

CMMoST 2021

6TH INTERNATIONAL CONFERENCE ON

Mechanical Models in Structural Engineering

01 – 03 December 2021

Escuela de Ingenierías Industriales
Universidad de Valladolid

Conference Programme



UNIVERSIDAD DE GRANADA



UNIVERSIDAD DE SEVILLA



Universidad de Valladolid

6th International Conference on Mechanical
Models in Structural Engineering

CMMOST 2021

Valladolid, December 2021

TECHNICAL PROGRAMME

Edited by Álvaro Magdaleno González
Universidad de Valladolid



Universidad de Valladolid

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WELCOME

CMMoST 2021 is the 6th edition of the Thematic Conference on Mechanical Models in Structural Engineering that is being held from 1 to 3 December in Valladolid (Spain). This series of conferences started in 2011 and progressed successfully over the decade. Previous editions were held in Granada (2011 and 2013), Sevilla (2015), Madrid (2017) and Alicante (2019).

This series constitutes an excellent opportunity to present research projects and results and also share experiences in the field of mechanical modeling in structural engineering. CMMoST is aimed at both researchers and professionals dedicated to the development and application of mechanical models in structural engineering.

In this edition, 54 contributions are programmed in 14 sessions, including 2 plenary lecture sessions and 12 oral sessions. The presentations come from 5 countries apart from Spain and 14 will be contributed by predoctoral researchers. Since its beginning, CMMoST has maintained its international scope, but also tries to encourage the young local researchers, making it easier for them to make their presentations in Spanish. Because of this, two official languages are permitted: English and Spanish.

Supported by the participants and local sponsors, CMMoST 2021 proposes an attractive social program that includes a reception at the Escuela de Ingenierías Industriales (School of Industrial Engineering), a tour around the city center of Valladolid, a wine experience at the Wine Museum in the nearby village of Peñafiel and a gala dinner to taste dishes of the local, traditional cuisine.

Finally, the Organization Committee of CMMoST 2021 is very thankful to the authors for their valuable contributions, to the chairmen for their help and the Conference Secretariat for their dedication to the tedious administrative tasks. To all of you, thank you very much.

ACKNOWLEDGEMENTS



Ayuntamiento de
Valladolid



Colegio Oficial de
Ingenieros Industriales
de Madrid



ORGANIZATION

Organizers

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Luisa María Gil Martín	Universidad de Granada
Enrique Hernández Montes	Universidad de Granada
Margarita Cámara Pérez	Universidad de Sevilla
Víctor Compán Cardiel	Universidad de Sevilla
Andrés Sáez Pérez	Universidad de Sevilla

Local committee (Universidad de Valladolid)

Álvaro Magdaleno González
Jesús Fernández Vizán
Mariano Cacho Pérez
José María García Terán
Elena Pérez Vázquez

Conference Secretariat

Álvaro Magdaleno González
E-mail: cmmost21@uva.es
Phone: +34 983 18 5974
Address: Paseo del Cauce 59, Valladolid, Spain

Natividad Cabrerós Martínez
Ismael Martín Villa

Scientific Committee

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Lourdes Jalón Ramírez	Dimitrios Vamvatsikos

PLENARY LECTURERS



Francisco Martínez Cutillas

Civil Engineer (Universidad Politécnica de Madrid, UPM, 1987) and PhD in Engineering (UPM, 1993), he has been professor of Mechanics and Structures at the ETSI de Caminos, Canales y Puertos of UPM since 1996, combining academic activities with his professional activity in the company Principia. He works mainly in the area of structural mechanics, specializing in the risk of cracks in reinforced concrete structures, damage and constitutive modeling of structural materials. His studies in nonlinear dynamics, impact, seismic effects, large dynamic deformations, explosions and metal forming are also noteworthy.



Enrique Hernández Montes

Civil Engineer (University of Granada, 1992) and PhD in Civil Engineering (University of Granada, 1995), he has been professor in Mechanics and Structures at the ETSI de Caminos of Granada since 2007. In addition to his academic activities and several research stays as a visiting professor at the universities of Illinois Urbana-Champaign, Milan and Santa Clara, he has worked as a structural specialist in companies (Prointec S.A., Global Quality Steel) and has been involved in multiple projects of bridges and reinforced concrete cavity walls and piles. He has proposed the EB-PA method (energy-based push-over analysis, included in the North American standard FEMA-440) and has published more than 100 papers. He is also the inventor of several patents (asymmetric piles) and the author of specialized books in structural technology.

