2017-2018 ANNUAL REPORT

The University of Texas at Austin Student Chapter
of the Earthquake Engineering Research Institute

Report Date: May 21, 2018

This report summarizes the membership and activities conducted by the University of Texas at Austin Student Chapter of the Earthquake Engineering Research Institute during the 2017-2018 academic year.

MISSION & GOALS

The Student Chapter of the Earthquake Engineering Research Institute (EERI) at the University of Texas (UT) at Austin, hereafter referred to as the Chapter, serves to further the mission of EERI by disseminating knowledge about earthquakes and their effects, and the mitigation of earthquake hazards through engineering. To this end, the Chapter organizes seminars and outreach activities, and encourages the student body to join EERI. The Chapter was founded in 1992 and has been continuously active since that time. In the following report, we present information about the membership in the chapter and its activities during the 2017-2018 academic year.

MEMBERSHIP

The University of Texas at Austin Student Chapter had a total of 24 members in 2017-2018.

OFFICERS

The Board consisted of the following members:

Role	Name	EERI Member Number	Email	Student Status
President	**Stalin Armijos**	17355	starmijos@utexas.edu	Graduate student
Vice President	**Ghassam Fawaz**	19938	gfawaz@utexas.edu	Graduate student
Treasurer	**Farid Khosravikia**	19382	Farid.khosravikia@utexas.edu	Graduate student
Secretory	**Yumeng Tao**		yumeng.tao@utexas.edu	Graduate student

Board meetings were on the following dates to plan activities: 2/21/2017, 5/16/2017, 9/21/2017, and 2/22/2018,


Stalin Armijos


Ghassam Fawaz


Farid Khosravikia


Yumeng Tao

FACULTY & INDUSTRYADVISORS

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MEMBERS

A complete list of members is shown below.

Name	EERI Member Number	Email	Student Status
Alafifi, Laila	18713	lailaalafifi13@gmail.com	Undergraduate student
Armijos, Stalin	17355	starmijos@utexas.edu	Graduate Student
Arterburn, Hailey			Graduate Student
Cheng, Christine	18431	christinecheng1119@gmail.com	Undergraduate student
Ebrahimkhanlou, Arvin		arvinkhanlou@gmail.com	Graduate Student
El-Afifi, Tarek	18402	telafifi@gmail.com	Graduate Student
Fawaz, Ghassam	19938	gfawaz@utexas.edu	Graduate Student
Finklea, Mackenzie	18655	macfink@att.net	Undergraduate student
Galloso, Jordan	18684	jrgalloso@gmail.com	Undergraduate student
Gragg, Casey	18664	caseygragg26@utexas.edu	Undergraduate student
Hynes, Erin	18665	hynes.erin00@utexas.edu	Undergraduate student
Jung, Kee Young	19324	Keeyoung.j@utexas.edu	Undergraduate student
Khosravikia, Farid	19382	Farid.khosravikia@utexas.edu	Graduate Student
Mast, Arqa	18658	arqam110@gmail.com	Undergraduate student
McLaughlin, Kaleigh	15409	kmclaug2@nd.edu	Graduate Student
Nakamura, Yuta	18298	ynakamu2@utexas.edu	Graduate Student
Philpott, Andrew	18434	ajphilpott@utexas.edu	Graduate Student
Stolte, Andrew	16034	a.c.stolte@utexas.edu	Graduate Student
Tao, Yumeng		yumeng.tao@utexas.edu	Graduate Student
Teague, David	16035	dteague@utexas.edu	Graduate Student
Varughese, Nancy	18405	varughesenancy@utexas.edu	Undergraduate student
Wang, Xiaoyue	18066	xy_wang@utexas.edu	Graduate Student
Xu, Boqin	18064	boqinxu@utexas.edu	Graduate Student
Zhu, Sharon	18669	sharonzhu@utexas.edu	Undergraduate student

BUDGET & FINANCIALS

The student chapter of EERI at UT Austin has three accounts with the university, which have a cumulative balance of $541.69. The membership dues received from the national chapter support lunches for our seminars and outreach activities. The seismic design team is self-funded and raises the majority of their money from corporate supporters.

