ENGINEERING MECHANICS 2024

30th INTERNATIONAL CONFERENCE

MAY 14 – 16, 2024, MILOVY, CZECH REPUBLIC



PROGRAMME OF THE CONFERENCE

Institute of Solid Mechanics, Mechatronics and Biomechanics, Faculty of Mechanical Engineering, Brno University of Technology

Institute of Thermomechanics, Academy of Sciences of the Czech Republic, v.v.i. – branch Brno

> Institute of Theoretical and Applied Mechanics, Academy of Sciences of the Czech Republic, v.v.i.

> > ŽĎAS, a. s., Žďár nad Sázavou

IFToMM Member Committee of Czech Republic

Czech Society for Mechanics

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CONTACT ADDRESS OF THE ENGINEERING MECHANICS 2024

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Conference EM2024 is hosted by the OREA Resort Devět Skal, Milovy

Address: Hotel reception and Registration Desk:

OREA Resort Devět Skal Tel.: +420 566 585 111

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Czech Republic

1. GENERAL INFORMATION

ACCOMMODATION

The accommodation of the participants is reserved in the **OREA Resort Devět Skal** (see map in the chapter 5.). Please contact kindly the reception of the hotel immediately after your arrival. For information regarding other **hotel services** (swimming pool, etc.), please contact hotel reception.

BADGES

The participants are kindly requested to **wear their badges during the conference** to be admitted to scientific sessions, meals, transportation and other services.

BOARDING

Boarding is provided for participants in the hotel restaurant, **starting with Tuesday dinner and ending by the breakfast on Thursday**. Breakfasts are served from 7:00, lunches and dinners are scheduled according to the conference programme. The meal costs are included in the conference fee. The visible conference badge is a sign for the staff to serve you.

CONFERENCE REGISTRATION

The **Registration corner of the EM2024 Conference** is located in front of the Conference Hall (on the 2nd floor) of the hotel Devět Skal. It is open from 13:00 to 18:30 on Tuesday (14th May) and from 8:30 to 16:00 on Wednesday (15th May).

INSURANCE

The Conference Committee is not responsible for the health problems of the participants nor for losses. The visitors from abroad are recommended to take out insurance in the country of their origin.

INTERNET SERVICES

Wi-Fi coverage of the entire hotel is ensured during the conference.

REFRESHMENT

Coffee, tea and cookies are available during the Coffee Breaks for all conference participants. Outside these breaks, snacks can be purchased at the hotel bar (11:00 - 23:00). For other possibilities, please contact the staff of the hotel.

TRANSPORTATION

- A special bus to Milovy will be leaving Žďár nad Sázavou (bus station in front of the railway station) at 12:45 on Tuesday 14 May, 2024.
- A special bus to Žďár nad Sázavou (bus & railway station) will be leaving hotel Devět Skal approximately at 9:30 on Thursday 16 May, 2024.

2. SCIENTIFIC INFORMATION

The 30th International Conference ENGINEERING MECHANICS 2024 continues in the tradition of the fruitful meetings which have been held in Svratka for many decades.

The Scientific Committee reviewed and chose **75 papers** for the presentation (57 lectures and 18 posters) including **2 invited keynote lectures**, which will be heard on Tuesday and Wednesday. All accepted papers are published in **Conference Proceedings "Engineering Mechanics 2024"**. The proceedings will be also published on-line on www.engmech.cz.

OFFICIAL LANGUAGE

The official languages of the conference are Czech, Slovak and English. No simultaneous translation is provided. All presentations/posters must be written in English.

LECTURES

The conference includes the **Keynote lectures** (plenary session) and parallel sessions in the conference facilities located on the 2^{nd} floor of the Devět skal hotel. The plenary sessions will take place in the main lecture hall (**Conference Hall**), the **parallel sections** in three smaller lounges (**Lecture Hall I – III**) that are accessible from the Conference Hall.

