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Cost Action CA18203 - Optimizing Design for Inspection (ODIN)

PRACTICAL INFORMATION GUIDE TECHNICAL PROGRAMME



Training School on COmputational Modelling and Advanced Design Approaches (COMADA)

Belgrade, Serbia

Date: March 13-15th, 2024

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About COST

The European Cooperation in Science and Technology (COST) is a funding organisation for the creation of research networks, called COST Actions. These networks offer an open space for collaboration among scientists across Europe (and beyond) and thereby give impetus to research advancements and innovation.

COST is bottom up, this means that researchers can create a network - based on their own research interests and ideas - by submitting a proposal to the COST Open Call. The proposal can be in any science field. COST Actions are highly interdisciplinary and open. It is possible to join ongoing Actions, which therefore keep expanding over the funding period of four years. They are multi-stakeholder, often involving the private sector, policymakers as well as civil society.

Since 1971, COST has received EU funding under various research and innovation framework programs, such as Horizon 2020.

COST funding intends to complement national research funds, as they are exclusively dedicated to covering collaboration activities, such as workshops, conferences, working group meetings, training schools, short-term scientific missions, and dissemination and communication activities. For more information, please go to the Funding section of the COST website (<https://www.cost.eu/>).

The COST Association places emphasis on actively involving researchers from less research-intensive COST Countries (Inclusiveness Target Countries, ITC¹). Researchers from Near Neighbour Countries and International Partner Countries can also take part in COST Actions based on mutual benefit. For more information, please visit the global networking page (<https://www.cost.eu/>).



¹Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Macedonia, Hungary, Latvia, Lithuania, Luxembourg, Malta, Montenegro, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Turkey

Cost Action CA18203 - Optimizing Design for Inspection (ODIN)

This Action will maximize the full benefit of in service, continuous monitoring of critical aerospace structures by integrating ultrasonic wave based non-destructive evaluation (NDE), energy harvesting and wireless sensor technologies at the design conception phase.

Optimization (of sensors and structures), computational modelling, advanced signal processing and advanced design approaches will be integrated to produce a novel framework, design tools and guidelines for the delivery of the first generation of self-sensing aircraft capable of delivering accurate structural prognosis.

Ultrasound based NDE techniques, energy harvesting and wireless sensor networks are being increasingly demonstrated to be effective in monitoring damage in aerospace components at a laboratory setting.

These components include critical elements such as airframe, engines, landing gear and control surfaces. However, there is an urgent need to integrate these approaches and techniques at the inception of an aircraft. This COST Action will bring together the top European experts across these areas to support the development of an integrated framework for optimized self-sensing structures capable of diagnosis and prognosis, together with demonstrators and educational activities, including training programs, which will ultimately lead to cleaner and safer skies.



General information

Start of Action: 02/10/2019

End of Action: 01/04/2024

MAIN CONTACTS

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Domain website: <https://www.cost.eu/actions/CA18203/>

Action's Working Groups

Working group 1	<p>Design, Optimisation and Integration</p> <p>This group will encompass industrial aerospace design engineers and experts, mathematicians, computer scientists and optimizers with the objective to analyse the requirements for integrating SHM systems at the inception of an aerospace design. A significant challenge for this group is to ensure that specific aerospace requirements are communicated effectively and efficiently to the SHM system designers.</p>
Working group 2	<p>Damage detection</p> <p>This group will focus on the analysis of existing strategies including sensor technologies. They will quantify the capability of systems to identify damage in new structures, power level requirements and compare state of the art signal processing approaches to damage location and characterisation. Finally, the group will deliver a strategy for sharing data and signal processing algorithms.</p>
Working group 3	<p>Power management and energy harvesting</p> <p>Power requirements are a crucial element of this Network. Currently there is a power gap between low power systems and the available energy through current harvesting approaches. Furthermore, there are large disparities between published data and that which is achievable based on methods of testing and analysis. Therefore, this group will seek to develop a detailed understanding of current vibration levels and temperature differences and the location or position they would be found on an aircraft and standard testing procedures to allow a comparison across European research groups. There will be cross work group activities associated with this group.</p>
Working group 4	<p>Wireless Communications</p> <p>Wireless communication is of great importance to unlocking the potential of SHM systems in aerospace, bridge structures and wind turbines. However, the greatest challenge lies in aerospace where there is a restriction in allowable wireless protocols and the complex geometry that signals have to propagate through and around. The working group will focus on aerospace protocols and strategies that will reduce power requirements at a sensor node. In addition, the working group will review the safety and security of existing protocols.</p>
Working group 5	<p>Data management and signal processing</p> <p>This working group will focus on human interface, data interpretation, data presentation, data mining, data efficiency/reduction and hardware integration. There are three tasks associated with this working group. The group will be heavily linked to WG1 and WG2. In addition, there will be strong activities focused on low power processing to reduce power consumption of systems.</p>

