



ZAVOD ZA
GRADBENIŠTVO
SLOVENIJE

SLOVENIAN NATIONAL
BUILDING AND CIVIL
ENGINEERING INSTITUTE



programme



sHERezad: Sustainable Built Heritage

1st International Summer School

In situ techniques
in preservation of built heritage

2-4 JULY 2024

Slovenian National Building and
Civil Engineering Institute (ZAG)
Ljubljana, Slovenia

- 1** AGENDA
- 2** LECTURERS&LECTURES
- 3** SOCIAL EVENT
- 4** GUIDED TOUR
- 5** SUPPORTERS

Experience science, deepen your knowledge, expand your international networks, and make this summer an unforgettable experience in Slovenia with a taste of heritage ... at ZAG.



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8:00-8:20	Registration
8:20-8:45	Opening of the summer school Špela Spanžel, Acting Director-general of the Cultural Heritage Directorate, Ministry of Culture, the Government of the Republic of Slovenia Dr. Polonca Ropret, National Coordinator of the European Research Infrastructure for Heritage Science, Slovenia (E-RIHS.SI) Mag. Gregor Ficko, Director of the Chamber of Construction and Building Materials Industry of Slovenia, The Chamber of Commerce and Industry of Slovenia Dr. Stanislav Lenart, President of the Scientific Council of Slovenian National Building and Civil Engineering Institute
8:45-9:30	Lecture: On site studies of consolidant effectiveness with different techniques Andreja Pondelak, Andriana Sever Škapin, Slovenian National Building and Civil Engineering Institute, Slovenia Sabina Dolenc, Slovenian National Building and Civil Engineering Institute, Slovenia, University of Ljubljana, Faculty of Natural Sciences and Engineering, Slovenia
9:30-10:15	Lecture: In situ spectroscopic analysis of Cultural Heritage Polonca Ropret, Institute for the Protection of Cultural Heritage of Slovenia, Slovenia
10:15-10:45	<i>Coffee break</i>
10:45-11:30	Lecture: 3D X-ray imaging techniques: precious tools in the cultural heritage conservation Lidija Korat, Slovenian National Building and Civil Engineering Institute, Slovenia, Lucia Mancini, Slovenian National Building and Civil Engineering Institute, Slovenia, LINXS – Lund Institute for Advanced Neutron and X-ray Science, Sweden
11:30-12:15	Lecture: Multi-disciplinary approach for diagnostic and monitoring of the structural health of wall paintings by non-destructive techniques Cristiano Riminesi, National Research Council of Italy, Italy
12:15-13:00	Lecture: Electrochemical impedance spectroscopy as a tool for non-destructive testing of patinated bronze sculptures Helena Otmačić Čurković, Mikić Dajana, Kapitanović Angela, Viskić Marko, University of Zagreb, Faculty of Chemical Engineering and Technology, Croatia
13:00-13:45	<i>Lunch break</i>

agenda



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Tuesday,
2nd of July 2024
MATERIALS

The first day of summer school will be dedicated to non-destructive and non-invasive techniques used in characterization of materials of heritage. Series of interesting lectures and chances to start a debate during breaks will be followed by a culinary experience in the heart of Ljubljana.

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- 13:45-14:30 Lecture: **Non-destructive assessment of wood: Case study of castle Leskovec**
Miha Humar, Boštjan Lesar, University of Ljubljana, Biotechnical faculty, Slovenia
- 14:30-15:15 Lecture: **Biological burden on built heritage – how to recognize and sample**
Polona Zalar, University of Ljubljana, Biotechnical faculty, Slovenia
- 15:15-16:00 Lecture: **Diagnosis for the restoration of historical built heritage: the contribution of non-invasive on-site imaging methods**
Nicola Masini, National Research Council of Italy, Italy
- 19:00 *Get together dinner*

agenda



8:00-8:45	Lecture: Heritage Building Information Modelling Katja Malovrh Rebec, Slovenian National Building and Civil Engineering Institute, Slovenia
8:45-9:30	Lecture: 3D technology in restoration processes Rok Hafner, Institute for the Protection of Cultural Heritage of Slovenia, Slovenia
9:30-10:15	Lecture: Use of VR and AI in heritage science Izidor Mlakar, University of Maribor, Faculty of Electrical Engineering and Computer Science, Slovenia
10:15-11:00	Lecture: Hyperspectral Imaging for Cultural Heritage Applications John Gilchrist, ClydeHSI, United Kingdom
11:00-12:00	Lunch break
12:10	Bus departure
13:00-17:00	Guided tour: Wall paintings of Church of the Annunciation in Crngrob The Church of the Annunciation in Crngrob is one of the most complex monuments in Slovenia. The original church dedicated to the Mother of God stood on the site of today's northern nave at least as early as the 13 th century. At that time, there were only a few inhabitants in Sorško polje, from which we could conclude that the original church was already built as a pilgrimage church. In 1273, the construction of the Romanesque church began and the oldest preserved parts of the building date from this period. As a part of a guided tour, NDT techniques will be demonstrated on site. ClydeHSI will demonstrate hyperspectral imaging on selected wall paintings. Other NDT methods that have been used over the years at ZAG to investigate the consolidation effectiveness and the condition of wall paintings will also be presented (e. g. USV, colour difference monitoring, DRMS method).
18:00	Arrival to Ljubljana

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Wednesday,
3rd of July 2024
MODELLING

The second day of summer school will offer insight into advanced modelling of built heritage.

