

7th European Conference on Structural Control

<http://eacs2022.ippt.pan.pl>

CONFERENCE PROGRAMME



European Association
for the Control of
Structures



Institute of Fundamental
Technological Research,
Polish Academy of Sciences



Committee on Mechanics,
Polish Academy of Sciences

July 10–13, 2022
Warsaw, Poland

Conference Chairs

J. Holnicki-Szulc, *IPPT PAN, PL*
D. Wagg, *University of Sheffield, UK*
Ł. Jankowski, *IPPT PAN, PL*

Scientific Secretary

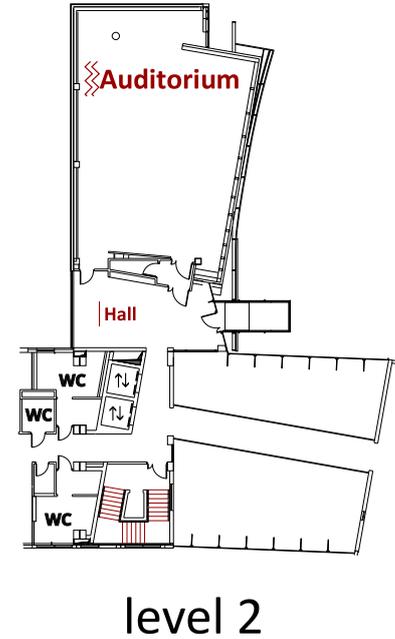
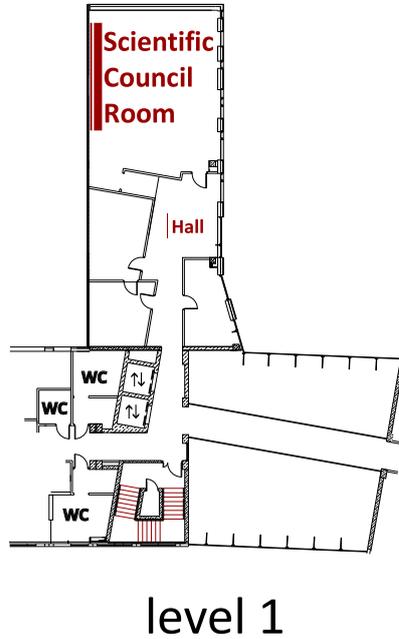
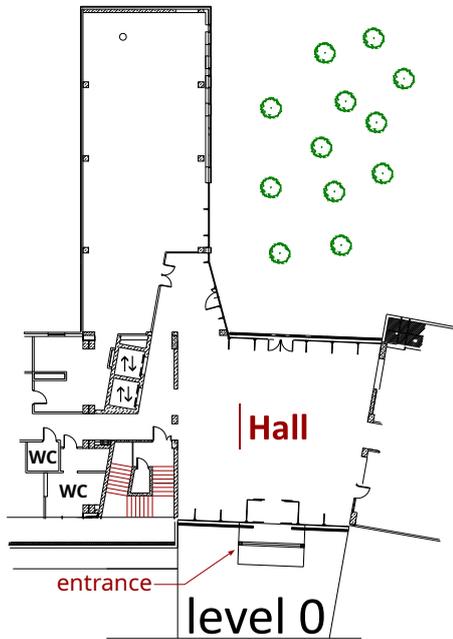
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Venue: Institute of Fundamental Technological Research
 Polish Academy of Sciences
 ul. Pawińskiego 5b
 02-106 Warsaw, Poland

