

## • ROSE FACULTY

Aiming at a unique diversity of teaching and research training in the field of Earthquake Engineering, the organisation of the ROSE School is based on a relatively short permanence of scholars with extremely high qualification. Indeed, all lecturers at the School are internationally recognised experts in the field, coming from a number of distinguished institutions, listed below:

G.M. Calvi	ROSE School, Co-Director
M.J.N. Priesley	ROSE School, Co-Director
N. Abrahamson	Pacific Gas & Electric Co., USA
D.P. Abrams	University of Illinois at Urbana-Champaign, USA
D.L. Anderson	University of British Columbia, Canada
F. Auricchio	Università degli Studi di Pavia, Italy
J. Berrill	University of Canterbury, Christchurch, NZ
J.J. Bommer	Imperial College London, UK
D.M. Boore	U.S. Geological Survey, California, USA
F. Brezzi	Università degli Studi di Pavia, Italy
A. Carr	University of Canterbury, Christchurch, NZ
M.P. Collins	University of Toronto, Canada
A. Der Kiureghian	University of California at Berkeley, USA
R. DesRoches	Georgia Institute of Technology, Georgia, USA
A. Elnashai	University of Illinois at Urbana-Champaign, USA
R.E. Englekirk	Englekirk Companies, USA
E. Faccioli	Politecnico di Milano, Italy
M.N. Fardis	University of Patras, Greece
G.L. Fenves	University of California at Berkeley, USA
A. Filiatrault	University of New York at Buffalo, USA
L. Gambarotta	Università degli Studi di Genova, Italy
M.C. Griffith	University of Adelaide, Australia
T.J.R. Hughes	University of Texas at Austin, USA
E. Kausel	MIT, Cambridge, USA
K. Kawashima	Tokyo Institute of Technology, Japan
M.J. Kowalsky	North Carolina State University, USA
C.G. Lai	EUCENTRE, Pavia, Italy
G. Magenes	Università degli Studi di Pavia, Italy
N. Makris	University of Patras, Greece
G. Martin	University of Southern California, USA
E. Miranda	Stanford University, USA
G. Monti	Università di Roma "La Sapienza", Italy
M. Nakashima	University of Kyoto, Japan
T.D. O'Rourke	Cornell University, USA
S. Otani	Chiba University, Japan
V. Pane	Università degli Studi di Perugia, Italy
A.S. Papageorgiou	University of Patras, Greece
A. Pavese	Università degli Studi di Pavia, Italy
A. Pecker	Ecole Nationale des Ponts et Chaussées, France
M. Pender	University of Auckland, New Zealand
R. Pinho	EUCENTRE, Pavia, Italy
P.E. Pinto	Università di Roma "La Sapienza", Italy
J.H. Prevost	Princeton University, USA
J. Restrepo	University of California at San Diego, USA
G. Rix	Georgia Institute of Technology, Georgia, USA
F. Sabetta	Servizio Sismico Nazionale, Roma, Italy
F. Seible	University of California at San Diego, USA
D. Slejko	INOGS, Trieste, Italy
G. Solari	Università degli Studi di Genova, Italy
E. Spacone	Università degli Studi di Chieti, Italy
J.P. Stewart	Università of California at Los Angeles, USA
M. Stucchi	Istituto Nazionale Geofisica e Vulcanologia, Italy
D. Veneziano	MIT, Cambridge, USA

The University Institute for Advanced Studies (IUSS) was founded in 1997 by the University of Pavia and the Italian Ministry of Universities and Research, to provide advanced training and education at under-graduate and post-graduate levels. Within this framework, the aim of the European School of Advanced Studies in Reduction of Seismic Risk (ROSE) is to prepare professionals and researchers in the field of Earthquake Engineering, to meet the ever-growing worldwide demand for expertise in this specialised subject.



## ROSE SCHOOL

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The European Commission has approved and financed an Erasmus Mundus Masters on Earthquake Engineering and Engineering Seismology (MEEES), coordinated by the ROSE School and featuring also the participation of the University of Grenoble Joseph Fourier (France) and the University of Patras (Greece) as project partners, as well as of Imperial College London (UK), Joint Research Centre (Ispra, Italy) and the Italian Institute for Geophysics and Vulcanology (Italy) as satellite participants. Within the framework of this prestigious Erasmus Mundus programme, which aims to enhance quality in European higher education and to promote inter-cultural understanding through co-operation with third countries, a relatively large number of scholarships are available for both non-European as well as European students. Interested applicants are invited to visit the MEEES website ([www.meees.org](http://www.meees.org)) for detailed information and instructions on financial conditions and application procedures.



Istituto Universitario  
di Studi Superiori di Pavia



Almo Collegio  
Borromeo, Pavia



Università degli Studi  
di Pavia

# THE SIXTH INTERNATIONAL ROSE SCHOOL SEMINAR

Almo Collegio Borromeo, Pavia, Italy  
29–30 May 2006

# ROSE SCHOOL

EUROPEAN SCHOOL  
FOR ADVANCED STUDIES  
IN REDUCTION  
OF SEISMIC RISK



## • THE ROSE SCHOOL

The European School for Advanced Studies in Reduction of Seismic Risk (ROSE) was founded in the autumn of 2000, with the aim of providing higher-level education in the field of earthquake engineering. The syllabus offers a comprehensive set of subjects covering applied mechanics, structural engineering, earthquake engineering, engineering seismology and soil dynamics, with emphasis on both theoretical background and design considerations.

Each course is intensively taught in a period of three to five weeks, during which the respective lecturer is able to fully dedicate his/her time and efforts exclusively to the scholastic activities at the school, thus ensuring teaching and research training at the highest possible levels of quality. The School also relies on advanced numerical and experimental facilities, such as the EUCENTRE laboratory, featuring full-scale shaking table and orthogonal reaction walls, as well as the large Structural laboratory of the University of Pavia.

