WINTER SCHOOL

5th International course on

Seismic Analysis of Structures using OpenSEES

Finite Element-based Framework and Civil Engineering Applications

AIM OF THE COURSE

OpenSEES (Open System for Earthquake Engineering Simulations) is an open source software mainly conceived for the seismic analysis of structures. The source code is public in order to facilitate its wide diffusion and to be adaptable to the needs of users, who can also modify and extend default libraries in terms of materials, components, and algorithms. The main difficulties that users usually face during their first approach to OpenSEES are due to the programming language, which might appear rather complex. Following previous editions, the main goal of this short course is to provide a basic understanding of finite element-based theoretical framework and programming language in OpenSEES. Structural engineering and research applications will be also presented.
The **winter school** edition will be held at **Politecnico di Torino** from **January 20 to January 22, 2020**.

ORGANIZATION OF THE COURSE

The course is full-immersion scheduled over 3 days starting from fundamentals to advanced applications.
The lectures are organized as follows:

- **Theoretical lectures** – Fundamentals about the Finite Element Method.
- **Applicative lectures** – Programming language and model development in OpenSEES.
- **Illustrative examples** – Examples about the use of OpenSEES from young researchers.
- **Live workshop** – Live exercise using OpenSEES.
- **Seminars** – Advanced applications that illustrate the potential of OpenSEES in research projects.

TARGET AUDIENCE

Master students, PhD candidates and post-doctoral fellows, researchers and practitioners.

LANGUAGE

The course will be offered in English.

MAIN ORGANIZERS

Giorgio Monti (Sapienza University of Rome, EOS), Giuseppe Carlo Marano (Politecnico di Torino), Giuseppe Andrea Ferro (Politecnico di Torino), Fabio di Trapani (Politecnico di Torino), Cristoforo Demartino (Zhejiang University).

SCIENTIFIC COMMITTEE

Giorgio Monti (Sapienza University of Rome, EOS), Giuseppe Carlo Marano (Politecnico di Torino), Camillo Nuti (Roma Tre University), Luciano Rosati (University of Naples Federico II), Bruno Briseghella (Fuzhou University), Fabrizio Mollaioli (Sapienza University of Rome), Sashi Kunnath (UC Davis), Yan Xiao (Zhejiang University/University of Illinois at Urbana Champaign Institute), Giuseppe Quaranta (Sapienza University of Rome), Rita Greco (Politecnico di Bari), Fabio Di Trapani (Politecnico di Torino), Cristoforo Demartino (Zhejiang University/University of Illinois at Urbana Champaign Institute), Francesco Marmo (University of Naples Federico II), Giovanni Minafò (University of Palermo).

COLLABORATORS

Costanza Anerdi, BeiBei Xiong, Diego Gino, Guglielmo Amendola

DATES AND VENUE

January 20, 2020, to January 22, 2020.
Politecnico di Torino
Aula 5D, Corso Duca degli Abruzzi, 24, 10129 Torino
Official website link: http://international.polito.it/catalogue/summer_schools

ORGANIZATIONAL SECRETARIAT

AITEF snc Via Thailandia 27 - 00144 Roma P.IVA e Cod. Fiscale 07882751006

REGISTRATION AND FEES

Registration is required by sending an e-mail to opensees.eos.course@gmail.com before January 10, 2020 to register.
The individual fee cost is 100 €. Payments will be accepted by bank transfer. Payment details will be provided after registration acceptance. Course registration entitles one year registration in EOS.

POLITECNICO DI TORINO | DISEG
Dipartimento di Ingegneria Strutturale, Edile e Geotecnica

EOS EURASIAN OPENSEES

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SPEAKERS

- **SEMINARS**
  Dimitrios Lignos (École Polytechnique Fédérale de Lausanne)
  Gian Paolo Cimellaro (Politecnico di Torino)
- **THEORETICAL AND APPLICATIVE LECTURES**
  Cristoforo Demartino (Zhejiang University/University of Illinois at Urbana Champaign Institute)
  Fabio Di Trapani (Politecnico di Torino)
  Emma La Malfa Ribolla (Czech Technical University)
  Davide Lavorato (Roma Tre University)
  Francesco Marmo (University of Naples Federico II)
  Giovanni Minafò (University of Palermo)
  Paolo Ricci (University of Naples Federico II)
  Salvatore Sessa (University of Naples Federico II)
- **APPLICATIVE EXAMPLES**
  Mariano Di Domenico (University of Naples Federico II)
  Giorgia Di Gangi (Sapienza University of Rome)
  Marzia Malavisi (Politecnico di Torino)

PREVIOUS EDITIONS

- First edition
  February 18, 2016 – Roma Tre University, Italy.
  May 20, 2016 – Nanjing Tech University, China.
- Second edition
  February 17, 2017 – Roma Tre University, Italy.
  July 3-4, 2017 – Fuzhou University, China.
  July 6-7, 2017 – Nanjing Tech University, China.
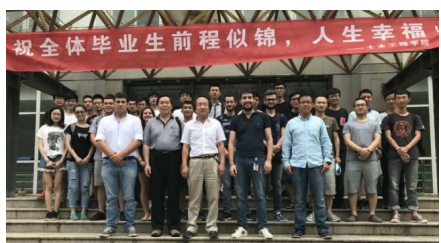- Third edition
  March 20, 2018 – University of Naples Federico II, Italy.
  March 27, 2018 – Roma Tre University, Italy.
- Fourth edition
  March 10, 17, April 29, 2019 – Fuzhou University, China.
  March 27 to 29, 2019 – Sapienza University of Rome, Italy.