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| Conference schedule at a glance | | | | | |
|---------------------------------|--|---|------------------------------------|-----------------------------|----------------------------------|
| | | Auditorium level 2 | Scientific Council Room level 1 | Halls levels 0* or 1/2** | |
| July 10 | 15:00 – 17:00 | EACS BoD meeting (<i>room 20</i>) | | | |
| | 17:00 – 19:00 | Welcome reception | | | |
| Monday, July 11 | 9:30 – 9:45 | Opening (<i>prof. Tadeusz Burczyński, Director of IPPT PAN</i>) | | | |
| | 9:45 – 10:30 | Plenary lecture (<i>prof. Billie F. Spencer Jr</i>) | | | |
| | 10:30 – 11:15 | Plenary lecture (<i>prof. Jason Z. Jiang</i>) | | | |
| | 11:15 – 11:35 | | | | Coffee break |
| | 11:35 – 13:15 | session S1 | session S3-a | | |
| | 13:15 – 14:00 | | | | Lunch break |
| | 14:00 – 15:20 | session S7-a | session S3-b | | |
| | 15:20 – 16:00 | | | | Poster session / Coffee break |
| 16:00 – ~20:00 | Chopin's Warsaw – tour & recital (<i>buses leave from IPPT PAN at 16:00</i>) | | | | |
| Tuesday, July 12 | 9:30 – 10:15 | Plenary lecture (<i>prof. Nathan van de Wouw</i>) | | | |
| | 10:15 – 11:00 | Plenary lecture (<i>prof. Przemysław Perlikowski</i>) | | | |
| | 11:00 – 11:20 | | | | Coffee break |
| | 11:20 – 13:00 | session S5-a | session S7-b | | |
| | 13:00 – 13:45 | | | | Lunch break |
| | 13:45 – 15:25 | session S6-a | session S4 | | |
| | 15:25 – 15:45 | | | | Coffee break |
| | 15:45 – 17:25 | session S6-b | session S8 | | |
| 18:00 – | Conference dinner (<i>buses leave from IPPT PAN at 18:00</i>) | | | | |

*Lunch **Cofee breaks

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|-----------------|---------------|--------------|--------------|----------------------|
| Wed, July 13 | 9:30 – 11:10 | session S5-b | session S7-c | |
| | 11:10 – 11:30 | | | Coffee break |
| | 11:30 – 13:30 | session S5-c | session S6-c | |
| | 13:30 – 14:15 | | | Lunch / coffee break |

Oral sessions

S1 EACS 2022 special session: bridging to the future (*Special session in honor of EACS founding fathers*)

Organizers: Sara Casciati (*SIART s.r.l., Italy*), Łukasz Jankowski (*IPPT PAN, Poland*), Michael Krommer (*TU Wien, Austria*), Francesc Pozo (*Universitat Politècnica de Catalunya, UPC, Spain*)

S2 [*cancelled due to Covid-19*]

S3 LIVE-I project session - lightweight gear transmission

Organizers: Mohamed Ichchou (*Ecole Centrale de Lyon, France*), Francesco Franco (*University of Naples, Italy*), Stephan Rinderknecht (*TU Darmstadt, Germany*), Przemysław Kołakowski (*Adaptronica sp. z o.o., Poland*)

S4 SMART-SPACE session

Organizers: Jan Holnicki-Szulc, Zbigniew Wołęjsza (*IPPT PAN, Poland*), Przemysław Kołakowski (*Adaptronica sp z o.o., Poland*)

S5 Structural health monitoring and damage detection

Organizers: Magdalena Rucka (*Gdansk University of Technology, Poland*), Yonghui An (*Dalian University of Technology, China*), Bartomiej Błachowski (*IPPT PAN, Poland*), Nikos G. Pnevmatikos (*University of West Attica, Greece*)

S6 Optimization and optimal control approach in structural mechanics

Organizers: Dominik Pisarski (*IPPT PAN, Poland*), Andrzej Myśliński (*Systems Research Institute, Poland*)

S7 Adaptive shock-absorbers for mitigation of impact and vibration

Organizers: Robert Zalewski (*Warsaw University of Technology, Poland*), Cezary Graczykowski (*IPPT PAN, Poland*)

S8 Smart materials

Organizer: Tomasz G. Zieliński (*IPPT PAN, Poland*)

DETAILED CONFERENCE PROGRAMME

SUNDAY, July 10

| | |
|---------------|-------------------------------------|
| 15:00 – 17:00 | EACS BoD meeting (<i>room 20</i>) |
| 17:00 – 19:00 | Welcome reception |