All of the above endows a truly unique character to the ROSE School, be it for its fully international nature or for its innovative organisation in education and research training in the field of Earthquake Engineering.

## • INTERNATIONAL ROSE SCHOOL SEMINARS

As a part of the ROSE program, an International seminar is organised every year, to provide the School students with an opportunity to present and discuss their research work to an audience of international experts.

In addition to standard presentations on research work carried out at the School, the annual Seminars feature also the tradition of inviting a prominent scientist to deliver a keynote lecture on a given contemporary and highly relevant topic in the field of Earthquake Engineering. At this year's event, such keynote address will be delivered by Professor Michael Pender, with the title "Integrated Design of Structure/Foundation Systems".

It is also foreseen that all contributions to the seminar will be published, after a standard review process, in a special issue of the Journal of Earthquake Engineering, which will be distributed to all participants and journal subscribers in mid 2007. Copies of the JEE Special Issues containing the proceedings of previous editions of this annual Seminar are available from the ROSE School Secretariat, on request.

## • ATTENDING THE EVENT

As in its previous editions, a large number of the ROSE Faculty members, listed overleaf, will be attending the Seminar, ensuring a lively and entertaining workshop. Further, it is noted that relatively extended times are allocated for the presentation of each paper, so that in-depth and highly technical discussions can take place.

In addition to ROSE faculty and students, a maximum of 50 external participants may also be accepted, for which reason professionals and researchers worldwide are encouraged to take part in the event. A 160 Euro fee is required from external attendees, to cover for the cost of coffee/lunch breaks, seminar dinner and proceedings. Special financial conditions are, however, in place for University researchers or students, to whom a fee of not more than 120€ is usually requested.

Those who wish to attend the Seminar are kindly invited to compile and submit the registration form to the ROSE School Secretariat, at the address given overleaf. If you need assistance of any kind (registration form, accommodation, travelling directions, etc.), please do not hesitate in contacting our Administrative Officer, Ms. Sandra Castelli (rose@unipv.it). You may also refer to the ROSE website for further information on all ROSE School activities.

## • VENUE

The ROSE School is located at the European Centre for Training and Research in Earthquake Engineering (EUCENTRE, www.eucentre.it), in Pavia, a historical town in the North of Italy (35 km from Milan), full of University tradition and fame.

The Seminar itself will take place at the Collegio Borromeo (www.collegioborromeo.it), a landmark structure in the centre of Pavia, founded in 1561 as a "A Palace for Sapience" by Saint Carlo Borromeo and Pope Pio IV Medici. It is located in Piazza Borromeo, 9.

## • POST-SEMINAR ACTIVITIES

As part of its PhD admission procedure, a written/oral examination takes place, once a year, at the ROSE School. Whenever possible, the scheduling of such exam is made to coincide with the week of the International Seminar, so as to capitalise on the contemporaneous presence of a large number of the School's academic staff. All ROSE School faculty members are invited to take part.

## • PROGRAMME OF THE SEMINAR

### Monday, 29<sup>th</sup> May

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10.00 – 13.00 ROSE School Board Meeting  
13.00 – 14.30 Welcome lunch and registration  
14.30 – 16.00 Session 1 - Chairman: A. Pavese  
*Development of a flexure-shear fibre beam-column element for modelling of frame structures under seismic loading*  
P. Ceresa<sup>1</sup>, L. Petrini, R. Pinho

*Implementation of a masonry panel model for nonlinear dynamic analysis of infilled RC frames*  
E. Smyrou<sup>1</sup>, C. Blandon-Urbe, S. Antoniou

*Numerical investigation on the seismic performance of pre-1970 designed frames with masonry infills*  
M. Galli<sup>2</sup>, S. Pampanin, G. Magenes

16.00 – 16.30 Coffee break

16.30 – 17.30 Session 2 - Chairman: J. Berrill  
*Exact causal relationships between material damping ratio and phase velocity in geomaterials*  
K.C. Meza-Fajardo<sup>1</sup>, C.G. Lai

*Dynamic response of soil under vibrations produced by the EUCENTRE shaking table*  
J.E. Londono<sup>2</sup>, C. Strobbia

20.30 – 23:30 ROSE Seminar Dinner

### Tuesday, 30<sup>th</sup> May

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9.30 – 10.30 Session 3 - Chairman: K. Kawashima  
*Preliminary investigations on 3D pushover of irregular buildings*  
H. Meireles<sup>2</sup>, R. Bento, R. Pinho

*Developments in the estimation and mitigation of residual deformations due to seismic response*  
J.D. Pettinga<sup>1</sup>, S. Pampanin, C. Christopoulos, M.J.N. Priestley

10.30 – 11.00 Coffee Break

11.00 – 12.30 Session 4 - Chairman: G. Magenes  
*Structural characterisation of Turkish RC building stock for loss assessment applications*  
I.E. Bal<sup>1</sup>, H. Crowley, G. Gulay

*Seismic hazard data for the new Italian seismic design code*  
V. Montaldo, C. Meletti, M. Stucchi, A.A. Gomez Capera

*Return-period dependent Italian response spectra and its implications on design/assessment of structures*  
S. Gavridou, M. Stucchi, G.M. Calvi

12.30 – 14.00 Lunch break

14.00 – 15.30 Keynote lecture – M. Pender  
*Integrated Design of Structure/Foundation Systems*

15.30 – 17.00 Graduation ceremony  
Programme of future activities  
Closing speeches

<sup>1</sup>PhD researcher, <sup>2</sup>MSc student