The presentation of a keynote lecture lasts 40 minutes while that one of a normal lecture 15 minutes including the discussion. The Chairmen of scientific sessions are responsible for keeping the timetable. The presenting authors are kindly asked to contact their PC Service at least 10 minutes before starting of the session and to check functionality of their presentation.

The data projector with PC is available in all Lecture Halls as a standard. No other facilities will be provided, unless the speaker employs its own device – please contact the PC Service in that Lecture Hall.

POSTER SESSION

The area for the poster session is reserved in the back of the Conference Hall from Tuesday afternoon. For every paper announced for the poster session, a particular panel of ca. $0.9 \times 1.2 \text{ m}$ (width x height) is assigned and labelled by the number and title of the poster. The fixing material will be available at the place and at the Registration Desk.

The authors of the posters exhibited at the Conference can register at the Registration Desk to the **competition for the Prize of the Managing Director of the ŽĎAS**. The only condition for participation is the personal presence of the author at the Award Ceremony.

The Special Poster Committee – under chairmanship of Mr. Radek Vlček, MSc., technical director of the ŽĎAS company – will conclude the assessment of the posters exhibited on Wednesday (11:15 – 11:45). The winners of the competition will be announced and awarded on Wednesday evening at 19:00 before the Group Photo and Conference Dinner.

The authors are kindly asked to **dismount their posters by Wednesday evening**.

VARIATIONS

The **Scientific Committee is entitled to vary the conference programme** if necessary for scientific or technical reasons. If a speaker is missing in the planned time the next speakers take the order and the break after that particular session will be longer.

LIST OF SECTIONS

Section	Abbreviation	Lecture Hall
Keynote Lectures	KEY I and II	
Poster Session	POS	Conference Hall
Dynamics + Kinematics	DYN I and II	
Technological Processes	TEC	Lecture Hall I
Mechatronics	MCT	
Mechanics of Solids	SOL	
Thermomechanics	TER	Lecture Hall II
Fluid Mechanics	FLU I and II	
Biomechanics	BIO	Lecture Hall III
Reliability of Structures	REL	Lecture Hall III

3. CONFERENCE TIMETABLE

Tuesday - 14th May 2024					
13:00 – 18:30	Regi	R e g i s t r a t i o n – in front of the Conference Hall			
		Conference Hall			
15:15 – 15:30	Opening Ceremony				
15:30 – 16:10	KEYI – Keynote lectures				
16:10 – 16:30		Coffee Break			
	Conference Hall	Conference Hall Lecture Hall I Lecture Hall II Lecture Hall III			
16:30 – 19:00	DYN I SOL BIO				
19:00 – 20:20	Dinner – Restaurant				

Wednesday - 15th May 2024							
8:30 – 16:00	Regi	R e g i s t r a t i o n – in front of the Conference Hall					
	Conference Hall	Conference Hall Lecture Hall I Lecture Hall II Lecture Hall III					
9:00 – 9:40	KEYII						
9:45 – 11:15		DYN II	FLU I	REL			
11:15 – 11:45	Coffee	Break & Pos	ster Session ((see bellow)			
	Conference Hall	Conference Hall Lecture Hall I Lecture Hall II Lecture Hall III					
11:15 - 11:45	POS						
12:00 – 14:00		Lunch -	Restaurant				
	Conference Hall	Conference Hall Lecture Hall I Lecture Hall II Lecture Hall II					
14:00 – 15:15		TEC MCT	FLU II				
15:15 – 15:45		Coffee	Break				
15:45 – 19:00	Free time						
10.00 10.15	Conference Hall						
19:00 – 19:15	Award of the Prize of the Technical Director of ŽĎAS						
19:15 – 19:20	Group photo in front of the OREA Hotel Devět Skal						
19:20 – 24:00	Со	nference Di	nner – Restau	rant			

4. DETAILED PROGRAMME

4.1. Conference Hall

Tuesday – 14 th May 2024 – Conference Hall		
15:15 – 15:30	Opening Ceremony – Plenary session	
	Keynote lectures – Plenary session Chairman: J. Petruška	(KEY I)
15:30 – 16:10	Sant Z.: QUO VADO BIOMECHANICS	24
16:10 – 16:30	Coffee Break	