Agenda²

	Day 1 – 13.03.2024		Day 2 – 14.03.2024		Day 3 – 15.03.2024
Time		Time		Time	
09:00 - 10:30	Welcome / First session	09:00 - 10:30	Fourth session	09:00 - 10:30	Seventh session
10:30	Coffee break	10:30	Coffee break	10:30	Coffee break
10:45 – 12:00	Second session	10:45 – 12:00	Fifth session	10:45 – 12:00	Eight session
12:00 - 13:30	Lunch	12:00 - 13:30	Lunch	12:00 - 13:30	Lunch
13:30 - 17:00	Third session	13:30 - 17:00	Sixth session	13:30 - 17:00	Ninth session
				17:00	End of the training school

²Please note, this is a provisional agenda. A more detailed one will be sent to you as we approach the beginning of the training school.

Belgrade

Belgrade is the capital and largest city of Serbia. It is located at the confluence of the Sava and Danube rivers and at the crossroads of the Pannonian Plain and the Balkan Peninsula. The population of the Belgrade metropolitan area is 1,681,405, according to the 2022 census. It is one of the major cities of Southeast Europe and the third most populous city on the Danube River.



Following the Serbian Revolution, Belgrade was once again named the capital of Serbia in 1841.

Northern Belgrade remained the southernmost Habsburg post until 1918, when it was attached to the city, due to former Austro-Hungarian territories becoming part of the new Kingdom of Serbs, Croats and Slovenes after World War I. Belgrade was the capital of Yugoslavia from its creation in 1918 to its dissolution in 2006. In a fatally strategic position, the city has been battled over in 115 wars and razed 44 times, being bombed five times and besieged many times.

Being Serbia's primate city, Belgrade has special administrative status within Serbia. It is the seat of the central government, administrative bodies, and government ministries, as well as home to almost all of the largest Serbian companies, media, and scientific institutions. Belgrade is classified as a Beta-Global City. The city is home to the University Clinical Centre of Serbia, a hospital complex with one of the largest capacities in the world; the Church of Saint Sava, one of the largest Orthodox church buildings; and the Štark Arena, one of the largest capacity indoor arenas in Europe.



Thanks to its very favorable geographical position, rich historical heritage from different civilizations, as well as its widely known local hospitality and excellent food, today Belgrade is one of the most visited touristic centers in Europe.

As a city that preserves memories of famous Serbs, such as great inventor Nikola Tesla and Nobel prize laureate Ivo Andrić, you simply have to visit Belgrade.

Ivo Andrić, Serbian Nobel prize laureate, wrote about Belgrade:

"The sky above Belgrade is wide and high, unstable but always beautiful; even during winter serenities with their icy splendor; even during summer storms when the whole of it turns into a single gloomy cloud which, driven by the mad wind, carries the rain mixed with the dust of panonian plain; even in spring when it seems that it also blooms, along with the ground; even in autumn when it grows heavy with the autumn stars in swarms. Always beautiful and rich, as a compensation to this strange town for everything that isn't there, and a consolation because of everything that shouldn't be there. But the greatest splendor of that sky above Belgrade that are the sunsets. In autumn and in summer, they are broad and bright like desert mirages, and in winter, they are smothered by murky clouds and dark red hazes. And in every time of year frequently come the days when the flame of that sun setting in the plain, between the rivers beneath Belgrade, gets reflected way up in the high celestial dome, and it breaks there and pours down over the scattered town. Then, for a moment, the reddish tint of the sun paints even the remotest corners of Belgrade and reflects into the windows, even of those houses it otherwise poorly illuminates."