CONFERENCE INFORMATION

Venue



Escuela de Ingenierías Industriales
Universidad de Valladolid

Paseo del Cauce 59, 47011 Valladolid, Spain
41°39'26"N, 4°42'37"W

Location of conference rooms

The Conference is mainly located in the **Salón de Actos** of the Escuela de Ingenierías Industriales (School of Industrial Engineering). The opening and closing ceremonies, the plenary sessions and half of the parallel sessions take place there. As can be seen in the Conference Venue Maps (pages 21 and 22), it is located on the first floor of the building.

The rest of the parallel sessions take place in the **Sala de Grados**, which is also located on the first floor of the building.

The Entrance Hall of the building plays an important role in this Conference, since the conference desk is located here at the beginning of each day. Also, coffee breaks take place here.

Registration

Registration is mandatory for all attending the Conference for the first time. The registration desk is placed in the Entrance Hall at the beginning of each day and is later moved to the entrance of the Salón de Actos. During registration, the participants are given a backpack with some goods and useful information together with their identification badge and the lunch and gala dinner tickets.

Oral presentations

During the technical sessions, the participants have up to 12 minutes to present their work, followed by some minutes of discussion with the audience. A computer with basic software (PowerPoint, Adobe Reader, etc.) is available in both rooms, together with a laser pointer. Remember that both English and Spanish languages are permitted in this Conference, although we encourage the slides/PowerPoint/etc. to be prepared in English to enable the international participants to follow the presentations more easily to some extent.

In order to avoid delays, the speakers must introduce themselves to the chairman in the assigned room before their session starts and upload their presentation into the computer.

Wi-Fi Network

A private Wi-Fi network is available for the conference participants inside the Escuela de Ingenierías Industriales building. To access it, use the following information:

Name: cmmost21

Password: 6CMMoST21

Coffee breaks and lunches

Following the technical sessions, a short coffee break or a lunch will take place. The coffee is served in the Entrance Hall. The lunches are served at 13:30 in the cafeteria of the Facultad de Ciencias Económicas y Empresariales (Faculty of Economics and Business Studies) which is 5 minutes walk away from the Escuela de Ingenierías Industriales (see page 23).

SOCIAL PROGRAM

Visit to Valladolid

Valladolid City Council and its Tourism Office will provide the Conference attendants the opportunity to discover the city and its main monuments. The participants have two opportunities to enjoy this activity: Wednesday evening (at 18:30) and Friday after lunch.

Cata de vinos (wine tasting) and Wine Museum in Peñafiel

After the last technical session on Thursday, a visit to a nearby village (Peñafiel) is scheduled. Its castle houses the Wine Museum and offers wine-related activities such as a regional wine tasting. In this case, the participants will taste three wines that have won awards (red, rosé and white) from different regional Designations of Origin: Ribera de Duero, Cigales and Rueda.



Gala dinner

Right after the wine tasting, the Gala Dinner takes place at a restaurant located very close to the Duratón river: El Molino de Palacios (<http://molinodepalacios.com>). It is an old water mill refurbished as a traditional restaurant where the participants will taste local and traditional dishes.

CONFERENCE TOPICS

The works presented in this conference are classified in at least one of the following topics. Most of the technical sessions cover one or two of them.

ID	Topic name
T1	Computational models for structural analysis
T2	Monitoring and characterization of structural loads
T3	Experimental methodologies for material and structural characterization
T4	Models for structural damage assessment
T5	Models for structural works
T6	Structural health monitoring (SHM)
T7	Vibration control in structures

In the following Technical Program Overview and in the Detailed Technical Program, the topics are mentioned by means of their identification number.