Wednesday – 15 th May 2024 – Conference Hall		
	Keynote lectures – Plenary session Chairman: J. Petruška	(KEY II)
9:00 – 9:40	Hajžman M., Bulín R, Byrtus M., Dyk Š., Polach P., Rendl J., Smolík I DYNAMICS OF ROTATING SYSTEMS FOCUSED ON INDUSTRIAL APPLICATIONS	18

4.1.1. Poster session (POS)

	Wednesday – 15 th May 2024 – Conference Hall			
11:15 - 11:45	Note: All of the entered posters exhibited at the Conference will be accepted into the comper for the Prize of the Managing Director of the ŽĎAS Company. The special committee – under chairmanship of Ing. Radek Vlček, technical direct of the ŽĎAS company.			
BIO	Gzik-Zroska B., Joszko K., Stradomski G., Piątek A., Wolański W., Kawlewska E.: ASSESSMENT OF MECHANICAL PROPERTIES OF TITANIUM SAMPLES, MANUFACTURED WITH THE USE OF ADDITIVE TECHNOLOGIES	102		
BIO	Thomková B., Hrubanová A., Košková O., Richtrová M., Skácel P., Štourač P., Marcián P.: EXPERIMENTAL ASSESMENT OF THE MECHANICAL BEHAVIOR OF IMPRESSION MATERIAL FOR ANAESTHESIOLOGY USE: A PRELIMINARY STUDY	298		

BIO	Thomková B., Borák L., Podešva P., Podešva M., Joukal M., Marcián P.: <i>INFLUENCE OF DENTAL IMPLANT INSERTION DEPTH ON STRAIN IN PERIIMPLANT BONE TISSUE</i>	302
DYN	Čečrdle J., Vích O., Stárek J., Vlach J., Kolář M., Šmíd M.: NEW DESIGN AND UPGRADE OF WHIRL FLUTTER AEROELASTIC DEMONSTRATOR	66
DYN	Pavlenko M. V.: DEGEREE OF SUSCEPTIBILITY OF THE GAS-BEARING COAL MASSIF TO CHANGES UNDER VIBRATION AND TECHNICAL SOLUTIONS FOR INCREASING METHANE EXTRACTION FROM THE RESERVOIR	234
FLU	Balážová R., Ferrari S., Hlinka J., Santus A.: TURBULENCE ESTIMATION BY EDDY DISSIPATION RATE AT LOW-ALTITUDES USING UAV IN-SITU DATA	42
FLU	Pařez J., Vampola T.: PREDICTION OF NON-STATIONARY DEFORMATION OF GAS TURBINE USING MACHINE LEARNING APPROACH COUPLING BETWEEN CFD AND FEM MODEL	226
KIN	Hroncová D., Delyová I., Sivák P., Prada E.: MANIPULATOR TRAJECTORY AND WORKSPACE IN THE MATLAB AND MSC ADAMS ENVIRONMENTS	130
МСТ	Miková Ľ., Šarga P., Vagaš M., Prada E., Brada L.: MODELING OF A QUARTER-CAR MODEL PASSING AN OBSTACLE USING LAPLACE TRANSFORMS, MATLAB/SIMULINK AND SIMSCAPE	202
MCT	Vechet S., Krejsa J., Chen K. S.: AI BASED ASSISTIVE MAINTENANCE OF MACHINES VIA QUERIX EXPERT-SYSTEM	310
SOL	Jančář R., Dlugoš J., Fridrichová K.: INFLUENCE OF SIMPLIFYING THE GEOMETRY OF THE FE MODEL OF THE VEHICLE FRONTAL FULL BARRIER CRASH TEST	146
SOL	Kovář J., Fuis V.: INFLUENCE OF BERKOVICH INDENTER TILT ON THE PROJECTED CONTACT AREA AT NANOINDENTATION TEST	166
SOL	Ondrášek J.: DESIGN OF AN INDEXING GEARBOX WITH RADIAL CAMS	218
SOL	Rackovský D. M., Czakó A.: INFLUENCE OF SINE-SHAPED PROFILE DEVIATIONS ON STATIC TRANSMISSION ERROR	246
SOL	Wdowiak-Postulak A., Świt G., Krampikowska A.: PREFABRICATED SYSTEM FOR STRENGTHENING FULL-SIZE WOODEN GIRDERS USING PRE-STRESSED FIBER-REINFORCED POLYMERS AND STEEL – BENDING SHEAR TESTS	318
TEC	Mrkos J., Horký P., Formánek M.: RECONSTRUCTION OF DUO ROLLING MILL	206
TER	Chudý D., Jegla Z.: PERSPECTIVE WAYS OF HEAT TRANSFER ENHANCEMENT FOR HEAT EXCHANGERS IN FOULING CONDITIONS	74
TER	Zabloudil J., Jegla Z., Daxner J., Babička Fialová D., Freisleben V., Reppich M.: CONSTRUCTION OF A MODULAR DEVICE FOR TESTING HIGHTEMPERATURE FLUE-GAS FOULING IN WASTE-HEAT SOURCES	322