MONDAY, July 11

| | |
|---------------|--|
| 9:30 – 9:45 | Opening: <i>prof. Tadeusz Burczyński, Director of IPPT PAN</i> |
| 9:45 – 10:30 | Plenary lecture: <i>prof. Billie F. Spencer Jr, University of Illinois at Urbana-Champaign, US</i> <i>Structural health monitoring of freight railroad bridges in North America</i> |
| 10:30 – 11:15 | Plenary lecture: <i>prof. Jason Zheng Jiang, University of Bristol, UK</i> <i>Multidomain synthesis of vibration suppression systems</i> |
| 11:15 – 11:35 | Coffee break |
| | Auditorium: session S1 <i>(level 2)</i> EACS 2022 special session: bridging to the future <i>(Special session in honor of EACS founding fathers)</i> |
| 11:35 – 11:55 | <u>Sara Casciati</u> <i>Comparing the efficiency of different structural skeletons for isolated domes</i> |
| 11:55 – 12:15 | <u>Tugberk Guner</u> , Oreste S. Bursi, Marco Broccardo <i>A bistable locally resonant metafoundation for seismic protection of process plant components</i> |
| 12:15 – 12:35 | <u>Dominik Pisarski</u> , Łukasz Jankowski <i>Reinforcement learning algorithm for controlling the transient vibrations of semi-active structures induced by unknown periodic excitation</i> |
| 12:35 – 12:55 | <u>Piotr Bartkowski</u> , Franciszek Gawiński, Łukasz Pawliszak <i>Electromagnetically-controlled shape morphing composite</i> |
| 12:55 – 13:15 | <u>Blazej Poplawski</u> , Grzegorz Mikułowski, Arkadiusz Mróz, Łukasz Jankowski <i>Semi-active vibration mitigation of 2D frames by means of local nodal reconfiguration</i> |

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| | Scientific Council Room: session S3-a (level 1) LIVE-I project session – lightweight gear transmission |
| 11:35 – 11:55 | <u>Firas Bejar</u> , Joël Perret-Liaudet, Olivier Bareille, Mohamed Ichchou, Mauro Fontana <i>Numerical assessment of the static and dynamic behaviors resulting from gear blanks with holes</i> |
| 11:55 – 12:15 | <u>Wael Masmoudi</u> , Jean-Luc Wojtowicki, Giuseppe Petrone, Francesco Franco, Sergio De Rosa <i>Materials optimization of lightweight gear transmission components</i> |
| 12:15 – 12:35 | <u>Daniel Amaral</u> , Mohamed Ichchou, Przemysław Kołakowski, Pascal Fossat, Michelle Salvia <i>Enhanced vibro-acoustic behavior of lightweight gearbox housing through the use of locally resonant metamaterials</i> |
| 12:35 – 12:55 | <u>Ranim Najib</u> , Jessica Neufond, Giuseppe Petrone, Francesco Franco, Sergio De Rosa <i>Manufacturing margins and robustness of NVH prediction for lightweight transmissions</i> |
| 13:15 – 14:00 | Lunch break |
| | Auditorium: session S7-a (level 2) Adaptive shock-absorbers for mitigation of impact and vibration |
| 14:00 – 14:20 | <u>David Wagg</u> <i>Recent developments in inerter-based devices for vibration mitigation</i> |
| 14:20 – 14:40 | <u>Krzysztof Kecik</u> , Kacper Serwin <i>Energy harvesting and vibration control using adaptive suspension of a pendulum tuned mass damper</i> |
| 14:40 – 15:00 | <u>Grzegorz Mikułowski</u> , Blazej Poplawski, Łukasz Jankowski <i>Experimental validation of vibration control performance and sensor placement in a frame structure with semi-active joints</i> |
| 15:00 – 15:20 | <u>Mateusz Żurawski</u> , Cezary Graczykowski, Robert Zalewski <i>The prototype, mathematical modelling and optimization of Adaptive Tuned Particle Impact Damper</i> |