TECHNICAL PROGRAM OVERVIEW

Wednesday, December 1

15:00	Registration opens Location: Entrance Hall
16:00 – 16:30	Informal opening Location: Salón de actos
16:30 – 18:00	Session 1 Chair: Álvaro Magdaleno Location: Salón de actos Topics: T1
18:00 – 18:30	Coffee Break Location: Entrance Hall
18:30 – 21:00	Touristic Visits (first call)

Thursday, December 2

8:30	Registration opens Location: Entrance Hall
9:00 – 9:30	Official opening ceremony Location: Salón de actos
9:30 – 11:00	Session 2a Chair: Enrique Hernández Montes Location: Salón de actos Topics: T1
	Session 2b Chair: Luis Rodríguez-Tembleque Location: Sala de Grados <i>Student session</i> Topics: T1, T3
11:00 – 11:30	Coffee Break Location: Entrance Hall

11:30 – 12:15	Plenary lecture Title: Experiences on Advanced Numerical Simulations Lecturer: Francisco Martínez Cutillas Location: Salón de actos	
12:15 – 13:30	Session 3a Chair: Tomislav Jarak Location: Salón de actos Topics: T1, T7	
	Session 3b Chair: Antolín Lorenzana Location: Sala de Grados Topics: T6	
13:30 – 15:00	Lunch Location: Faculty of Economics and Business Studies	
15:00 – 16:15	Session 4a Chair: José Manuel Soria Location: Salón de actos Topics: T2, T4	
	Session 4b Chair: Emiliano Pereira Location: Sala de Grados <i>Student session</i> Topics: T2,T4,T7	
16:15 – 16:45	Coffee Break Location: Entrance Hall	
16:45 – 18:00	Session 5a Chair: Salvador Ivorra Location: Salón de actos Topics: T5	
	Session 5b Chair: Javier F. Jiménez Alonso Location: Sala de Grados <i>Student session</i> Topics: T1, T7	
18:00 – 18:20	Mini-plenary session Location: Salón de actos	
18:20 – 23:00	Wine experience and Gala dinner	

Friday, December 3

8:30	Registration opens Location: Entrance Hall
9:00 – 10:30	Session 6a Chair: José Adam Location: Salón de actos Topics: T4
	Session 6b Chair: Andrés Sáez Location: Sala de Grados Topics: T3
10:30 – 11:00	Coffee Break Location: Entrance Hall
11:00 – 11:45	Plenary lecture Title: Lo que aprendí de mi amigo Mark Aschheim: El desplazamiento de cedencia como el mejor parámetro para diseño sísmico. Lecturer: Enrique Hernández Montes Location: Salón de actos
11:45 – 13:00	Session 7 Chair: Iván M. Diaz Location: Salón de actos Topics: T7
13:00 – 13:30	Closure and award ceremony Location: Salón de actos
13:30 – 15:00	Lunch Location: Faculty of Economics and Business Studies
15:00 – 18:00	Touristic Visits (second call)

DETAILED TECHNICAL PROGRAMME

Wednesday, December 1

Session 1:

Chair: Álvaro Magdaleno

ID	TITLE and authors
2	ON THE DESIGN OF SEVERAL TUNED MASS DAMPERS FOR A MULTI-DEGREE-OF-FREEDOM MODEL OF A SHEAR BUILDING <i>A. Lorenzana, E. Pérez-Vázquez, J. Cara and Á. Magdaleno</i>
25	APPLICATION OF NSGA-II TO DESIGN MULTIPLE MITIGATION DEVICES IN SLENDER STRUCTURES <i>E. Pérez-Vázquez, M. Posada-Calvo, Á. Magdaleno and A. Lorenzana</i>
12	THE OCTAHEDRON FAMILY AS A SOURCE OF TENSEGRITY STRUCTURES: STUDY OF THE EQUILIBRUM CONFIGURATIONS CONSIDERING DIFFERENT FORCE:LENGTH RATIOS <i>M. A. Fernández-Ruiz, E. Hernández-Montes, L. M. Gil-Martín</i>
15	ANALYSIS OF SPHERICAL SHELL STRUCTURES USING THREE-DIMENSIONAL FINITE ELEMENTS FORMULATED IN GENERAL CURVILINEAR COORDINATES <i>J. M. Martínez-Valle</i>
35	PHYSICALLY BASED MODEL TO SIMULATE THE DIRECT CONNECTION BETWEEN MICROPILES AND EXISTING FOUNDATIONS <i>F. Pellicer-Martínez, P. Castrillo, A. M. Hernández-Díaz, V. S. Martínez-Lirón and J. Pérez-Aracil</i>

