



ARCH 2019

9TH INTERNATIONAL
CONFERENCE

PORTO
OCTOBER 2>4
2019

ON ARCH
BRIDGES

Conference Program





9TH INTERNATIONAL
CONFERENCE
ON ARCH
BRIDGES

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1 · FEUP

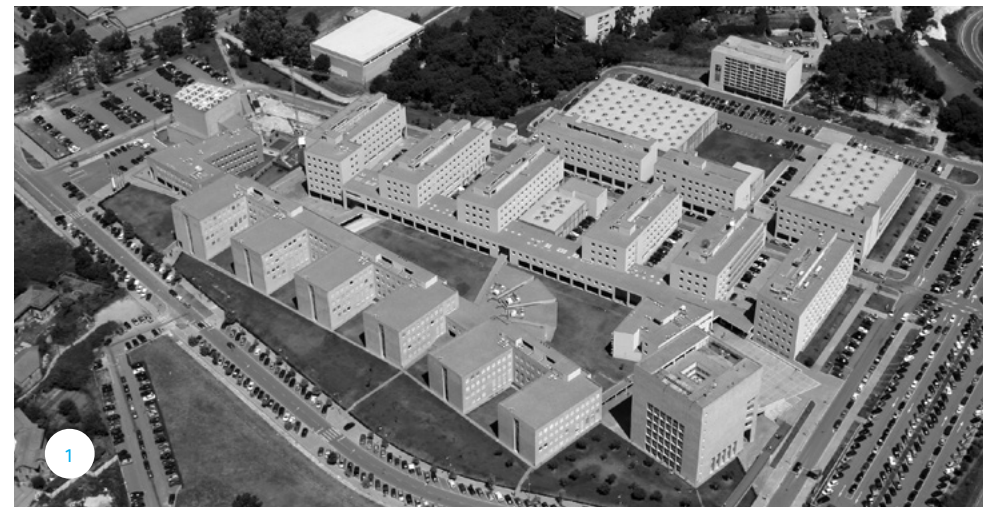
Conference venue
 Rua Dr Roberto Frias
 4200 465 Porto
 41°10'40.7"N 8°35'52.1"W

2 · Cais de Gaia

Douro River Cruise
 41°08'13.5"N 8°36'55.9"W

3 · Caves Real Companhia Velha

Conference Diner
 Rua Azevedo Magalhães 314
 4431 952 VN Gaia
 41°07'55.1"N 8°36'05.3"W



Welcome to the 9th International Conference on Arch Bridges, ARCH 2019, in Porto! Under the theme Arch Bridges – Natural beauty for all time, this event follows eight previous successful conferences held in Bolton (UK, 1995), Venice (Italy, 1998), Paris (France, 2001), Barcelona (Spain, 2004), Madeira (Portugal, 2007), Fuzhou (China, 2010), Split (Croatia, 2013) and Wrocław (Poland 2016), and we are very honoured to host this international conference at the campus of the Faculty of Engineering of the University of Porto (FEUP). And welcome to Porto! Famous for the Port Wine, Porto is the largest city of Northern Portugal and presently one of the most attractive touristic places of Portugal. Porto holds four beautiful and impressive examples of arch bridges, one of which is considered National Monument crossing the Douro River in a World Heritage Site Zone, making it a right place to host ARCH2019. This conference intends to be an international forum addressed to all those who deal with arch bridge structures, namely scientists, designers, technicians, stakeholders and contractors, seeking for related knowledge, experience and specialized information exchange and diffusion. The event focuses on key topics related to arch bridges, such as historical, analytical, numerical and experimental investigations, design and construction, rehabilitation, maintenance and condition assessment, and future trends. All these topics are addressed in 5 plenary keynote lectures, 3 special sessions and 14 regular

sessions. Full contributions presented in ARCH 2019, including 5 invited keynote papers and 98 research and technical papers, were prepared by authors from 26 countries. The papers are included in the Conference Proceedings published online as a volume of the Springer Structural Integrity book series entitled Proceedings of ARCH 2019 – 9th International Conference on Arch Bridges, which is freely available for conference delegates during and after 4 weeks after the conference. In order to help you planning your conference, a book of abstracts in digital support is available in a pendrive which also includes a digital version of the present conference program.

We would like to thank all the keynote lecturers, authors and participants for their valuable contributions to this conference, the special session organizers for their commitment, the Advisory and Scientific Committee members for their careful work, all sponsors and exhibitors for their contributions and Springer for the support to the Structural Integrity Book Series. Finally, we express our deep gratitude to all who actively contributed for the organization of this event at FEUP and to FEUP/IC staff for their precious support.

We hope you enjoy and profit the conference and wish you a very pleasant stay in Porto.