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| | Scientific Council Room: session S3-b <i>(level 1)</i> LIVE-I project session – lightweight gear transmission |
| 14:00 – 14:20 | <u>Barabara Zaparoli Cunha</u> , Christophe Droz, Abdel-Malek Zine, Stéphane Foulard, Mohamed Ichchou <i>Uncertainty propagation in static and dynamic gear whine analyses through neural networks surrogate models</i> |
| 14:20 – 14:40 | <u>Sina Soleimanian</u> , Giuseppe Petrone, Arkadiusz Mroz, Francesco Franco, Przemysław Kolakowski, Sergio De Rosa <i>Optimal tuning of an adaptive vibration absorber for vibration control of vehicle transmission system</i> |
| 14:40 – 15:00 | <u>Sneha Rupa Nampally</u> , Sherif Okda, Mauro Fontana, Rainer Nordmann, Stephan Rinderknecht <i>Experimental studies on the influence of static torque in a novel gearbox test-rig</i> |
| 15:00 – 15:20 | <u>Sherif Okda</u> , Sneha Rupa Nampally, Mauro Fontana, Sven Herold, Rainer Nordmann, Stephan Rinderknecht, Tobias Melz <i>Experimental vibro-acoustic analysis of gearbox behavior using piezoelectric stack actuator excitation</i> |
| 15:20 – 16:00 | <p style="text-align: center;">Poster session / Coffee break</p> <u>César Peláez</u> , Alvaro Magdaleno, Antolin Lorenzana <i>Human-induced force reconstruction using a non-linear electrodynamic shaker applying ANN-based iterative learning controller</i> <u>Alvaro Magdaleno</u> , Javier Naranjo, Alvaro Iglesias-Pordomingo, César Peláez, Ivan M. Diaz <i>Study of the interaction phenomena between a slender structure and its passive mitigation devices</i> <u>Xinhao An</u> , Jilin Hou, Qingxia Zhang, Łukasz Jankowski <i>Identification of vehicle frequency response function based on Tikhonov regularization method</i> <u>Mariusz Ostrowski</u> , Bartłomiej Błachowski, Grzegorz Mikulowski, Łukasz Jankowski <i>Comparison of mode matching and Bayesian approach for parametric identification of frames with bolted connections</i> <u>Michał A. Posyniak</u> , A. Skop, Krzysztof M. Markowicz <i>Small sensors in atmospheric aerosols profiling</i> |
| 16:00– ~20:00 | <p style="text-align: center;">Chopin’s Warsaw – tour & recital <i>(busses leave from IPPT PAN at 16:00)</i></p> |

TUESDAY, July 12

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| 9:30 – 10:15 | Plenary lecture: <i>prof. Nathan van de Wouw, Eindhoven University of Technology, The Netherlands</i> <i>Hybrid and data-based control of high-tech mechatronic system</i> |
| 10:15 – 11:00 | Plenary lecture: <i>prof. Przemysław Perlikowski, Lodz University of Technology, Poland</i> <i>Mitigation of vibrations with tuned mass damper with inerter</i> |
| 11:00 – 11:20 | Coffee break |
| | Auditorium: session S5-a <i>(level 2)</i> Structural health monitoring and damage detection |
| 11:20 – 12:00 | <u>Ziemowit Dworakowski</u> keynote lecture: <i>Data interpretation challenges in Structural Health Monitoring</i> |
| 12:00 – 12:20 | <u>Jersson X. Leon-Medina, Núria Parés, Maribel Anaya, Diego Tibaduiza, Francesc Pozo</u> <i>Ensemble of feature extraction methods to improve the structural damage classification in a wind turbine foundation</i> |
| 12:20 – 12:40 | <u>Daniele Bortoluzzi, Sara Casciati, Matteo Francolini</u> <i>The problem of geothermal power installation on buildings: structural building monitoring and assessment during drilling activities</i> |
| 12:40 – 13:00 | <u>Rafał Sieńko, Łukasz Bednarski, Tomasz Howiacki, Katarzyna Zdanowicz</u> <i>Innovative monolithic DFOS sensor for temperature and mechanical strain measurements</i> |
| | Scientific Council Room: session S7-b <i>(level 1)</i> Adaptive shock-absorbers for mitigation of impact and vibration |
| 11:20 – 11:40 | <u>Piotr Bartkowski, Robert Zalewski</u> <i>Concept of smart multiaxial vacuum packed particles impact damper</i> |
| 11:40 – 12:00 | <u>Daniel Habtamu Zelleke, Vasant Matsagar</u> <i>Hybrid control of smart base-isolated structures under multi-hazard scenarios</i> |
| 12:00 – 12:20 | <u>Thomas Simpson, Vasilis Dertimanis, Eleni Chatzi</u> <i>Nonlinear adaptive inverse control for real time hybrid simulation</i> |