Thursday, December 2**Session 2a:**

Chair: Enrique Hernández Montes

ID	TITLE and authors
8	EVALUATION OF VIBRATION TRANSMISSION OF L-SHAPED PLATES USING FINITE ELEMENT ANALYSIS <i>J. Magdaleno, E. Segovia, J. Carbajo, J. Ramis, M. Á. Martin-Bravo</i>
20	DYNAMIC RESPONSE OF A FOOTBRIDGE WHEN USED FOR A GROUP OF SYNCHRONIZED WALKERS <i>M. Cacho-Pérez, Á. Iglesias-Pordomingo, Á. Magdaleno and A. Lorenzana</i>
28	NUMERICAL MODEL FOR THE PARAMETRIC ANALYSIS OF THE IMPACT BALL-PADDLE RACQUET <i>G. Castillo-López, F. García-Sánchez and J. M. Conde-Calabrús</i>
51	A FAST APPROACH TO STUDY THE DYNAMIC RESPONSE OF RAILWAY BRIDGES ACCOUNTING FOR SOIL-STRUCTURE INTERACTION <i>P. Galván, A. Romero, E. Moliner, D.P. Connolly and M.D. Martínez-Rodrigo</i>
59	MECHANICAL ASPECTS OF SHINGLED SOLAR CELLS <i>A. Fraile-de-Lerma, A. Lorenzana, L. Hermanns</i>

Session 2b:

Chair: Luis Rodríguez de Tembleque

ID	TITLE and authors
13	MECHANICAL BEHAVIOR OF DEMOUNTABLE AND REUSABLE JOINTS WITH WELDED STUDS <i>I. García-García, C. López-Colina, M.Á. Serrano-López and Y.C. Wang</i>
18	COST-EFFICIENT SURROGATE MODELING OF THE ELASTIC PROPERTIES OF FIBER-REINFORCED COMPOSITES <i>J.C. García-Merino, C. Calvo-Jurado, L. Rodríguez-Tembleque, A. Sáez and E. García-Macías</i>
30	ESTIMATION AND VALIDATION OF MODAL MASSES IN CONSTANT MASS-DENSITY SYSTEMS <i>N. García, R. Stufano, M. Aenlle and P. Fernández</i>
40	MODELLING CROWD-STRUCTURE INTERACTION ON AN ULTRA-LIGHTWEIGHT FRP FOOTBRIDGE <i>C. Gallegos-Calderón, J. Naranjo-Pérez, M.D.G. Pulido, J.M. Goicolea and I.M. Díaz</i>
54	PARAMETRIC STRUCTURAL ANALYSIS OF REINFORCED LIGHTWEIGHT CONCRETE BEAMS FOR BUILDINGS <i>I. Vives-Bonete, A.J. Tenza-Abril and F.B. Varona-Moya</i>

Session 3a:

Chair: Tomislav Jarak

ID	TITLE and authors
14	PROGRESSIVE COLLAPSE ASSESSMENT OF PRECAST REINFORCED CONCRETE STRUCTURES USING THE APPLIED ELEMENT METHOD <i>N. Makoond, M. Buitrago and J.M. Adam</i>
39	ON THE NATURAL BOUNDARY CONDITIONS IN THE MIXED COLLOCATION METHODS FOR ELASTICITY PROBLEMS <i>B. Jalušić and T. Jarak</i>
45	HYSTERETIC DEVICE FOR VIBRATION CONTROL <i>M. Diaferio, D. Foti, M. Lerna and M.F. Sabbà</i>
49	MCR-L CURVES FOR HOT ROLLED I-SECTIONS <i>P. Subotić and B. Šćepanović</i>

Session 3b:

Chair: Antolín Lorenzana

ID	TITLE and authors
4	SCALABLE AND LOW-COST MEMS-BASED STRUCTURAL HEALTH MONITORING SYSTEM <i>A. Izquierdo, J.J. Villacorta, L. del-Val and Á. Magdaleno</i>
5	INFLUENCE OF THE BOUNDARY CONDITIONS ON THE MODAL PROPERTIES OF A WALKABLE TIMBER PLATFORM <i>R.D. Martínez, J.A. Balmori, Á. Magdaleno and L.A. Basterra</i>
53	PARAMETRIC ANALYSIS OF SERVICEABILITY LIMIT STATE VERIFICATIONS IN REINFORCED CONCRETE ELEMENTS SUBJECTED TO BENDING <i>M. Sáez-Fernández, J. Pereiro-Barceló and F.B. Varona-Moya</i>
55	MECHANICAL BEHAVIOUR OF MASONRY PANELS PREVIOUSLY DAMAGED BY HIGH TEMPERATURES <i>B. Torres-Gorritz, F.B. Varona-Moya, F.J. Baeza-de-los-Santos and L. Estevan-García</i>