4.2. Lecture Hall I

	Tuesday – 14 th May 2024 – Lecture Hall I	
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16:30	Hračov S., Macháček M.: GALLOPING OF INSULATED BUNDLED OVERHEAD LINE SIMPLIFIED ANALYSIS	126
16:45	Macháček M., Hračov S.: GALLOPING OF INSULATED BUNDLED OVERHEAD LINE - NONLINEAR NUMERICAL ANALYSIS IN TIME DOMAIN	190
17:00	Isoz M., Gruber P., Ježek O., Kubíčková L., Gabriel D., Kaufman J., Brajer J USING FINITE VOLUME METHOD TO SIMULATE LASER SHOCK PEENING OF 7050 AL ALLOY	J.: 142
17:15	Dohnal J., Šebík M.: BATTERY CRASH SIMULATION IN ANSYS LS-DYNA	86
17:30	Polach P., Smolík L., Byrtus M., Hajžman M.: INVESTIGATION OF THE EFFECT OF SURFACE TEXTURING IN HYDRODYNAMIC SLIDING CONTACTS	242
17:45	Fischer C., Náprstek J.: SOLUTION METHODS FOR AN AEROELASTIC PROBLEM WITH COMBINED HARMONIC AND STOCHASTIC EXCITATION	98
18:00	Bayer J.: APPLYING A TWO DEGREE OF FREEDOM MODEL FOR DRIVE-BY IDENTIFICATION	Y 46
18:15	Byrtus R.: CGA-BASED SNAKE ROBOT CONTROL MODEL	54
18:30	Kumar Y.: FREE AXISYMMETRIC VIBRATION OF ELASTICALLY RESTRAINED POROUS ANNULAR PLATE USING HAAR WAVELETS	178
18:45 – 20:20	Dinner – Restaurant	

