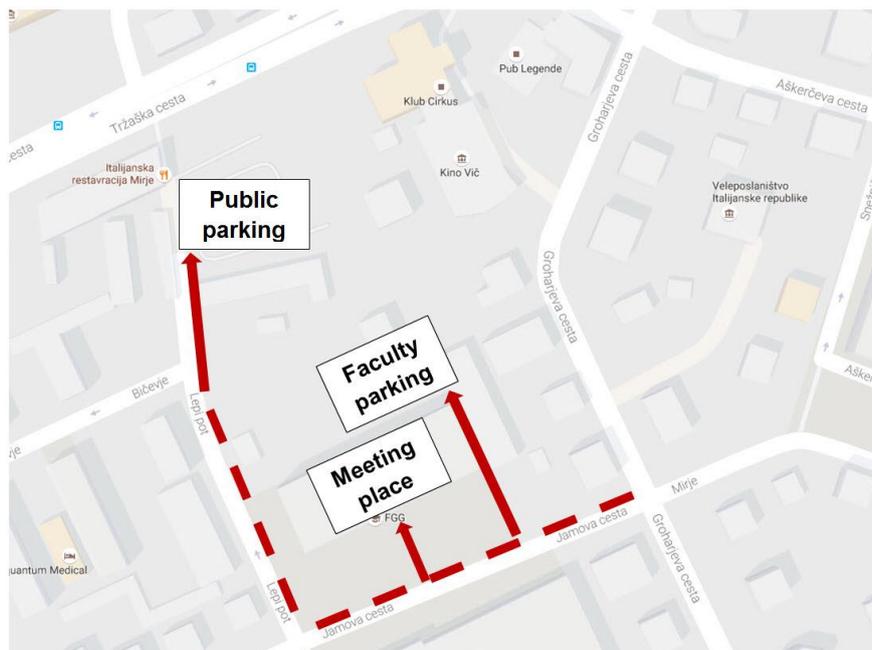


Figure 2: The Meeting place and possible parking places

## **Accommodation**

There are plenty of hotels downtown of Ljubljana, which is a walking distance to the Faculty. However, it is advised that participants book the accommodation in advance since the prices can increase if a booking is made less than two weeks before arrival. Perhaps the good option is to look on Airbnb in addition to booking.com and other providers for hotels. Please do not hesitate to contact us if you need further advice.

## **From the airport to downtown**

Upon your arrival at Ljubljana Jože Pučnik Airport, you can reach your hotel either by using a public bus service, a shuttle or by taxi. The bus has frequent itineraries every hour from 5 am to 8 pm, takes about 45 minutes to the bus station (J at Figure 2), which is a ten-minute walk from the centre of the city, and costs about 4 Euros. The shuttle ("[MARKUN shuttle](#)") takes you anywhere in the centre of Ljubljana for 9 Euros. Taxi service is available on a 24-hour base. A 30-minute drive costs approximately 40 Euros (ask for the price).

There are possibilities to fly to Trieste, Zagreb or perhaps Venice. In this case, you will need shuttle service for travelling to Ljubljana (e.g. [www.GoOpti.com](http://www.GoOpti.com)).

Other general information for the city of Ljubljana could be retrieved from:

<https://www.visitljubljana.com/en/visitors/>

<http://www.ljubljana.info/>

## **Contacts for logistic information:**

Jure Zizmond, office: +38614768611; [jizmond@fgg.uni-lj.si](mailto:jizmond@fgg.uni-lj.si)

Matjaz Dolsek, office: +38614768612; [mdolsek@fgg.uni-lj.si](mailto:mdolsek@fgg.uni-lj.si)

Please do not hesitate to contact us if you need some additional information.

## **Additional information:**

June 25<sup>th</sup> is Statehood Day, commemorating Slovenia's declaration of independence from Yugoslavia in 1991. It is a work-free day. The national ceremonial celebration will be held on 24<sup>th</sup> June at Kongresni trg (downtown Ljubljana), starts at 21:15.