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| 12:20 – 12:40 | <u>Michał Makowski</u> , Lech Knap, Cezary Graczykowski <i>Algorithm for real-time identification of faults in semi-active suspension</i> |
| 12:40 – 13:00 | <u>Rami Faraj</u> , Blazej Poplawski, Dorian Gabryel, Tomasz Kowalski, Krzysztof Hinc <i>Analyses of the rescue cushion design – sensitivity study</i> |
| 13:00 – 13:45 | Lunch break |
| | Auditorium: session S6-a <i>(level 2)</i> Optimization and optimal control approach in structural mechanics |
| 13:45 – 14:05 | <u>Nicholas Wills</u> , Yi-Yuan Li, Jason Zheng Jiang, Tom Hill, Simon Neild, Miguel Dhaens <i>Performance improvements in an in-wheel motor system incorporating inerters</i> |
| 14:05 – 14:25 | <u>Steen Krenk</u> <i>Cubic frequency format for viscous damper on a flexible structure</i> |
| 14:25 – 14:45 | <u>Vedat Senol</u> , Gursoy Turan, Anders Helmersson, Vortechz Andersson <i>MRD based semi-active robust H_{∞} control of civil structures with parametric uncertainties</i> |
| 14:45 – 15:05 | <u>Neven Alujević</u> , Marin Jalšić, Srećko Arandia-Krešić, Ivan Čatipović <i>Non-reciprocal vibration transmission through absolute position and velocity feedback</i> |
| 15:05 – 15:25 | <u>Matthieu Diaz</u> , Pierre–Etienne Charbonnel, Ludovic Chamoin <i>Towards an automated physics-regularized model updating strategy applied to the monitoring of civil engineering structures in low-frequency dynamics</i> |
| | Scientific Council Room: session S4 <i>(level 1)</i> SMART-SPACE session |
| 13:45 – 14:05 | <u>Zbigniew Wotejsza</u> , <u>Jan Holnicki-Szulc</u> <i>Challenges for smart space LTA (Lighter than Air) aerostats for globe health monitoring and telecommunication</i> |
| 14:05 – 14:25 | <u>Andrzej Świercz</u> , Cezary Graczykowski, Lech Knap, Grzegorz Mikułowski, Jan Holnicki-Szulc <i>Design of adaptive aerostats for short-term missions</i> |
| 14:25 – 14:45 | <u>Anita Orłowska</u> , Lech Knap, Jan Holnicki-Szulc <i>Semi-active interface (SAI) technique for suppressing of impact born vibrations</i> |

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| 14:45 – 15:05 | <u>Jarosław Januszewski</u> , Witold Fedorowicz-Jackowski <i>Multispectral imagery obtained with an aerostat and the potential of their use in monitoring of agriculture, forestry and environmental protection</i> |
| 15:05 – 15:25 | <u>Cezary Graczykowski</u> , Lech Knap, Rami Faraj, Jan Holnicki-Szulc <i>Capsules for safe airdrop and efficient touchdown mitigation</i> |
| 15:25 – 15:45 | Coffee break |
| | Auditorium: session S6-b (level 2) Optimization and optimal control approach in structural mechanics |
| 15:45 – 16:05 | <u>Baki Ozturk</u> , Ersin Aydin, Huseyin Cetin, Fatih Tugrul, Yunus Bozkurt, Tunahan Celik, Mehmet Akcakoyunluo <i>Effect of tuned mass dampers on displacement response behavior of structures under harmonic loading</i> |
| 16:05 – 16:25 | <u>Elżbieta Jarzębowska</u> , Krzysztof Augustynek, Andrzej Urbaś <i>Motion tracking of a rigid-flexible link robotic system in an underactuated control mode</i> |
| 16:25 – 16:45 | <u>Ido Halperin</u> , Yuri Ribakov <i>Optimal structural control by hybrid active and semi-active control strategy</i> |
| 16:45 – 17:05 | <u>Andrzej Mitura</u> , Jerzy Warmiński <i>Experimental studies of rotor blades vibration control</i> |
| 17:05 – 17:25 | <u>Paweł Hańczur</u> , Tomasz Szolc, Robert Konowrocki <i>Active control of torsional vibrations in rotating systems by means of the driving asynchronous motor</i> |
| | Scientific Council Room: session S8 (level 1) Smart materials |
| 15:45 – 16:05 | <u>Andrzej Koszewnik</u> , Daniel Ołdziej <i>Parameter optimization of a magnetic coupled piezoelectric energy harvester: numerical analysis and experimental study</i> |
| 16:05 – 16:25 | <u>Bartłomiej Stępnia</u> k, Krzysztof Falkowski <i>Modelling of two antagonistic shape memory alloy wires</i> |