Exciting guided tour will follow in the afternoon introducing not only the landscape beauty of Slovenia but also one of the most complex monuments in Slovenia, and a sneak peek into use of NDTs on site.

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- 8:00-8:45 Lecture: **Testing of masonry for earthquake resistance studies: non-destructive versus destructive, laboratory versus in-situ testing**
Miha Tomaževič, Slovenian National Building and Civil Engineering Institute, Slovenia
- 8:45-9:30 Lecture: **Distributed fibre optic sensors (DFOS) for diagnostics of various structures**
Tomasz Howiacki, Cracow University of Technology, Faculty for Civil Engineering, Poland
Katarzyna Zuziak, Nerve Sensors, Poland
Rafał Sieńko, Cracow University of Technology, Faculty for Civil Engineering, Poland
Łukasz Bednarski, Cracow University of Technology, Faculty for Civil Engineering, Poland
- 9:30-10:15 Lecture: **Damage identification and evaluation using acoustic emission and air-coupled ultrasonics**
Dimitrios Aggelis, Vrije Universiteit Brussel, Belgium
Eleni Tsangouri, Vrije Universiteit Brussel, Belgium, CY Cergy Paris Université, France
Ospitia Nicolas, Vrije Universiteit Brussel, Belgium, Ghent Universiteit, Ghent, Belgium
- 10:15-11:00 Lecture: **Preventive conservation of historic structures and artefacts by intelligent wireless sensor networks**
Markus Krüger, TU Graz, Institute of Technology and Testing of Building Materials, Austria, TTI GmbH, TGU Smartmote, Germany
Helmut Pongratz, TTI GmbH, TGU Smartmote, Germany
Thomas Muelleder, TU Graz, Institute of Technology and Testing of Building Materials, Austria, TTI GmbH, TGU Smartmote, Germany
- 11:00-11:30 *Coffee break*
- 11:30-12:15 Lecture: **Integration of underground architectures into development and management programs of degraded areas**
Mateja Golež, Rok Vežočnik, Slovenian National Building and Civil Engineering Institute, Slovenia
Janko Rožič, architect Odprti krog
- 12:15-13:00 Lecture: **Infrared assessment of built heritage**
Zvonko Jagličič, University of Ljubljana, Faculty of Civil and Geodetic Engineering, Slovenia, Institute of Mathematics, Physics and Mechanics, Slovenia
Andreja Padovnik, University of Ljubljana, Faculty of Civil and Geodetic Engineering, Slovenia, Restavradorstvo Andreja Padovnik, sp., Slovenia

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Thursday, 4th of July 2024 **STRUCTURES, SENSING & INTERDISCIPLINARITY**

The third day of summer school will cover topics connected with structures, sensing, and interdisciplinary approach to heritage.

After lunch the closure of three days of science, heritage, and a fun get-together will follow - with an interweaving of new ties and acquaintances and with a broadened view of heritage.

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- 13:00-13:45 Lecture: **Interdisciplinary insight into baroque stucco marble**
Irena Kralj Cigić, University of Ljubljana, Faculty of Chemistry and Chemical Technology, Slovenia
Matej Klemenčič, University of Ljubljana, Faculty of Arts, Slovenia
Martina Vuga, University of Ljubljana, Academy of Fine Arts and Design, Slovenia
Katja Kavkler, Institute for the Protection of Cultural Heritage of Slovenia, Slovenia
- 13:45-14:30 Lecture: **Investigation of the structural, physical and mechanical properties of wood from historic buildings using conventional and NDT methods**
Jure Žigon, Maks Merela, Angela Balzano, Katarina Čufar, Luka Krže, Aleš Straže, University of Ljubljana, Biotechnical Faculty, Slovenia
- 14:30-15:30 *Lunch*
- 15:30 Closure of the summer school



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The church of the annunciation of Mary in Crngrob

The small village of Crngrob lies next to Škofja Loka and is best known for its Church of the Annunciation of Mary, which is declared as a monument of national importance. It is a Gothic church which has been rebuilt several times in the past. The church's artwork includes a painting of Holy Sunday from the workshop of Johannes of Ljubljana (cca. 1460), a gothic painting of Saint Christopher on the south wall from 1464 (usually referred to as the Crngrob Façade Master), a painting of St. Christopher on the bell tower (Janez Gosar, mid-19 th century), and now almost completely faded frescoes of another St. Christopher from the 14th and 15th centuries on the north wall of the nave painted by Master Bolfgang.



guided tour



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guided tour



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Slovenian National Building and Civil Engineering Institute, Ljubljana, Slovenia

Organizing committee:

Sabina Dolenc, Andreja Pondelak, Maruša Mrak, Katarina Šter, and Ana Brunčič



Slovenian Research and Innovation Agency

ARIS research project No. J2-4424 - An integrated approach for conservation of cultural heritage wall paintings

ARIS research core funding No. P2-0273 - Building structures and materials

ARIS research core funding No. IO-0032 - Testing of Materials and Structures

ARIS Bilateral project Slovenia-Croatia No. BI-HR/23-23-015: Durability study of bronze protection for outdoor application



Loški
muzej

Loški museum Škofja Loka, Škofja Loka, Slovenia

supporters



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Experience science, heritage,
and a fun get-together all in
three days.

See you in Slovenia!

Registration [here](#).

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