António ARÊDE, *Conference Chairman*
Rui CALÇADA, *Conference Co-Chairman*
Cristina COSTA, *Conference Co-Chairman*

ORGANIZING COMMITTEE

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Rui CALÇADA, U.Porto / FEUP
Conference Co-Chairman
Cristina COSTA, I.P.Tomar / FEUP
Conference Co-Chairman
Filipe MAGALHÃES, U.Porto / FEUP
Esmeralda PAUPÉRIO, I.C / FEUP
Rúben SILVA, U.Porto / FEUP

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Zlatko SAVOR, Croatia
Baochun CHEN, China
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Enzo SIVIERO, Italy
Charles ABDUNUR, France
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Mario MIRANDA, Italy
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Paulo LOURENÇO, Portugal
Pawel HAWRYSZKOW, Poland
Pedro PACHECO, Portugal
Serge MONTENS, France
Tomasz Kaminski, Poland
Vasilis SARHOSIS, UK
Vincent de Ville de GOYET, Belgium
Yong-Lin PI, Australia
Zlatko ŠAVOR, Croatia
Zoltan ORBÁN, Hungary

PLENARY KEYNOTE LECTURES

Masonry bridges and viaducts: testing, mechanics, retrofitting towards an extended life

Antonio Brencich, Faculty of Engineering of the University of Genova, Italy

History of Arch Bridges in Portugal

Júlio Appleton, Technical University of Lisbon, Portugal

Arch bridges or bridges with arches, elegant and efficient solutions to cross an obstacle

Vincent de Ville de Goyet, University of Liège, Belgium

Challenges and development of long span arch bridges in statics, dynamics and aerodynamics

Yaojun Ge, Tongji University, Shanghai, China

Arch Bridges in Italy and the role of Riccardo Morandi in the last century

Enzo Siviero, Università eCampus of Novedrate (Co), Italy

SPECIAL SESSIONS (SS)

SS-1 Design and Construction

organized by Javier Jimenez (University of Sevilla, Spain) and João Fonseca (University of Beira Interior, Covilhã, Portugal)

SS-2 Structural rehabilitation and maintenance

organized by Antonio Brencich (University of Genova, Italy) and Paulo Cruz (University of Minho, Portugal)

SS-3 Experimental and numerical assessment

organized by Carmelo Gentile (Politecnico di Milano, Italy) and Álvaro Cunha (University of Porto, Portugal)

TOPICS (T)

T1 - Heritage arch bridges

T2 - Analytic and numerical studies of arch structures

T3 - Experimental studies of arch structures

T4 - Design and construction of arch bridges

T5 - Rehabilitation, maintenance and condition assessment of arch bridges

T6 - New and future trends in arch bridges

Practical guidelines

VENUE

The conference will take place at the campus of the Faculty of Engineering of the University of Porto (FEUP). With origins dating back to the eighteenth century, the University of Porto is currently one of the most prestigious Higher Education Institutions of Europe.

Porto is the largest city of Northern Portugal.

The Historic Centre of Porto, classified as World Heritage by UNESCO, is one of the most attractive entertainment venues for visitors, providing a rich variety of monuments and ordinary dwelling, from different periods stretching back as far as the 14th century. The city of Porto, its river, Douro, and the outstanding bridges cannot be dissociated. Porto is the centre of a culturally and naturally rich region that gathers together history, arts and nature.

CONFERENCE SECRETARIAT

The secretariat is located close to the FEUP Auditorium.

Opening hours:

Tuesday, 1st October, 17:30 to 19:30

Wednesday, 2nd October, 8:00 to 18:00

Thursday, 3rd October, 8:30 to 19:00

Friday, 4th October, 8:30 to 16:00

REGISTRATION

All attendees of the conference are requested to check in at the registration desk of the conference secretariat.

Registration rates comprise:

Standard rate

- participation in the conference
- submission of up to two papers
- Conference Abstracts Book in a pendrive and on-line access to full papers in the Conference Proceedings published in an eBook
- participation in welcome reception
- lunches
- coffee breaks
- conference dinner

Student rate

- participation in the conference
- submission of up to one paper

- Conference Abstracts Book in a pendrive and on-line access to full papers in the Conference Proceedings published in an eBook
- participation in welcome reception
- lunches
- coffee breaks

Accompanying person rate

- participation in the conference
- participation in welcome reception
- lunches
- coffee breaks
- touristic pack

ORAL PRESENTATIONS

- All presentations at the conference are oral and in English.
- Please check the final program to confirm the time and room of your presentation.
- The time allocated for each presentation is 15 minutes, including questions and discussion. In order to keep the conference on schedule and to accommodate participants who want to move between sessions, session chairs are urged to strictly follow the time schedule.
- All lecture rooms are equipped with a computer.
- All presenting authors are requested to be present in the lecture room 15 minutes prior to the start of the session in order to copy their presentation file to the computer in the lecture room. Bring your presentations on a portable data device.
- Presentation files may be in .pdf or .ppt(x) format. Note that it is not allowed to use own notebook computers for the presentation to keep the time between presentations minimal.
- All computers are equipped with Windows 10, Adobe Reader and Microsoft Office 2007.
- Authors whose presentation contains animations, videos, or special effects are strongly encouraged to test it before their session in the respective room. It is the authors' responsibility to check in advance that their presentation works fine with the installed version of the available software.