Session 4a:

Chair: José M. Soria

ID	TITLE and authors
6	GROUND REACTION FORCES GENERATION OF VIRTUAL HUMAN SUBJECTS APPLYING A FUZZY LOGIC-BASED ALGORITHM ON STATISTICAL INDICATORS EXTRACTED FROM EXPERIMENTAL DATA <i>J.M. García-Terán, C. Peláez, A. Fraile and A. Lorenzana</i>
16	MODELLING VARIABLE PEDESTRIAN DYNAMIC LOADING FACTORS INDUCED ON RIGID SURFACES <i>M. Garcia-Dieguez and J.L. Zapico-Valle</i>
43	CALIBRATION OF THE DYNAMIC LOAD FACTOR COEFFICIENTS FOR THIRD AND FOURTH HARMONIC FOR HSI MODEL IN AN ULTRA-LIGHTWEIGHT FRP LAB FOOTBRIDGE <i>J.M. Soria, J.F. Jiménez-Alonso, C. Gallegos-Calderón and C. M. C. Renedo</i>
50	MECHANICAL THIN INTERPHASES IN LEAD-FREE PRINTABLE PIEZOCOMPOSITES <i>J. Cañamero-Torres, B. Alegre-Sabatel, F. C. Buroni and L. Rodríguez-Tembleque</i>

Session 4b:

Chair: Emiliano Pereira

ID	TITLE and authors
7	INFLUENCE OF THE FRICTION EFFECTS ON THE EFFICIENCY OF A TUNED MASS DAMPER <i>Á. Iglesias-Pordomingo, C. Peláez, Á. Magdaleno and A. Lorenzana</i>
9	DAMAGE DETECTION IN SLENDER STRUCTURES BASED ON A HYBRID SYSTEM OF SUPERVISED LEARNING ALGORITHMS AND MODEL UPDATING TO ANALYZE RAW DYNAMIC DATA <i>C. Peláez, Á. Magdaleno and A. Lorenzana</i>
33	DETECTION OF STRUCTURAL DAMAGE IN LAMINATED WOOD STRUCTURES THROUGH FINITE ELEMENT METHOD AND MODAL UPDATING <i>R. Sanchez-Ruiz, R. Sancibrian, I. Lombillo, J. Peña-Lasso and A. Gaute</i>
57	STRUCTURAL OPTIMIZATION OF LIVELY COMPOSITE FLOORS WITH INTEGRATED CONSTRAINED LAYER DAMPING <i>P. Vidal-Fernández, C.M.C. Renedo, J.H. García Palacios and I.M. Díaz</i>

Session 5a:

Chair: Salvador Ivorra

ID	TITLE and authors
10	ESTIMATION OF SHORT-TERM DEFLECTION IN RC BEAMS USING EFFECTIVE MOMENTS OF INERTIA <i>L. M. Gil-Martín, M. A. Fernández-Ruiz, J. F. Carbonell-Márquez and E. Hernández-Montes</i>
21	CONPOSITE BRIDGE DECK OPTIMIZATION WITH TRAJECTORY BASED ALGORITHMS <i>D. Martínez-Muñoz, A. J. Sánchez-Garrido, J. V. Martí and V. Yepes</i>
22	NEUTROSOPHIC LOGIC APPLIED TO THE MULTI-CRITERIA EVALUATION OF SUSTAINABLE ALTERNATIVES FOR EARTH-RETAINING WALLS <i>A. J. Sánchez-Garrido, D. Martínez-Muñoz, I. J. Navarro and V. Yepes</i>
26	METAMODELING OF THE ADDITIONAL PLATE IN BENDING IN BEAM-TO-BEAM STEEL CONNECTIONS <i>M. López-López, A. Loureiro-Montero, R. M. Gutiérrez-Fernández and J. M. Reinoso-Prado</i>