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| 16:25 – 16:45 | <u>Kamil Opiela</u> , Robert Konowrocki, Tomasz G. Zieliński <i>Magnetically controlled sound absorption by means of a composite additively manufactured material</i> |
| 16:45 – 17:05 | <u>Aleksander Kras</u> , Paolo Gardonio <i>Flywheel proof mass actuator for active vibration control</i> |
| 17:05 – 17:25 | <u>Jacek Widłaszewski</u> <i>Laser micro bending mechanism for high-precision adjustment in mechatronic systems</i> |
| 18:00 | Buses leave from IPPT PAN for conference dinner |

WEDNESDAY, July 13

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| | Auditorium: session S5-b <i>(level 2)</i> Structural health monitoring and damage detection |
| 9:30 – 10:10 | <u>Yasutaka Narazaki</u> , Wendong Pang keynote lecture: <i>Fully autonomous post-earthquake visual inspection of railway bridges: prototype development</i> |
| 10:10 – 10:30 | <u>Mariusz Ostrowski</u> , Bartłomiej Błachowski, Mateusz Żarski, Bartosz Wójcik, Piotr Tazowski, Łukasz Jankowski <i>Comparison of the accuracy of computer vision-based methods for estimation of structural displacements using synthetic video data</i> |
| 10:30 – 10:50 | <u>Piotr Bońkowski</u> , Piotr Bobra, Zbigniew Zembaty <i>Monitoring of flexural stiffness drop of reinforced concrete structures using rotation rate sensors</i> |
| 10:50 – 11:10 | <u>Tulay Ercan</u> , Costas Papadimitriou <i>Optimal sensor placement for structural health monitoring</i> |
| | Scientific Council Room: session S7-c <i>(level 1)</i> Adaptive shock-absorbers for mitigation of impact and vibration |
| 9:30 - 9:50 | <u>Daniela Enciu</u> , Ioan Ursu, George Tecuceanu <i>New strategy for the safety and comfort of the passengers and aircraft crew during atmospheric turbulence</i> |

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| 9:50 – 10:10 | <u>Cezary Graczykowski</u> , Rami Faraj <i>Optimal and predictive control of semi-active fluid-based dampers under impact excitation</i> |
| 10:10 – 10:30 | <u>Rami Faraj</u> , Rafał Wiszowaty, Grzegorz Mikułowski, Cezary Graczykowski <i>Experimental verification of the kinematic control for pneumatic impact absorber</i> |
| 10:30 – 10:50 | <u>Lech Knap</u> , Michał Makowski <i>The use of controlled damper with the piezoelectric valve in control of vehicle vibrations</i> |
| 10:50 – 11:10 | <u>Haonan He</u> , Yuan Li, Jason Zheng Jiang, Steve Burrow, Simon Neild, Andrew Conn <i>Optimal vibration-absorber network identification: an approach based on graph theory</i> |
| 11:10 – 11:30 | Coffee break |
| | Auditorium: session S5-c <i>(level 2)</i> Structural health monitoring and damage detection |
| 11:30 – 11:50 | <u>Aleksandra Bogdanovic</u> , Zoran Rakicevic, Julijana Bojadjieva, Vlatko Sheshov, Kemal Edip <i>3D seismic network in urban environment</i> |
| 11:50 – 12:10 | Arkadiusz Kwiecień, Zoran Rakicevic, Jarosław Chełmecki, Aleksandra Bogdanovic, Marcin Tekieli, Matija Gams, Łukasz Hojdys, Piotr Krajewski, Filip Manojlovski, Antonio Soklarovski, Ömer Faruk Halici, Anastasios Sapalidis <i>Comparison of experimentally determined structural dynamic characteristics on a shake table tested model by different methods</i> |
| 12:10 – 12:30 | <u>Nikos Pnevmatikos</u> , Bartłomiej Błachowski, Styliani Papatzani, Fotini Konstandakopoulou, Pantelis Broukos <i>Damage detection of structure subjected to earthquake excitation based on multifractal analysis and wavelet leaders</i> |
| 12:30 – 12:50 | <u>Santhakumar Sampath</u> , Hoon Sohn <i>Non-contact nonlinear wave mixing response of narrowband Lamb waves generated by making a laser beam with line laser array sources</i> |