WIRELESS NETWORK

A wireless network is available in the conference buildings. All participants receive a password to connect to the network upon registration.

Username: arch2019

Password: feup2019

COFFEE BREAKS

Coffee breaks take place during the hours mentioned in the conference program. Locations of the coffee break are indicated on the venue plan of FEUP on p. 11.

LUNCH BREAKS

Lunches are included in the conference registration fee, and they will be served at the 13h00, as indicated on the venue plan of FEUP on p. 11.

WELCOME RECEPTION

On Wednesday 2 October at 18:30, a Welcome Reception/Technical Visit will take place in a Douro Cruiser.

A bus service, leaving from FEUP at 17:15, is organised to take the participants to Cais de Gaia.

TECHNICAL VISIT

A Technical Visit to the Arch Bridges of Porto will take place during the Welcome Reception in a Douro river cruise.

The visit will be preceded by a Technical Overview of Porto Arch Bridges in a Plenary Session immediately after the afternoon Parallel Sessions. The Technical Visit is open to participants having access to the Welcome Reception (Full Delegates, Students and accompanying persons).

CONFERENCE DINNER

On Thursday 3 October at 20:30, the Conference Dinner takes place at Caves Real Companhia Velha (see city map, p.4).

A bus service, leaving from FEUP at 19:00, is organised to take the participants to the dinner venue.

ADDITIONAL USEFUL INFORMATION

Electricity

The electric power is 220V.

Opening hours

Banks and stores Banks are generally open from 9:00 to 15:30, supermarkets from 8:30 to 18:30, while most other shops open their doors from 10:00 to 18:00. Most shops remain open at lunchtime, although you may find a few closed between 12:30 and 14:30.

Credit cards

Shops and restaurants usually accept major international credit cards.

Cost of living

Meal, Inexpensive restaurant	7,50 €
Meal for 2, mid-range restaurant	30,00 €
McMenu at McDonalds	6,00 €
Domestic Beer (0.5 litre draught)	1,60 €
Imported Beer (0.33 litre bottle)	2,70 €
Cappuccino	1,50 €
Cola/Pepsi (0.33 litre bottle)	1,30 €
Water (0.33 litre bottle)	1,00 €

TAXI SERVICE

Several taxi services are available in Porto:

RadioTaxi

00351 225073900
00351 969661666
00351 917555085
00351 935073900

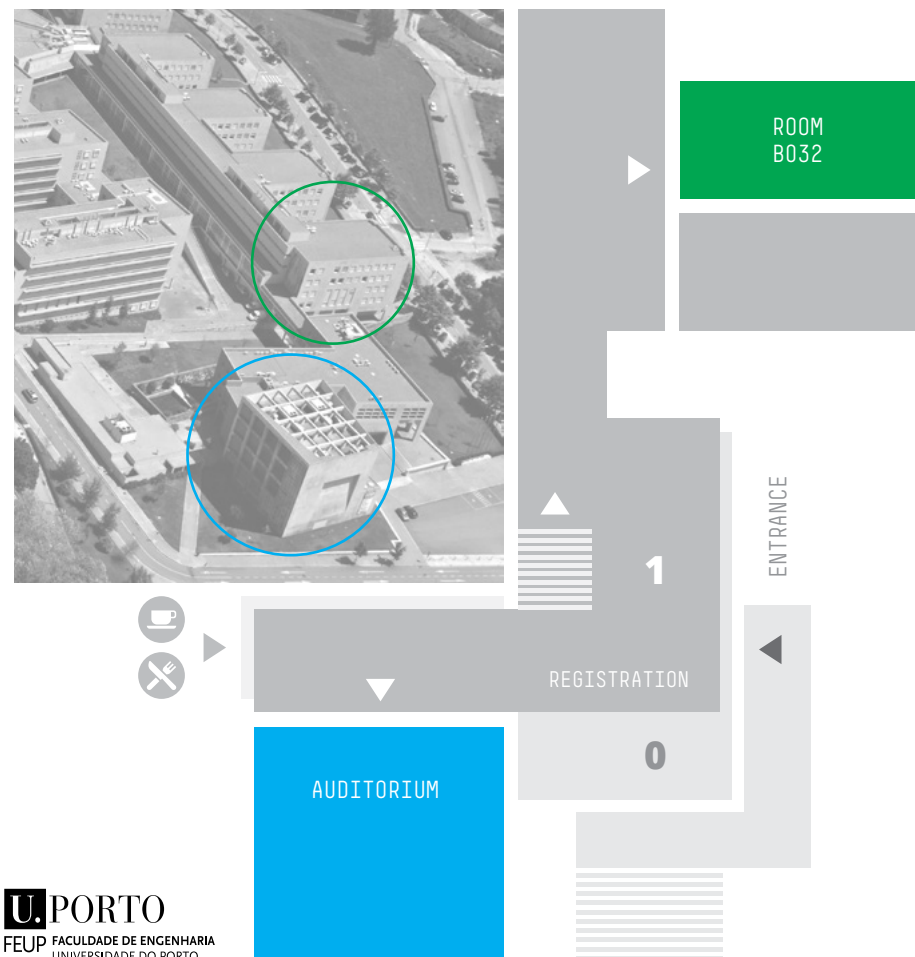
Taxis Invicta

00351 22 507 6400
00351 912 301 251
00351 934 772 173
00351 968 520 063

PARKING IN AND NEAR THE FEUP CAMPUS:

It is usually very hard to get a free parking place in the vicinity of FEUP campus. It is strongly recommended that the participants use public transports (Metro or BUSES) or ridesharing apps to get to FEUP.

FEUP Map





2nd October · Wednesday

08:00 09:00		Registration	
09:00 09:30		Opening Session	
09:30 10:00		Plenary Keynote Lecture <i>History of arch bridges in Portugal</i> Julio Appleton	
10:00 11:00	AUDITORIUM	Heritage arch bridges	B032 Experimental studies of arch structures I
		Analytic and numerical studies of arch structures I	
Coffee-Break			
11:30 13:00	AUDITORIUM	Analytic and numerical studies of arch structures II	B032 Experimental studies of arch structures II
Lunch			
14:30 16:30	AUDITORIUM	Analytic and numerical studies of arch structures III	B032 Special Session: Design and Construction
16:30 17:00		Overview of Porto Arch bridges Antonio Adão da Fonseca	
17:00 17:45	G124	Permanent Scientific Committee Meeting	
18:30 19:30	DOURO CRUISE	Welcome Reception / Technical Visit	

3rd October · Thursday

09:00 09:45		Plenary Keynote Lecture <i>Challenge and Development of Long Span Arch Bridges in Statics, Dynamics and Aerodynamics</i> Yaojun Ge	
09:45 11:00	AUDITORIUM	Analytic and numerical studies of arch structures IV	B032 Rehabilitation, maintenance and condition assessment of arch bridges - I
		Coffee-Break	
11:30 13:00	AUDITORIUM	Analytic and numerical studies of arch structures V	B032 Special Session: Structural rehabilitation and maintenance - I
Lunch			
14:30 15:15	AUDITORIUM	Plenary Keynote Lecture <i>Masonry bridges and viaducts: testing, mechanics, retrofitting towards an extended life</i> Antonio Brencich	
15:15 16:30		Design and construction of arch bridges - I	B032 Rehabilitation, maintenance and condition assessment of arch bridges - II
Coffee-Break			
17:00 18:30	AUDITORIUM	Design and construction of arch bridges - II	B032 Special Session: Structural rehabilitation and maintenance - II
20:30 23:30	WINE CELLARS	Conference Dinner	

4th October · Friday

09:00 09:45		Plenary Keynote Lecture <i>Arch bridges or bridges with arches, elegant and efficient solutions to cross an obstacle</i> Vincent de Ville de Goyet	
09:45 11:00	AUDITORIUM	Design and construction of arch bridges - III	B032 Special Session: Experimental and numerical assessment
		Coffee-Break	
11:30 13:00	AUDITORIUM	Design and construction of arch bridges - IV	B032 New and future trends in arch bridges
Lunch			
14:30 15:15	AUDITORIUM	Plenary Keynote Lecture <i>The arch bridges of Riccardo Morandi in the history of "900"</i> Enzo Siviero	
15:15 15:30		Closing Session	