Session 5b:

Chair: Javier F. Jiménez Alonso

ID	TITLE and authors
23	NUMERICAL SIMULATION OF HIGH-EFFICIENCY ONE PASS WELDING PROCESS IN THICK STEEL PLATES CONSIDERING HARDENING EFFECTS <i>M. Vukobojac, B. Jalušić, M. Perić, I. Skozrit and Z. Tonković</i>
38	ON MODAL ANALYSIS OF PHASE-FIELD FRACTURE MODELS <i>K. Jukić, T. Jarak, Z. Tonković and A. Lorenzana</i>
42	SENSOR PLACEMENT OPTIMIZATION USING CONVEX L0 NORM RELAXATIONS <i>M. Jokić and J. Rožić</i>
48	NUMERICAL ANALYSIS OF ALUMINIUM LATTICE STRUCTURE WITH K-JOINTS <i>N. Nikolić and B. Šćepanović</i>

Friday, December 3

Session 6a:

Chair: José Adam

ID	TITLE and authors
11	AVOIDING FAILURE PROPAGATION IN STEEL TRUSS BRIDGES: A CASE STUDY <i>E. Bertolesi, G. Caredda, M. Orru, M. Buitrago, M. C. Porcu and J. Adam</i>
36	ECONOMIC REPERCUSSION THAT THE DIRECT CONNECTION MICROPILE-FOUNDATION HAS ON THE UNDERPINNING PROJECTS COST <i>F. Pellicer-Martínez, V. S. Martínez-Lirón, A. M. Hernández-Díaz, J. A. López-Juárez and J. Pérez-Aracil</i>
46	EXTENDING THE FATIGUE LIFE OF SLENDER STEEL FOOTBRIDGES WITH TUNED MASS DAMPERS <i>J. F. Jiménez-Alonso, J. M. Soria-Herrera, I. M. Díaz and A. Sáez</i>
47	CRACK GROWTH AND DETECTION IN CNT-COMPOSITES BASED ON INDUCED RESISTIVITY CHANGES <i>L. Rodríguez-Tembleque, E. García-Macías, F. C. Buroni and A. Sáez</i>
56	FORENSIC ANALYSIS TAKEN AFTER THE COLLAPSE OF A HISTORICAL BELL <i>S. Ivorra-Chorro, B. Torres-Gorritz, L. Estevan-García and D. Bru-Orts</i>

Session 6b:

Chair: Andrés Sáez

ID	TITLE and authors
17	HORMIGÓN DE MUY ALTA RESISTENCIA (HMAR) CON SUSTITUCIÓN DE RESIDUOS EN MATRICES CEMENTOSAS <i>M^a Dolores Rubio-Cintas</i>
27	NON-LINEAR VISCOELASTIC BEHAVIOR EXPERIMENTAL CALIBRATION OF A RECYCLED RUBBER FROM ELTs <i>J. González-Vega, G. Castillo-López, F. García-Sánchez, J. M. Galindo-Moreno and S. Guerrero-Porras</i>
29	ON THE EVALUATION OF AN EPOXY-VINYL-ESTER RESIN, DOPED WITH CARBON NANO BY-PRODUCTS, AS A SENSOR IN STRUCTURAL ANALYSIS <i>G. Castillo-López, F. García-Sánchez, L. Pérez-Martínez, L. Germán and S. Neira</i>
44	EXPERIMENTAL MODE CHARACTERIZATION OF A TYMPANIC MEMBRANE FROM TIME DOMAIN HIGH SPEED DIGITAL HOLOGRAPHIC TESTS <i>J. M. García-Manrique, H. Tang, J. T. Cheng and A. González-Herrera</i>
58	THE OBSERVED FISHED INFORMATION MATRIX FOR UNCERTAINTY QUANTIFICATION IN OPERATIONAL MODAL ANALYSIS <i>J. Cara and Á. Magdaleno</i>