Wednesday – 15th May 2024 – Lecture Hall I

9:45 – 11:15	Dynamics Chairmen: M. Sokol, J. Dupal	N II)
9:45	Marton M., Sokol M., Lamperová K.: STRUCTURAL DAMAGE DETECTION BY PSO METHOD	194
10:00	Kałaczyński T., Łukasiewicz M., Liss M., Mazurkiewicz A.: VIBRATION DIAGNOSTICS IN THE ASSESSMENT OF THE VEHICLES BODYWORK TECHNICAL STATE PROCEDURE	150
10:15	Sokol M., Crespo-Sanchez S., Rodríguez-Paz M., Mazáčková K., Gogová Z.: DAMAGE IDENTIFICATION OF SMALL HOUSES IN DIFFERENT SEISMIC REGIONS	278
10:30	Dupal J.: PROBABILITY LIMITS OF THE CRITICAL ROTOR SPEEDS	94
10:45	Sosna P., Hadaš Z.: DEVELOPMENT AND VERIFICATION OF NOVEL DUAL PLUNGER HYBRID KINETIC ENERGY HARVESTER	286
11:00	Rohan E., Naili S.: ELASTODYNAMICS IN PERIODIC MEDIA – APPROXIMATION BY HIGHER ORDER HOMOGENIZATION AND METAMATERIALS WITH RESONATORS	258
11:15 – 11:45	Coffee Break & Poster Session	
12:00 – 14:00	Lunch – Restaurant	
	Technological Processes (TEC
14:00 – 15:15		TEC) MCT)
14:00 – 15:15	Mechatronics (1)	_
	Mechatronics Chairmen: S. Věchet, Z. Hadaš Houfek M., Šimáček F.: STRESS-STRAIN ANALYSIS OF THE EFZ-22 SAND	MCT)
14:00	Mechatronics Chairmen: S. Věchet, Z. Hadaš Houfek M., Šimáček F.: STRESS-STRAIN ANALYSIS OF THE EFZ-22 SAND FILTER PRESSURE VESSEL Holesovský F., Hejna M.: TEMPERATURE FIELD EVALUATION USING	122
14:00	Mechatronics Chairmen: S. Věchet, Z. Hadaš Houfek M., Šimáček F.: STRESS-STRAIN ANALYSIS OF THE EFZ-22 SAND FILTER PRESSURE VESSEL Holesovský F., Hejna M.: TEMPERATURE FIELD EVALUATION USING INJECTION MOLD THERMAL INSERTS Červenka M., Koštial R.: THERMAL MANAGEMENT FOR MISSION	122 118
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4.3. Lecture Hall II

	Tuesday – 14 th May 2024 – Lecture Hall II	
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16:30	Cimrman R.: WEAK IMPOSITION OF POTENTIAL DIRICHLET BOUNDARY CONDITIONS IN PIEZOELASTICITY: NUMERICAL STUDY	78
16:45	Němeček J., Němečková J., Němeček J.: MICRO-SCALE CREEP OF CEMENTITIOUS MATERIALS	214
17:00	Hrstka M., Bajer J., Hadaš Z., Sharif Khodaei Z., Aliabadi F., Kotoul M.: MODELLING OF LEADING EDGE MORPHING BY USING GEOMETRICALLY EXACT BEAM THEORY	134
17:15	Lukeš V., Rohan E.: EFFICIENT COMPUTATIONAL ALGORITHM FOR SOLVING TWO-SCALE PROBLEMS OF LARGE DEFORMING HETEROGENEOUS PERIODIC STRUCTURES	186
17:30	Komlev V., Machacek J.: DESIGN OF CABLE-NETS FOR GLASS FAÇADES	162
17:45	Blacha Ł.: B-SPLINE BASED DENSITY ESTIMATION OF FATIGUE FAILURE. IN SLM 18NI300 STEEL	S 50
18:00	Čada Z., Černák M.: STRUCTURAL OPTIMIZATION USING BIOLOGICAL GROWTH METHOD IN ANSYS MECHANICAL, PART I and II	58
18:15	Daxner J., Jegla Z., Zabloudil J., Babička Fialová D., Reppich M.: DESIGN OF A DEVICE FOR MEASURING THE RATE OF PARTICULATE FOULING OF HEAT TRANSFER SURFACES	82
18:30	Vacek V., Petrášek Š., Horvath J.: DESIGN STUDY OF COOLING FOR FORWARD-TYPE DETECTORS UNDER INCREASED LUMINOSITY EXPECTED AT THE FUTURE LHC OPERATING CONDITIONS	306
18:45	Panfilov I. A., Aizikovich S. M., Vasiliev A. S.: ELASTOPLASTIC MODELS FOR INTERPRETING INDENTATION RESULTS	222
19:00 – 20:20	Dinner – Restaurant	