08:00 09:00	Registration							
09:00 09:30	Opening Session							
09:30 10:00	AUDITORIUM	Plenary Keynote Lecture <i>History of arch bridges in Portugal</i> Julio Appleton Chair: António Adão da Fonseca						
	Topic	Parallel Session 02-A-1 Chair: Daniel Oliveira		Topic	Parallel Session 02-A-2 Chair: Filipe Magalhães			
10:00 10:15	T1	Daniel Vale	<i>Old bridges in Bragança - building a landscape heritage</i>	ROOM B032	T3 - I	Paweł Hawryszków and Krzysztof Galik	<i>Uncommon university initiatives in arch bridges education</i>	
10:15 10:30		Miguel Malheiro and Aníbal Costa	<i>Strategies and conservation concepts in the Bridge of Arco in Marco de Canaveses</i>			Leqia He, Zhiyong Zhang, Giuseppe Carlo Marano, Bruno Briseghella, Junqing Xue and Zhengbin Ni	<i>Dynamic characterization of a stress ribbon and butterfly arch pedestrian bridge using wireless measurements</i>	
10:30 10:45	T2 - I	Harold Schuch, Carnot L. Nogueira, Frederick R. Rutz and Kevin L. Rens	<i>Photogrammetric modelling of a Stone Bridge for structural analysis</i>			Jiangang Wei, Zhitao Xie, Qingxiong Wu, Baochun Chen and Jianchun Ping	<i>Experimental study of spatial mechanical behavior on CFST X-shaped arches subjected to non-directional loads</i>	
10:45 11:00		Tomasz Kaminski	<i>Consequences of simplifications in modelling and analysis of masonry arch bridges</i>			Solovev Sergei and Khrapunov Evgenii	<i>Improving the aerodynamic stability of bridges. Wind tunnel tests</i>	
11:00 11:30	Coffee-Break							
	Topic	Parallel Session 02-B-1 Chair: Paolo Zampieri		Topic	Parallel Session 02-B-2 Chair: Pawel Hawryskow			
11:30 11:45	AUDITORIUM	Mohamed Azim Elewa	<i>Analytical investigation on the behavior of skewed concrete tied arch bridges</i>	ROOM B032	T3 - II	Sinan Acikgoz, Haris Alexakis, Cong Ye, Andrea Franza and Matthew DeJong	<i>The Marsh Lane Railway Viaduct: 2 years of monitoring with combined sensing and surveying technologies</i>	
11:45 12:00		Mohamed Azim Elewa and Eslam Sayed Youssef	<i>Behavior of concrete tide arch railway bridges under moving loads</i>			Daniel V. Oliveira, Reza Allahvirzideh, Ana Sánchez, Belén Riveiro, Nuno Mendes, Rui A. Silva and Francisco M. Fernandes	<i>Assessment of a medieval arch bridge resorting to non-destructive techniques and numerical tools</i>	
12:00 12:15		T2 - II	Junping Liu, Tongning Wang and Lan Li			<i>Effect of different debonding degree on mechanical behavior of CFST truss arch ribs</i>	Rúben Silva, Cristina Costa and António Arêde	<i>Dynamic and quasi-static load tests in a railway stone multispan masonry arch bridge</i>
12:15 12:30		João Amado and Cristina Costa	<i>Application of the COSTTU1406 quality control framework to a stone arch bridge in Portugal</i>			Tomasz Kaminski, Mieszko Kuźawa and Jan Bień	<i>Experimental and numerical assessment of an old backfilled concrete arch bridge</i>	
12:30 12:45		Mariano Angelo Zanini, Lorenzo Hofer, Flora Faleschini and Carlo Pellegrino	<i>Seismic reliability analysis: application to an existing single-span open-spandrel RC arch bridge</i>			Jian Yang and Baochun Chen	<i>Effect of steel fibers on compressive strength of UHPC arch bridges</i>	
12:45 13:00		Rúben Silva, Cristina Costa and António Arêde	<i>Nonlinear analysis of a multispan stone masonry bridge under railway traffic loading</i>					
13:00 14:30	Lunch							

Topic		Parallel Session 02-C-1 Chair: José Vieira de Lemos	
14:30 14:45	AUDITORIUM	Vasilis Sarhosis, Tamás Forgács and Jose Vieira de Lemos	<i>Modelling backfill in masonry arch bridges: A DEM approach</i>
14:45 15:00		Tamás Forgács, Szilveszter Rendes, Sándor Ádány and Vasilis Sarhosis	<i>Mechanical role of spandrel walls on the capacity of masonry arch bridges</i>
15:00 15:15		Cristina Costa and António Arêde	<i>Contributions on refined modelling of stone arch bridges</i>
15:15 15:30		Fernando Saitta, Paolo Clemente, Giacomo Buffarini and Giovanni Bongiovanni	<i>The mechanism method in the analysis of two-span masonry arch bridges</i>
15:30 15:45		Matthew Gilbert, John Valentino, Colin Smith and Tom Pritchard	<i>Limit analysis of masonry arch bridges using discontinuity layout optimization</i>
15:45 16:00		Serena Amodio, Matthew Gilbert and Colin Smith	<i>Modelling masonry arch bridges containing internal spandrel walls</i>
16:00 16:15		Qi Dang, Matthew Gilbert and Colin Smith	<i>Lower bound stress fields in the limit analysis of soil-filled masonry arch bridges</i>
16:15 16:30			
16:30 17:00	<i>Overview of Porto Arch bridges</i> Antonio Adão da Fonseca Chair: António Arêde		
17:00 17:45	G-128	Permanent Scientific Committee Meeting	

18:30 19:30	Douro Cruise	Welcome Reception	
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T1 Heritage arch bridges
 T2 Analytic and numerical studies of arch structures
 T3 Experimental studies of arch structures
 SS - 1 Special Session: Design and Constructions