City attractions worth visiting:

It is strongly recommended to use your free time and visit some of the most popular and historically more important places and attractions in Belgrade:

Belgrade Fortress



This fortress, constructed all throughout the 1st to the 18th century, with the aim of being a strategic place for defense on the hill above the confluence of the Sava and Danube rivers, today represents an outdoor museum. The Pobednik Monument (The Victor), which is the symbol of Belgrade, is the focal point of the entire area, which is made up of the Belgrade fortress, divided into the Upper and Lower Town and Kalemegdan Park. Don't miss out on seeing the

Roman Well, the Great Gunpowder Warehouse, the Military Bunker, and the Clock Tower on your walk. Take a look at the numerous exhibitions in the Military Museum, the Nebojša Tower, and the Museum of Natural History. The Great Kalemegdan Staircase will bring you to a place with a breathtaking view over the Sava and Danube confluence of Novi Beograd and Zemun. Down the landscaped path, you can see many sculptures from the turn of the 20th century, erected in honor of writers, composers, and other public figures.

Knez Mihailova street



Knez Mihailova Street is one of the oldest and most important streets in Belgrade, and also evidence of the continuous existence of the city. The present-day situation shows that the street has kept its authentic size, profile, and direction. Built almost simultaneously, the houses have uniform architectural forms. The materials used, the construction, function, and style of the building in this street belong to the period when Belgrade architecture ceased to follow

the principles of Balkan architecture and adopted European styles in building. Although some of the houses on the street front have been altered or replaced in the twentieth century, Knez Mihailova has preserved the character of a representative commercial street. Towards the end of the twentieth century, Knez Mihailova evolved into a cultural center of the capital.

Republic Square

The main meeting place in Belgrade, is the starting point of the city tour. The square, as a cultural and social hub of Belgrade, where the past meets the present, is the place where the youth gathers and where concerts and events are held. It is surrounded by historical buildings - the National Theatre built emulating La Scala in Milan, Riunione Palace housing Boško Buha Theatre, and the monumental edifice of the National Museum, the largest and oldest Serbian



museum. The monument to Prince Mihailo Obrenović, the work of the famous Venetian sculptor Enrico Pazzi, occupies the central area of the Square. It was set up in 1882, in memory of the Prince who improved the economic and cultural life in Serbia, and who was assassinated in 1868.

The Old Palace at Pionirski Park

The former Karadjordjevic family Royal garden was redecorated after World War II in 1945 into a city park, which was renamed Pionirski Park in 1952 because of the fountain dedicated to pioneers. Spread over 3,6 hectares, this park represents a unique natural oasis with historical and cultural monuments in the city center. In Pionirski Park, there is the Old Palace - the Assembly of the City of Belgrade and the New Palace, or the seat of the President of the Republic of Serbia.



Nobel Prize winner Ivo Andric has his monument in the park, and the area around the monument is called Andric's Wreath (Andricev Venac). The monument to Nadezda Petrovic is also located in this decorated zone. An important historical monument, the Observation Post of the Serbian Army High Command on Kajmakalan, is located at the very end of the park, facing the National Assembly and Bulevar Kralja Aleksandra street. Pioneer fountain, fountain "Girl with the jug" (Devojka sa krcagom), 73 benches, and

space for children with props enrich the magnificent park. Pionirski Park is considered one of the most beautiful parks in Belgrade, and the greenery that is regularly maintained contributes to this title. Rare plant species, more than two hundred years old oak, coniferous trees of domestic and foreign origin and decorative plantations make the park an authentic green paradise in the main city zone.

Aleksandar Karadjordjevic became the first man of the country in 1842. However, he did not have his court. For this purpose, a villa with a large courtyard on Terazije was bought. During his reign until 1934, the area around the villa was surrounded by high walls. After the liberation of Belgrade, on 20th October 1944, the walls were demolished, and the park became the central gathering place for both Belgraders and all those who came to the city.

Skadarlija - Bohemian center of Belgrade

Even though there's no gateway coming up to Skadarlija, when you enter this street from the hustle and bustle of busy Belgrade, it's as if the gates from a past time open and lead you into this corner where you can feel the historical atmosphere. Belgrade citizens and guests alike excitedly come to spend their nights in this cobblestoned street with the aim of experiencing the essence of a pastime. Skadarlija became a bohemian part of the city at the turn of the 20th century when actors, writers, and painters moved there, and the taverns of Skadarlija became the gathering places of the most famous individuals who were part of Belgrade culture. This Belgrade quarter is compared to the Montmartre in Paris in terms of the appearance and the cheerful, arty atmosphere. In present day restaurants of Skadarlija, besides traditional specialties, the sounds of urban traditional folk music and the greetings you will receive from the lady of Skadarlija will help you experience the atmosphere of the bohemian Belgrade from the past.