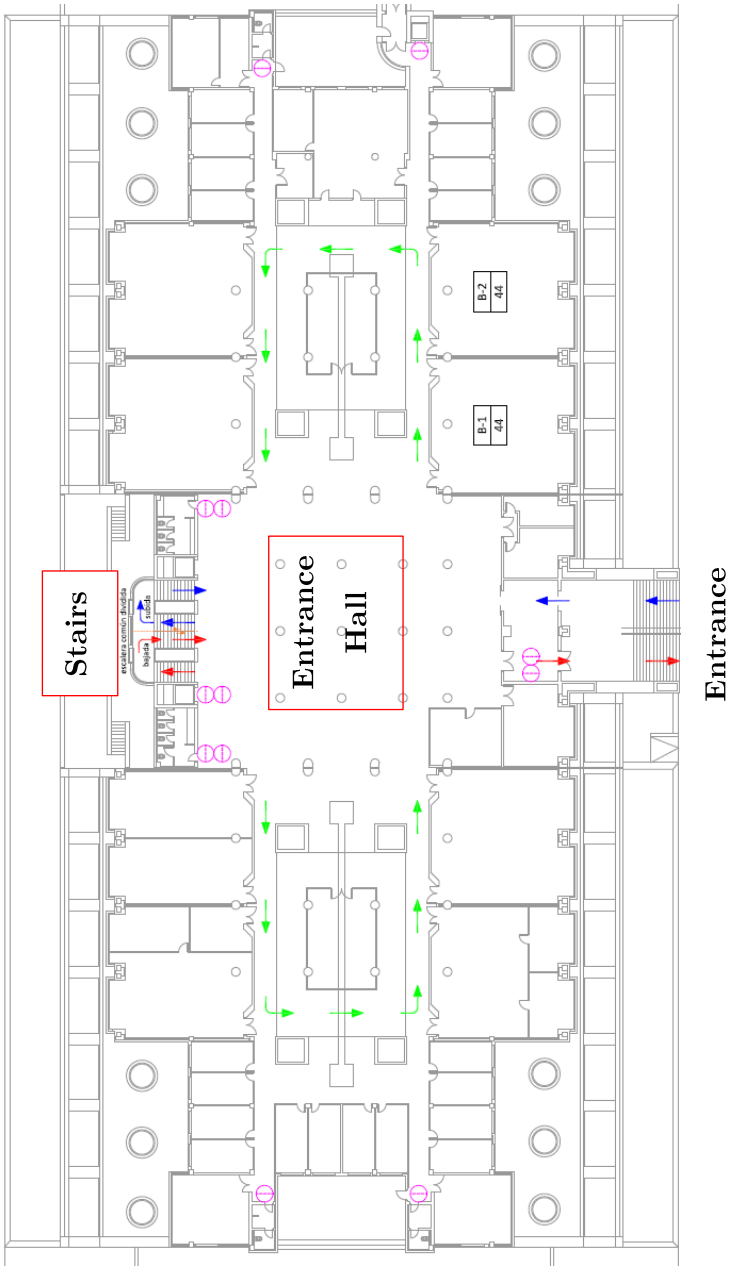
Session 7:

Chair: Iván M. Diaz

ID	TITLE and authors
1	A METHODOLOGY TO ESTIMATE THE PROPERTIES OF A TUNED MASS DAMPER INSTALLED ON A SLENDER STRUCTURE <i>Á. Magdaleno, J. Pérez-Aracil, J. M. Soria, C. Peláez and Á. Iglesias-Pordomingo</i>
24	THE APPLICATION OF ARTIFICIAL NEURAL NETWORKS AND REGRESSORS IN OPTIMAL VIBRATION CONTROL DESIGN <i>C. Camacho-Gómez, J. Pérez-Aracil, D. Casillas-Pérez, J. M. Soria, E. Pereira, D. Camacho and S. Salcedo-Sanz</i>
41	VIBRATION DAMPING IN CIVIL STRUCTURES WITH AN ON-OFF SEMI-ACTIVE CONTROL LAW IMPLEMENTED IN LINEAR ELECTRIC MOTOR <i>J. M. Soria, R. Mallol, J. Pérez-Aracil, Á. Magdaleno, P. Gil, C. Barrera-Vargas, E. Díez-Jiménez and E. Pereira</i>
32	STUDY OF THE REINFORCEMENT IN A FOOTBRIDGE WITH VIBRATION PROBLEMS <i>N. García-Fernández, P. Fernández-Fernández, M. Aenlle-López, M. Muñoz-Calvente and A. Álvarez-Vazquez</i>

CONFERENCE VENUE MAPS

GROUND FLOOR



FIRST FLOOR