Topic		Special Session: Design and Construction Chair: João Fonseca	
14:30 14:45	ROOM B032	Baochun Chen, Junping Liu and Habib Tabatabai	<i>Recent research and application of arch bridges in China</i>
14:45 15:00		Junping Liu, Quocbao Tran, Tan Yilong and Baochun Chen	<i>Design and construction of Hoang Van Thu Bridge in Vietnam</i>
15:00 15:15		Yu Han, Zhanfeng Yang, Dayan Qin and Jian Zheng	<i>Key technology and innovations in the construction of Matan Hongshui River super-large bridge</i>
15:15 15:30		Fatima Otero Vieitez	<i>Past and present for arch executions</i>
15:30 15:45		Manuel Escamilla, Borja Martín, Luis M. Salazar, José A. Agudelo, Hector Faúndez, Ainhoa Marín and Alejandro D. Salazar	<i>Innovative construction strategies for singular arch bridges</i>
15:45 16:00		Óscar Ramón Ramos-Gutiérrez, Javier Fernández-Dívar Sánchez, Guillermo Ortega Carreras, Ricardo Rafael Pereira-Da Sousa and Marcos Pantaleón-Prieto	<i>Viaduct over Genil River in the new Granada bypass. A three tied-arch innovative bridge</i>
16:00 16:15		Jose Romo	<i>A set of dainty tied-arch bridges: the formal expression of the structural logic</i>
16:15 16:30			

09:00 09:45	AUDITORIUM	Plenary Keynote Lecture <i>Challenge and Development of Long Span Arch Bridges in Statics, Dynamics and Aerodynamics</i> Yaojun Ge Chair: Elsa Caetano	
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Topic		Parallel Session 03-A-1 Chair: Tomasz Kaminski	
09:45 10:00	AUDITORIUM	09:45 10:00	Riccardo Stroschio <i>Medium span flat arch bridges: efficient or not?</i>
10:00 10:15		10:00 10:15	Esko Järvenpää, Rauno Heikkilä and Matti-Esko Järvenpää <i>Geometric non-linear form-finding design for optimal tied arch bridge</i>
10:15 10:30		10:15 10:30	Damian Beben and Tomasz Maleska <i>Impact of boundary conditions on the soil-steel arch bridge behavior under seismic excitation</i>
10:30 10:45		10:30 10:45	Czeslaw Machelski and Piotr Tomala <i>Investigation of deformations in flexible soil-steel arch bridge based on strain gauges' measurements</i>
10:45 11:00		10:45 11:00	Czeslaw Machelski and Piotr Tomala <i>Construction loads of the flexible arch bridges</i>

11:00
11:30 Coffee-Break

Topic		Parallel Session 03-B-1 Chair: Humberto Varum	
11:30 11:45	AUDITORIUM	11:30 11:45	Cyrille Denis Tetougueni, Paolo Zampieri and Carlo Pellegrino <i>Lateral stability of network arch bridges</i>
11:45 12:00		11:45 12:00	Konstantinos Kris Mermigas and Hongyou Wang <i>Comparative study of the proportions and efficiency of steel arch bridges</i>
12:00 12:15		12:00 12:15	Hoa Tran-Ngoc, Samir Khatir, Guido De Roeck, Thanh Bui-Tien, Long Nguyen-Ngoc and Magd Abdel Wahab <i>Stiffness identification of truss joints of the Nam O Bridge based on vibration measurements and model updating</i>
12:15 12:30		12:15 12:30	Teodora Bogdan, Mike Tibolt, Miguel Candeias, Wojciech Ochojski and Dennis Rademacher <i>Investigations on welded splices of heavy HD sections in net-arch bridges</i>
12:30 12:45		12:30 12:45	Junqing Xue, Yifei Zhang, Bruno Briseghella and Baochun Chen <i>Experimental research on effects of debonding on circular CFST long columns subjected to axial load</i>
12:45 13:00		12:45 13:00	António Póvoas and Joana Delgado <i>Practical advices for building arch bridge decks with Overhead Movable Scaffolding Systems</i>

13:00
14:30 Lunch

Topic		Parallel Session 03-A-2 Chair: Zoltán Orbán	
09:45 10:00	ROOM B032	09:45 10:00	Leon Lung-Yang Lai <i>Rehabilitation design and construction of an RC arch bridge</i>
10:00 10:15		10:00 10:15	Ricardo N. T. Teixeira and Nicholas W. G. Trump <i>Bridge asset management in the 21st Century: a case study</i>
10:15 10:30		10:15 10:30	Yiqiang Xiang <i>Multi-rib arch bridge strengthened by stayed-cable and field test</i>
10:30 10:45		10:30 10:45	Ray Langley <i>The maintenance of Silver Jubilee Bridge, UK</i>
10:45 11:00		10:45 11:00	Yugo Fukuoka, Toshihiro Okumatsu, Shozo Nakamura and Takafumi Nishikawa <i>Influence of temperature and bearing condition on the vibration characteristics of a steel arch bridge</i>