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PROGRAM

Day 1. Monday, January 20, 2020.

Time	Session	Speaker
08:30-09:00	Registration	
09:00–09:15	Welcome	G.A. Ferro G.C. Marano
09:15–09:30	Framework, aims and scope of the course	C. Demartino
09:30–11:00	Seminar: Multi-fidelity modelling for collapse simulation of steel and composite structures with OpenSees	D. Lignos
11:00–13:00	Theoretical lecture: Fundamentals of the Finite Element Method	E. La Malfa
13:00–14:00	Lunch break	
14.00-15:00	**Seminar**: Large scale simulations of virtual cities using OpenSees	G.P. Cimellaro
15:00–17:00	**Applicative lecture**: Introduction to TCL and OpenSEES	C. Demartino
17:00–19:00	**Live workshop**: Modelling and analysis of an elastic frame structure	

Day 2. Tuesday, January 21, 2020.

Time	Session	Speaker
09:00–11:00	**Theoretical lecture:** Methods and formulations for nonlinear analysis of reinforced concrete frames	F. Marmo
11:00–13:00	**Applicative lecture:** Static non-linear analysis of frame structures using OpenSEES: concentrated plasticity approach	F. Di Trapani
13:00–14:00	Lunch break	
14:00–16:30	**Applicative lecture**: Static non-linear analysis of a simple structure using OpenSEES: fiber approach	G. Minafò
16.30-17.30	**Applicative lecture:** Special elements and commands in OpenSEES	P. Ricci
17.30-18.00	**Applicative example:** Advanced modelling of masonry infills	M. Di Domenico
18:00–19:00	**Live workshop**: Modelling and analysis of an inelastic frame structure subject to static incremental loads	

Day 3. Wednesday, January 22, 2020.

Time	Session	Speaker
09:00–10:30	**Applicative lecture:** Dynamic analysis of frame structures using OpenSEES	F. Di Trapani
10:30–11:00	**Applicative example:** An example of dynamic analysis varying input action and geometry	M. Malavisi
11:00–12:30	**Applicative lecture:** Connecting Matlab to OpenSEES and modelling of 3D structures	C. Demartino
12:30-13:00	**Applicative example**: Identification of the constitutive laws of materials	G. Di Gangi
13:00–14:00	Lunch break	
14:00–15:00	**Applicative lecture**: Modelling of shear-flexure interaction	D. Lavorato
15:00–17:00	**Applicative lecture:** Adding a new material to OpenSEES	S. Sessa
17:00–18:30	**Live workshop**: Nonlinear modelling and analysis of frame structures subject to seismic loads	
18:30–19:00	Closure and certificate ceremony	G.A. Ferro G.C. Marano

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EUROASIAN OPENSEES ASSOCIATION

Eurasian OpenSEES (EOS), formerly European OpenSEES, is a trans-continental non-profit association of engineers and academics who share the vision of contributing to the development of efficient and effective computational tools for complex engineering analysis and design. EOS was officially founded and registered in 2017.

The transformation from a European based organization to a Eurasian one came due the vast contributions of researchers in Asia to computational structural mechanics and their elaborate and numerous efforts in developing and utilizing OpenSEES. EOS aims to bridge the continental gap between the East and West and contribute to global engineering and scientific collaboration.

The mission of the organization is to:

- Encourage and promote the principles of structural engineering according to the theories and techniques developed within the framework of international scientific research, with particular but not exclusive reference to the structural calculation framework OpenSEES, developed at the University of California, Berkeley;

- Organize, promote and disseminate study and research activities, training, development, design, promotional and publishing initiatives and other initiatives designed to foster exchanges of experience both between members and with other scholars and institutions;

- Develop and offer cutting-edge courses, workshops, seminars, and conferences to enrich the skillsets of researchers and practitioners around the world.

All the students and researchers interested in OpenSEES are highly encouraged to become part of the association!

DEPARTMENT OF STRUCTURAL, GEOTECHNICAL AND BUILDING ENGINEERING (DISEG)

The Department of STRUCTURAL, GEOTECHNICAL AND BUILDING ENGINEERING (DISEG) is the point of reference in Politecnico di Torino for the areas of knowledge that study safety issues and the practical and formal planning of constructions, taking into account environmental and human actions and their integration with the natural and built environment, considering their uniqueness and regarding the local community. DISEG promotes, coordinates and manages basic and applied research, training, technology transfer and services to the local community in the fields of structural mechanics, structural engineering, geotechnical engineering, building technology, building production, drawing and representation.
http://www.diseg.polito.it/en/

SUMMER SESSION OF THE COURSE
The summer session will be held at the University of Palermo. Stay tuned for details.

COURSE EVALUATION
It is easy to give your feedback about this course, and it starts right here. Start your evaluation by scanning the QR code on the right.