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| 12:50 – 13:10 | <u>Magdalena Knak</u> , Erwin Wojtczak, Magdalena Rucka <i>Coda wave interferometry for monitoring the fracture process of concrete beams under bending test</i> |
| 13:10 – 13:30 | <u>Michał Dziendzikowski</u> , Kamil Kowalczyk, Patryk Niedbała, Artur Kurnyta, Jan Biczuk, Krzysztof Sekuła, Krzysztof Kaźmierczak, Przemysław Kołakowski <i>Low velocity impact identification and damage assessment of composite structures based on embedded PZT sensors</i> |
| | Scientific Council Room: session S6-c (level 1) Optimization and optimal control approach in structural mechanics |
| 11:30 – 11:50 | <u>Komal Rajana</u> , <u>Agathoklis Giaralis</u> <i>Bi-objective optimal design of the energy harvesting enabled tuned mass damper inerter (EH-TMDI) for vibration mitigation and energy harvesting in stochastically excited multi-degree-of-freedom structures</i> |
| 11:50 – 12:10 | <u>Anna Al Sabouni-Zawadzka</u> , Adam Zawadzki <i>Experimental verification of deployment strategies for a simplex tensegrity column</i> |
| 12:10 – 12:30 | <u>Alberto Di Matteo</u> , Chiara Masnata, Antonina Pirrotta <i>Tuned Liquid Column Damper Inerter (TLCDI) for vibration control of base-isolated structures</i> |
| 12:30 – 12:50 | Paulina Kurnyta-Mazurek, Tomasz Szolc, <u>Maciej Henzel</u> , Krzysztof Falkowski <i>The parametric predictive control algorithm in the magnetic support system of a high-speed machine</i> |
| 12:50 – 13:10 | <u>Vasilis Dertimanis</u> , Sami Masri, Eleni Chatzi <i>Active Bayesian vibration mitigation of nonlinear systems with uncertain dynamics</i> |
| 13:10 – 13:30 | <u>Dominik Pisarski</u> , Robert Konowrocki, Tomasz Szolc <i>Distributed modular semi-active controller for suppression of vibrations and energy harvesting</i> |
| 13:10 – 14:15 | Lunch / coffee break |

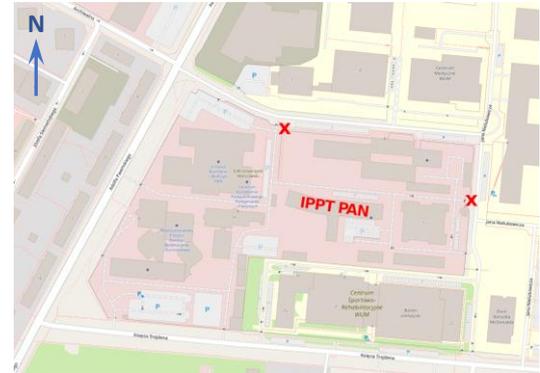
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Google Maps: IPPT PAN



The area around **IPPT PAN** is fenced.
Two entrances are marked with **x**.

Public transport in Warsaw is generally safe. It is relatively reliably covered in real time by Google Maps. Some other websites covering the public transport are:

<https://www.wtp.waw.pl/en/>

Official website of Warsaw Public Transport Authority

<https://jakdojade.pl/>

There is a number of **radio taxi** companies in Warsaw. Some of the most popular are:

| | |
|------------------|-----------------------|
| MPT Taxi / iTaxi | tel.: +48 22 19191 |
| Tanie Taxi | tel.: +48 666 666 651 |
| Opti Taxi | tel.: +48 608 300 500 |
| Ele Taxi | tel.: +48 22 8111 111 |