11:00
11:30 Coffee-Break

Topic		Special Session: Structural rehabilitation and maintenance - I Chair: Antonio Brencich	
11:30 11:45	ROOM B032	11:30 11:45	Zoltán Orbán <i>Sustainable masonry arch railway bridges</i>
11:45 12:00		11:45 12:00	Antonio Brencich, Alessandro Clemente and Massimo Robiola <i>Errors and new trends in widening the deck of a road bridge</i>
12:00 12:15		12:00 12:15	Antonio Brencich and Davide Pera <i>A low-invasive retrofitting technique for masonry bridges: experimental results</i>
12:15 12:30		12:15 12:30	Lorenzo Jurina and Edoardo O. Radaelli <i>"Reinforced Arch Method" as retrofitting technique for masonry arches. Experimental tests and numerical modelling</i>
12:30 12:45		12:30 12:45	Giuseppe Stagnitto and Alessandro Pederzani <i>Using thrust lines to calculate the kinematic collapse multiplier for retrofitting masonry arch bridges</i>
12:45 13:00		12:45 13:00	Paolo Zampieri, Nicolò Simoncello, Jaime Gonzales-Libreros and Carlo Pellegrino <i>Retrofitting of slender masonry arch bridges</i>

13:00
14:30 Lunch

14:30 15:15	AUDITORIUM	Plenary Keynote Lecture <i>Masonry bridges and viaducts: testing, mechanics, retrofitting towards an extended life</i> Antonio Brencich Chair: Matthew Gilbert	
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Topic	Parallel Session 03-C-1 Chair: Fernando Stucchi	
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15:15 15:30	AUDITORIUM	T4 - I	Ian Firth, Clare Taylor, Richard Jenkins and Musa Chunge	<i>Crossing the Thames at Taplow. The challenges of a slender arch footbridge</i>
15:30 15:45			Michael Müller, Holger Haug and Wolfgang Eilzer	<i>Tamina Canyon Bridge, Bad Ragaz, Switzerland</i>
15:45 16:00			Guillermo Capellán, Emilio Merino, Miguel Sacristán, Javier Martínez, Santiago Guerra and Pascual García	<i>Almonte Viaduct: Design principles and structural monitoring</i>
16:00 16:15			Guillermo Capellán, Emilio Merino, Ysabel Guil, Pascual García, Miguel Angel Frías and Manuel Casado	<i>A new arch bridge in Georgia, a high-seismicity area</i>

16:15 16:30	Coffee-Break		
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11:00 11:30	Coffee-Break		
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Topic	Parallel Session 03-D-1 Chair: Jan Biliszcuk	
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17:00 17:15	AUDITORIUM	T4 - II	José Manuel Baraibar	<i>Reconstruction of the Butron Castle arch bridge</i>
17:15 17:30			Junping Liu, Shaobin Lu and Jianming Yuan	<i>Design and construction of the Hejiang Yangtze River Highway Bridge</i>
17:30 17:45			Riccardo Stroschio	<i>A flat arch bridge construction method and its temporary stability</i>
17:45 18:00			Tingmin Mou, Bikun Fan, Yicheng Zhao and Jian Liang	<i>Technical development of long span concrete filled steel tube arch bridges in China</i>

18:00 18:15	Coffee-Break		
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18:15 18:30	Coffee-Break		
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Topic	Parallel Session 03-C-2 Chair: Bruno Brisighela	
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15:15 15:30	ROOM B032	T5 - II	Jonathan Haynes, Ahmed Naggasa, Levinshan Augusthus-Nelson, Feras El-Basir and Abdulaziz Alsaleh	<i>Modeling the behavior of radially pinned brick triplets</i>
15:30 15:45			Gianluca Borgna, Mariano Angelo Zanini, Lorenzo Hofer, Flora Faleschini and Jose Matos	<i>Structural reliability of masonry arch bridges subject to natural aging</i>
15:45 16:00			Esmeralda Paupério, Rúben Silva, Cristina Costa and António Arêde	<i>Survey methodologies and intervention in stone masonry arch bridges: the case study of Esmoriz bridge</i>
16:00 16:15			Hans Depamelaere and Bart Allaert	<i>Advanced zinc aluminum alloyed coatings for suspension bridges, cable stayed bridges and arch bridges</i>

16:15 16:30	Coffee-Break		
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11:00 11:30	Coffee-Break		
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Topic	Special Session: Structural rehabilitation and maintenance - II Chair: Antonio Brencich	
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17:00 17:15	ROOM B032	SS-2 II	Franco Iacobini, Marco Tisalvi, Andrea Vecchi, Francesco Iodice and Alberto Mauro	<i>Analysis methods and seismic strengthening of existing masonry arch bridges of the conventional railway network</i>
17:15 17:30			Bernardino Chiaia, Giulio Ventura, Cristina Zannini Quirini and Giulia Marasco	<i>The Marchetti Bridge: active control for maintenance and structural safety</i>
17:30 17:45			Elisa Saler, Valentina Pernechele, Filippo Lorenzoni, Lisa Biasetto and Francesca da Porto	<i>Dynamic identification and calibration of an arch steel bridge model for the evaluation of corrosion effects</i>
17:45 18:00			Rosario Ceravolo, Giorgia Coletta, Erica Lenticchia, Lili Li, Antonino Quattrone and Simone Rollo	<i>In-operation experimental modal analysis of a three span open-spandrel RC arch bridge</i>
18:00 18:15			Andrea Benedetti, Mirco Tarozzi, Giacomo Pignagnoli and Claudia Martinelli	<i>Dynamic investigation and short-monitoring of an historic multi-span masonry arch bridge</i>
18:15 18:30			Jack Smith and Sinan Acikgoz	<i>Dynamic amplification of curved beams subjected to moving point load</i>