Wednesday – 15th May 2024 – Lecture Hall II

0.45 11.15	Fluid Mechanics (FLU		
9:45 – 11:15	Chairmen: D. Duda, M. Isoz		
9:45	Šnábl P., Procházka P., Uruba V., Pešek L.: INVESTIGATION OF 3D FLOW STRUCTURES IN A LINEAR BLADE CASCADE WITH STEREO PARTICLE IMAGE VELOCIMETRY	270	
10:00	Duda D., Uruba V., Yanovych V., Klimko M., Tomášková T., Jeřábek M., Žitek P., Milčák P.: PIV MEASUREMENT OF WAKES PAST STATOR WHEEL INSIDE AIR TEST TURBINE VT-400 IN TWO AXIAL×TANGENTIAL PLANES	90	
10:15	Khýr M., Plachá M., Hlavatý T., Isoz M.: DATA-DRIVEN APPROACH TO ESTIMATING SOOT DISTRIBUTION INSIDE CATALYTIC FILTERS IN AUTOMOTIVE EXHAUST GAS AFTERTREATMENT	154	
10:30	Hlavatý T., Isoz M.: ON DIFFUSION, REACTION, AND FLOW OF HIGHCONCENTRATION MULTICOMPONENT GAS MIXTURES	114	
10:45	Ledvinková B., Hračov S., Macháček M.: LES SIMULATIONS OF AIRFLOW AROUND RECTANGLE WITH SIDE RATIO 2:1 AND THEIR COMPARISION WITH EXPERIMENTS	182	
11:00	Havran E.: ANALYTICAL INVESTIGATION OF MARS DRONE CONCEPTUAL DESIGN	110	
11:15 – 11:45	Coffee Break & Poster Session		
12:00 – 14:00	Lunch – Restaurant		
14:00 – 15:15	,	U II)	
	Chairmen: M. Isoz, D. Duda		
14:00	Chairmen: M. Isoz, D. Duda Ples M., Wolański W., Sobkowiak M.: ENHANCING MEDICAL INSIGHTS THROUGH COMPUTATIONAL FLUID DYNAMICS: VALIDATING SIMULATION MODEL FOR BLOOD FLOW IN VASCULAR SYSTEM	238	
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14:15	Ples M., Wolański W., Sobkowiak M.: ENHANCING MEDICAL INSIGHTS THROUGH COMPUTATIONAL FLUID DYNAMICS: VALIDATING SIMULATION MODEL FOR BLOOD FLOW IN VASCULAR SYSTEM Kubíčková L., Isoz M.: REYNOLDS-AVERAGED SIMULATION OF TURBULENT FLOWS WITH IMMERSED BOUNDARIES Studeník O., Kotouč Šourek M., Isoz M., Kočí P.: PARALLELIZATION OF DEM SOLVER FOR NON-SPHERICAL SOLIDS: A PATHWAY	174	
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4.4. Lecture Hall III