As an old urban ambiance, Skadarlija represents a combination of interlinked material and spiritual values that grew from the beginning of the eighteenth century to the present day. The first houses were built in that part of Belgrade in 1717 - 1739 as part of the exterior defensive belt of Belgrade. They influenced the direction of the shape of Skadarska Street. The house where the well-known Serbian writer and painter Đura Jakšić spent his life

was turned into a meeting point for poets during their nights in Skadarlija.

The Nikola Tesla Museum



(<https://tesla-museum.org/en/home/>)

The Museum is housed in the family residence of the industrialist and politician Đorđe Genčić, built-in 1927. The Museum is completely dedicated to the genius inventor, scientist and engineer Nikola Tesla, who gifted humanity with a great many significant discoveries and inventions. His inventions in the fields of electrical engineering, mechanical engineering, radio technology, and wireless control represent significant breakthroughs in science and technology and have changed the world around us with their ingenious solutions and universal applications.



The Nikola Tesla Museum in Belgrade was opened to the public on 20th October 1955. It was the first technical museum in Yugoslavia. The opening presented the permanent exhibition, which gave visitors the opportunity to see models built accurately according to Tesla`s drawings. Perhaps the most celebrated of these demonstrates the effects of a rotating magnetic field. The Egg of Columbus, which had amazed visitors to the 1893 World`s Fair in

Chicago, was also displayed to the Belgrade public. Also, Tesla`s first induction motor, a model hydroelectric power plant that illustrated Tesla`s polyphase transmission system, various generators and transformers, and a remote-controlled model boat were on display. The most popular exhibit for visitors today is the Tesla coil with antenna, which was the basis for the fluorescent light.

The Nikola Tesla Museum is today, by any criteria, a scientific and cultural institution that is unique in Serbia and the world. It is the only museum preserving the original and personal legacy of Nikola Tesla.

The Museum of Yugoslavia



(<https://muzej-jugoslavije.org/en/>)

The collection of the Museum of Yugoslav History, i.e., the Museum itself, was created by joining the collections of the "Josip Broz Tito" Memorial Center and the Museum of the Revolution of Yugoslav Peoples. Over 200,000 exhibits chronicle the history of Yugoslavia in the 20th century, with a special



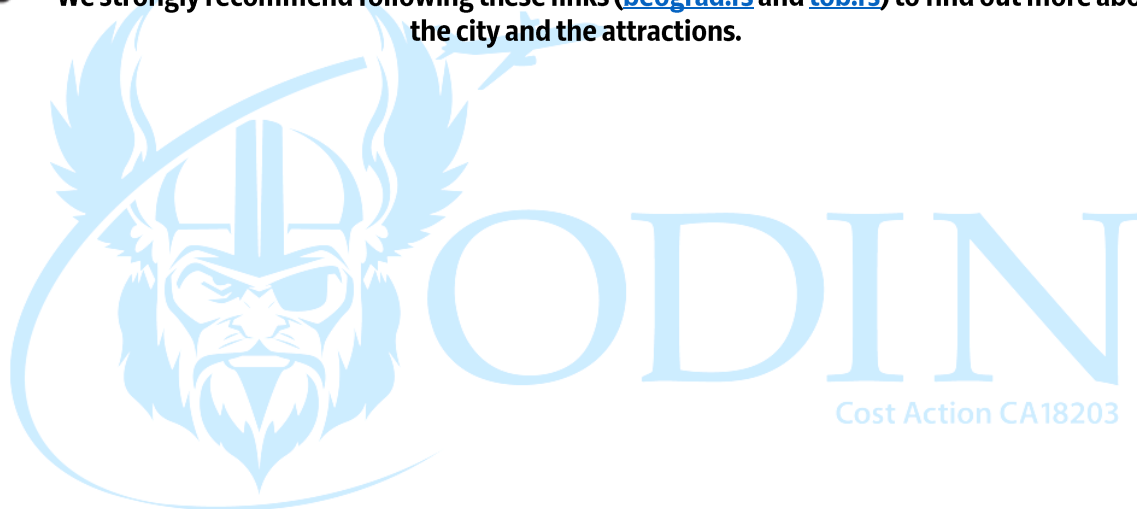
emphasis on the life and work of Josip Broz Tito. The Museum of Yugoslav History houses the 25th May Museum, the Old Museum, and the House of Flowers. The Museum also encompasses a park with sculptures by artists Augustinčić, Kršinić, Bodnarov, Vladeta Petrić, etc.