20:30 23:30	Wine Cellars	Conference Dinner	
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09:00 09:45	AUDITORIUM	Plenary Keynote Lecture <i>Arch bridges or bridges with arches, elegant and efficient solutions to cross an obstacle</i> Vincent de Ville de Goyet Chair: Rui Calçada							
	Topic	Parallel Session 04-A-1 Chair: Baochun Chen		Topic	Special Session: Experimental and numerical assessment Chair: Álvaro Cunha				
09:45 10:00	AUDITORIUM	T4-III	Aleksandar Bojovic and Antonio Mora Munoz	<i>Railway road bridge in Novi Sad – steel tied network arches over the Danube</i>	09:45 10:00	ROOM B032	SS-3	Maria Giovanna Masciotta, Daniele Brigante, Alberto Barontini, Daniele Pellegrini, Paulo Lourenco, Giovanni Fabbrocino, Cristina Padovani and Maria Girardi	<i>Experimental and numerical investigations of a segmental masonry arch subjected to horizontal settlements</i>
10:00 10:15			Marcelo Waimberg, Fernando Stucchi, Fabio Prado and Matheus Marquese	<i>The Santos-Guarujá Bridge over Santos Channel</i>	10:00 10:15			Sam Cocking, Daniel Thompson and Matthew DeJong	<i>Comparative evaluation of monitoring technologies for a historic skewed masonry arch railway bridge</i>
10:15 10:30			Manyop Han and Byungsuk Kim	<i>Classification of construction methods for arch bridges</i>	10:15 10:30			Gabriele Marrongelli, Carmelo Gentile and Antonella Saisi	<i>Anomaly detection based on automated OMA and mode shape changes: application on a historic arch bridge</i>
10:30 10:45			Javier Fernández, José Vicente Rajadell and Paula Rinaudo	<i>Formworks travelers for two different types of reinforced concrete arch bridges</i>	10:30 10:45			Paolo Borlenghi, Antonella Saisi and Carmelo Gentile	<i>Preliminary structural assessment of a multi-span masonry arch bridge</i>
10:45 11:00					10:45 11:00			Paweł Hawryszków and Wojciech Zielichowski-Haber	<i>Static and dynamic testing of a road arch bridge in Rabka Zdroj, Poland</i>
11:00 11:30		Coffee-Break							
	Topic	Parallel Session 04-B-1 Chair: Cristina Costa		Topic	Parallel Session 04-B-2 Chair: Lorenzo Jurina				
11:30 11:45	AUDITORIUM	T4-IV	Jan Biliszczuk, Anita Lunisk, Joanna Ways, Jerzy Onysyk and Marco Teichgraeber	<i>Conceptual design of a footbridge over the Warta River in Poznań</i>	11:30 11:45	ROOM B032	T6	Georg Gaßner, Kerstin Fuchs and Johann Kollegger	<i>Integral arch bridge of unlimited length</i>
11:45 12:00			Alejandro Calderon Landaverde and Alejandro Calderon Ollivier	<i>Use of the arch as substitution of a footbridge substructure</i>	11:45 12:00			António André, Inês Ferraz, Hugo Coelho, José Fernandes and Pedro Pacheco	<i>New span range on modular bridges – The arch relevance</i>
12:00 12:15			Michael Korniev, Vladimir Bolikov and Friedhelm Eric Rentmeister	<i>Podilskyi arch bridge in Kiev</i>	12:00 12:15			Jiri Strasky and Radim Necas	<i>Three arch pedestrian bridges</i>
12:15 12:30			Zhengchun Xia, Wangqing Wen, Aiguo Yan, Dingguo Yan and Xiaojiang Zhang	<i>Design of large-span steel-truss girder railway bridge stiffened by flexible arch rib</i>	12:15 12:30			João Fonseca and Clemente Pinto	<i>Cable-stiffened hinged arch bridges</i>
12:30 12:45			Hyung Kyoon Byun, Eric Gogny and Hong Yong Kim	<i>Namhangang railway bridge - a series of normal and underslung arches</i>	12:30 12:45			Jan Biliszczuk, Wojciech Lorenc, Edward Marcinków and Krzysztof Topolewicz	<i>New directions for the development of arch bridges in Poland</i>
12:45 13:00					12:45 13:00				
13:00 14:30		Lunch							
14:30 15:15	AUDITORIUM	Plenary Keynote Lecture <i>The arch bridges of Riccardo Morandi in the history of "900"</i> Enzo Siviero Chair: Jiří Stráský							
15:15 15:30		Closing Session							

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