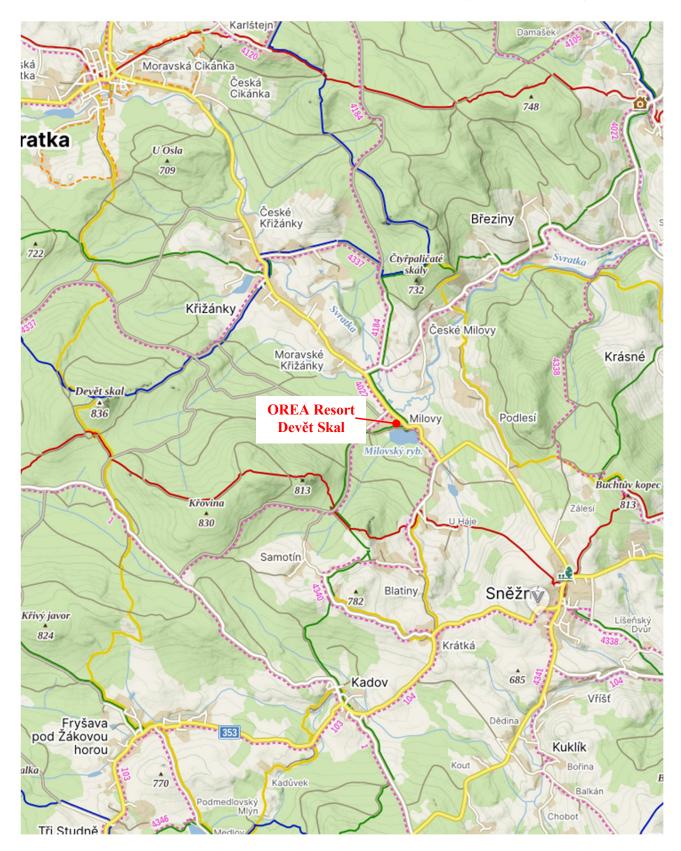
Tuesday – 14th May 2024 – Lecture Hall III **Biomechanics** (BIO) 16:30 - 18:30Chairmen: Z. Sant, M. Pásek Abramczyk I., Ligaj B.: INFLUENCE OF THE ETCHING TIME OF TI6AL4V 16:30 TITANIUM ALLOY WITH SELECTED ACID SOLUTIONS ON CHANGES 38 IN PHYSICAL PARAMETERS OF THE ELEMENT Pásek M., Bébarová M., Christé G.: ROLE OF SUBMEMBRANE SPACES IN THE CONTROL OF TRANSMEMBRANE ION FLUX AND CELLULAR 16:45 230 INOTROPIC STATE IN A MODEL OF HUMAN VENTRICULAR **CARDIOMYOCYTE** Radolf V., Horáček J., Košina J.: EXPERIMENTAL INVESTIGATION OF FLUID-STRUCTURE-ACOUSTIC COUPLINGS BY STUDYING 17:00 250 THE RESONANCE PROPERTIES OF VOCAL TRACT MODELS WITH YIELDING WALLS Hájek P., Horáček J., Švec J. G.: AUGMENTED M5 GEOMETRY OF HUMAN 106 17:15 VOCAL FOLD IN PHONATORY POSITION – PILOT RESULTS Hrubanová A., Thomková B., Košková O., Richtrová M., Borák L., Štourač P., Marcián P.: IMPACT OF DIFFERENT DISINFECTION SOLUTIONS 17:30 138 ON MECHANICAL PROPERTIES OF ORTHODONTIC IMPRESS SILICONE **MATERIAL** Sochor O., Hrubanová A., Joukal M., Burša J.: INFLUENCE OF ARTERY 17:45 274 UNFOLDMENT ON ITS MECHANICAL RESPONSE Votava T., Marcián P., Borák L., Fuis V., Zikmund T., Kaiser J., Wolff J.: 18:00 314 APPARENT YOUNG'S MODULUS OF HUMAN CRANIAL CANCELLOUS BONE Raziyan M. S., Janusas G.: ENHANCING SENSITIVITY IN PIEZOELECTRIC 18:15 MICRO CANTILEVER DESIGNS USING STRESS CONCENTRATION REGIONS 254 FOR LABEL FREE DETECTION 18:45 - 20:20Dinner – Restaurant

Wednesday – 15th May 2024 – Lecture Hall III

9:45 – 11:15	Reliability of Structures Chairmen: D. Novák, J. Petruška	(REL)
9:45	Michálková A., Jegla Z., Krišpín J., Gross A., Reppich M.: ASPECTS OF ADAPTATION OF FLANGE JOINTS FOR MODERN LOW-CARBON ENERGETICS	198
10:00	Slowik O., Šomodíková M., Novák D.: NON-LINEAR PROBABILISTIC ASSESSMENT OF EXISTING BRIDGE CONSIDERING DETERIORATION	266
10:15	Šorm F.: ACOUSTIC EMISSION METHODS IN STEEL BRIDGE DEGRADATION IDENTIFICATION AND MONITORING	282
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Conference Hotel - OREA Resort Devět Skal Vysočina, Milovy

5. *Map*



source: www.mapy.cz