Every weekend, all visitors who have paid for their tickets will have the opportunity to enjoy free guided tours of the Museum of Yugoslav History in both English and Serbian. The tour starts from the entrance gates of the Museum and winds through all sections of the Museum - from Sculpture Park, the House of Flowers, and the Old Museum all the way to the 25th May Museum.



We strongly recommend following these links (beograd.rs and tob.rs) to find out more about the city and the attractions.



Before arriving in Serbia, important to note:

- Serbia is not yet part of the European Union/EEA/Schengen area. Therefore, some of the rules/procedures that are known to you/you are accustomed to do not apply here!
Take your passport!
- The national currency is used for payments/monetary matters.
Cards/Euros for payment/exchange are used for exchange here; the national currency is DINAR (RSD).
Unless you must, we advise you not to exchange a lot of money. There won't be any place other than Serbia where you can actually use them.
- In Belgrade you can pay only by Credit card or by Dinars.
Usually, 1€=118 RSD. This is the average.
- European power plug is used.
- Water is safe to be drunk from the tap, ask just in case.

How to reach Belgrade

By Plane

Arriving by plane to Belgrade (BEG)

Arriving by plane to Belgrade (BEG) is the best option.

Belgrade Nikola Tesla Airport is located 18 km west of downtown Belgrade near the suburb of Surčin, surrounded by fertile lowlands. The Belgrade Airport has excellent connections with almost all airports in Europe, among them:

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- | | | |
|--------------|--------------|-------------------|
| ✈ Frankfurt, | ✈ Stockholm, | ✈ Budapest, |
| ✈ London, | ✈ Istanbul, | ✈ Zagreb, |
| ✈ Vienna, | ✈ Barcelona, | ✈ Memmingen, |
| ✈ Skopje, | ✈ Athens, | ✈ Basel-Mulhouse, |
| ✈ Rome, | ✈ Bucharest, | ✈ ... |
| ✈ Zurich, | ✈ Larnaca, | |

- **After landing, the best option is to take a Minibus A1 (Airport – Square "Slavija" - [bus](#)), or a taxi (A counter for issuing certificates of fixed price (vouchers) for taxi transport is located in the international arrivals area).**



Important! – Belgrade has a problem with non-licensed taxis; therefore, avoid a taxi in front of the airport building.

Renting a car is not a good option in Belgrade, due to the big problem with parking places in the Center where the Training school will be held.

How to reach the training school

Belgrade has an official public transport (buses, trams, trolleybuses).

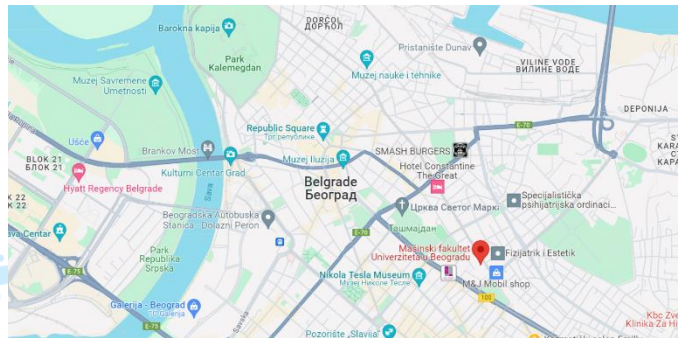


You can temporarily install the public transportation app available on [Google Play store](#) or use the [Moovit app](#)

Venue

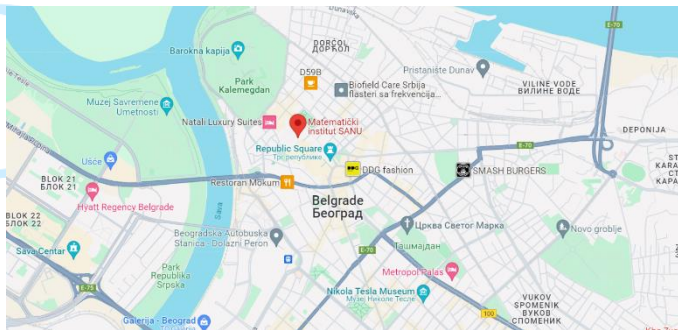
- For the first two Training School days:
13-14/03/2024

Meeting [Location](#) – Faculty of Mechanical Engineering, University of Belgrade, Kraljice Marije 16, 11120 Belgrade - see [link](#)
- the nearest public transport stations: "Masinski fakultet" – lines 2, 5, 65
"Vukov spomenik" – lines 2, 5, 27, 74, EKO1
"Tehnicki fakulteti" – lines 26, 27, 74, EKO1



- For the third Training School day:
15/03/2024

Meeting [Location](#) – Mathematical Institute of the Serbian Academy of Sciences and Arts, Kneza Mihaila 36, 11000 Belgrade - see [link](#)
- the nearest public transport station "Studentski trg" – lines 28, 29, 31, 41, E9, EKO2



(Exact room[s] for the Training school - TBA)

Faculty of Mechanical Engineering; University of Belgrade

Faculty of Mechanical Engineering; University of Belgrade is one of the oldest and largest higher education and scientific institutions in the field of mechanical engineering in the region. The first engineering school was formed back in 1846, and the beginning of teaching and education at the higher education level in the field of mechanical engineering dates back to 1873. It is actively engaged in scientific research activities in accordance with the needs and requirements of the economy and industry in Serbia and the region. The more than 300 employed teachers and associates, as well as more than 40 research associates engaged in domestic and international projects, represent one of the largest teaching-research-development potentials in Serbia. The Faculty participates and engages young researchers in a significant number of scientific research projects on national as well as international levels.

Mathematical Institute of the Serbian Academy of Sciences and Arts

The Mathematical Institute of the Serbian Academy of Sciences and Arts (MISANU) was founded in 1946 as the first institute of the Academy. Today, the Institute consists of three scientific research departments (Mathematics, Mechanics, and Computer Science and Applied Mathematics), four research centers, and about 20 seminars. Since 1990, MISANU members have been involved in many national and international projects. MISANU represents a unique center for research in the field of mathematics, computer science, and mechanics in Serbia, with more than 70 full-time researchers and important research collaborations with all university centers in Serbia, as well as a lot of Public Organizations and Industry representatives. One of the seminars - Seminar Mechanics of Machines and Mechanisms - Models and Mathematical Methods is a place for exchanging views and ideas through lectures and discussions in the research area of Applied Mechanics and Mechanical Engineering.

Meals & Refreshments

Refreshments will be served during the meeting according to the program schedule/as agreed.

Accommodation

Belgrade has numerous options for hotels and accommodation. Feel free to pick the one you find suitable and appropriate.



<https://www.tob.rs/en/where-to-stay>

It is recommended that the accommodation is either within walking distance of both venue locations (the best solution is the accommodation near the Center of Belgrade or between the Faculty of Mechanical Engineering and the Mathematical Institute).

Few recommendations:

- Hotel Palace - <https://palacehotel.rs/>
- Hotel Indigo - <https://www.hotelindigo.com/hotels/gb/en>
- Hotel Constantine the Great - <https://www.constantinethegreatbelgrade.com/>
- Eva Apartments (6 small studios in very good location and with good prices are available) – Apartments that our guests already booked and recommended. It is very important to reserve as soon as possible via the following booking website:
 - <https://www.apartmani-u-beogradu.com/en/apartments-belgrade/one-bedroom-apartment-eva-belgrade-center>
 - <https://www.apartmani-u-beogradu.com/en/apartments-belgrade/one-bedroom-apartment-eva-2-belgrade-center>
 - <https://www.apartmani-u-beogradu.com/en/apartments-belgrade/one-bedroom-apartment-eva-3-belgrade-center>
 - <https://www.apartmani-u-beogradu.com/en/apartments-belgrade/one-bedroom-apartment-eva-4-belgrade-center>
 - <https://www.apartmani-u-beogradu.com/en/apartments-belgrade/studio-apartment-eva-5-belgrade-center>
 - <https://www.apartmani-u-beogradu.com/en/apartments-belgrade/studio-apartment-eva-6-belgrade-center>

Social events - optionally

1. Have a dinner in the city center
2. Visiting Nikola Tesla Museum
3. Belgrade Center sightseeing walking tour, including Knez Mihailova Street and Belgrade Fortress

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For all additional questions, feel free to send an e-mail to the local organizers:

Natasa Trisovic ntrisovic@mas.bg.ac.rs;

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