CHAPTER ACTIVITIES

Seminars

Dr. Gian Michele Calvi, November, 2, 2017

Professor of Structural Design, Istituto Universitario di Studi Superiori (IUSS) di Pavia, Italy

Prof. Calvi gave a presentation on revisiting seismic demand, structure capacity and design spectra. For several decades, seismologists and engineers have been struggling to perfect the shape of design spectra, analyzing recorded signals and speculating on probabilities. This research effort produced several improvements, for example suggesting to adopt more than one period to define a spectral shape or proposing different spectral shapes as a function of the return period of the design ground motion. However, the basic assumption of adopting essentially three fundamental criteria, i.e.: constant acceleration at low periods, constant displacement at long periods, constant velocity in an intermediate period range, has never been really questioned. In this seminar, the grounds of a constant velocity assumption were discussed and shown to be disputable and not physically based. Spectral shapes based on different logics were shown to be consistent with the experimental evidence of several hundred recorded ground motions and to lead to significant differences in terms of displacement and acceleration demand. Moreover, the main parameters considered to define the seismic input are magnitude and epicenter distance, but the possible influence of other parameters – such as focal depth and fault distance, duration and number of significant cycles, local amplification – were discussed in this seminar.

Farid Khosravikia, October, 5, 2017

PhD student, from Structural program of Dept. of Civil, Architectural and Environmental Engineering, The University of Texas at Austin

Should engineers be concerned about seismic vulnerability of bridges in Texas? This is the main question that Mr. Khosravikia discussed during this seminar. Recently, there has been a significant increase in the rate of ground motions associated with petroleum activities and wastewater disposal in Texas. Such activities generally increase the subsurface pore pressure, which facilitates the release of stored tectonic stress along an adjacent fault. These types of human-caused earthquakes generally occur in areas nearby wastewater injection wells, many of which have been historically considered as non- or low-seismic regions. Accordingly, the infrastructure around these sites has not been designed for seismic demands, raising concerns about the safety of nearby infrastructure. This seminar addressed the vulnerability of Texas bridges to the effects of natural and induced seismic hazards. To do so, fragility curves are developed by considering major sources of uncertainty, including uncertainty in ground motions and local soil conditions expected in the state, as well as uncertainty in design and detailing practices in the area. The results of this fragility analysis were presented as a basis for discussion of potential seismic risks in areas affected by induced earthquakes.

Yumeng Tao, October, 5, 2017

PhD student, from Geotechnical program of Dept. of Civil, Architectural and Environmental Engineering, The University of Texas at Austin

The title of her presentation was Insights into Small-Strain Damping from Downhole Array Recordings. Seismic wave attenuation is a key parameter in site response models to predict ground motions and estimate site effects. Small-intensity earthquake recordings (PGA<0.1g) from two borehole arrays (Garner Valley and Treasure Island Downhole Arrays, CA) are investigated to quantify the small-strain material damping ratio (D_{min}) using four approaches and the different results are compared.

Outreach Activities

Participation in Explore UT (March 3, 2018)

Explore UT is an open house organized by the university and is a major university-wide outreach event attracting the general public, especially primary, middle, and high school students. The Chapter attempted to introduce the concepts of seismic design to the students through the construction of buildings using spaghettis (for members) and marshmallows (for joints). The buildings were then testing on a drill-operated shake table. The Chapter also displayed a set of posters describing earthquakes, earthquake safety, geotechnical seismic hazards, historical earthquake damage, and how earthquakes affect buildings.

Figure 1: Outreach activity: Explore UT

18 Annual Austin Earth Science Week Career Day (October, 2017)

It was a great day with almost 350 middle-school students. As a part of this big event, the mentors introduced the kids to earthquake engineering with shake table and soil liquefaction demonstrations. The kids also visited the NHERI@UTexas facility which houses large, one-of-a-kind shaker trucks. The mentors introduced them how the VibroSeis trucks are used to study the seismic performance of soils, foundations, and structures world-wide.

Figure 2: Introducing earthquake engineering to middle-school students

Figure 3: Students attentively watching a shaker truck demonstration.

Shake Table Competition for St. Stephen's Episcopal School Students (March, 2017)

EERI officers organized a shake table competition for approximately 25 students from St. Stephen's Episcopal School. The format of the competition was similar to EERI's annual Undergraduate Seismic Design Competition (SDC). Students teamed up to create structures, which were tested on a shake table at UT Austin's Ferguson Structural Engineering Laboratory (FSEL). This program is led by Dr. Patricia Clayton, and the facilitators for this program were Farid Khosravikia and Ghassam Fawaz. Immediately after the competition, students were given a presentation by the SDC team members pertaining to opportunities to get involved in student groups as an undergraduate student. Additionally, Dr. Patricia Clayton presented on earthquake engineering and structural engineering research. The presentation was followed by a tour of current FSEL projects, the NHERI@UTexas equipment facility, and a demonstration using a shaker truck.

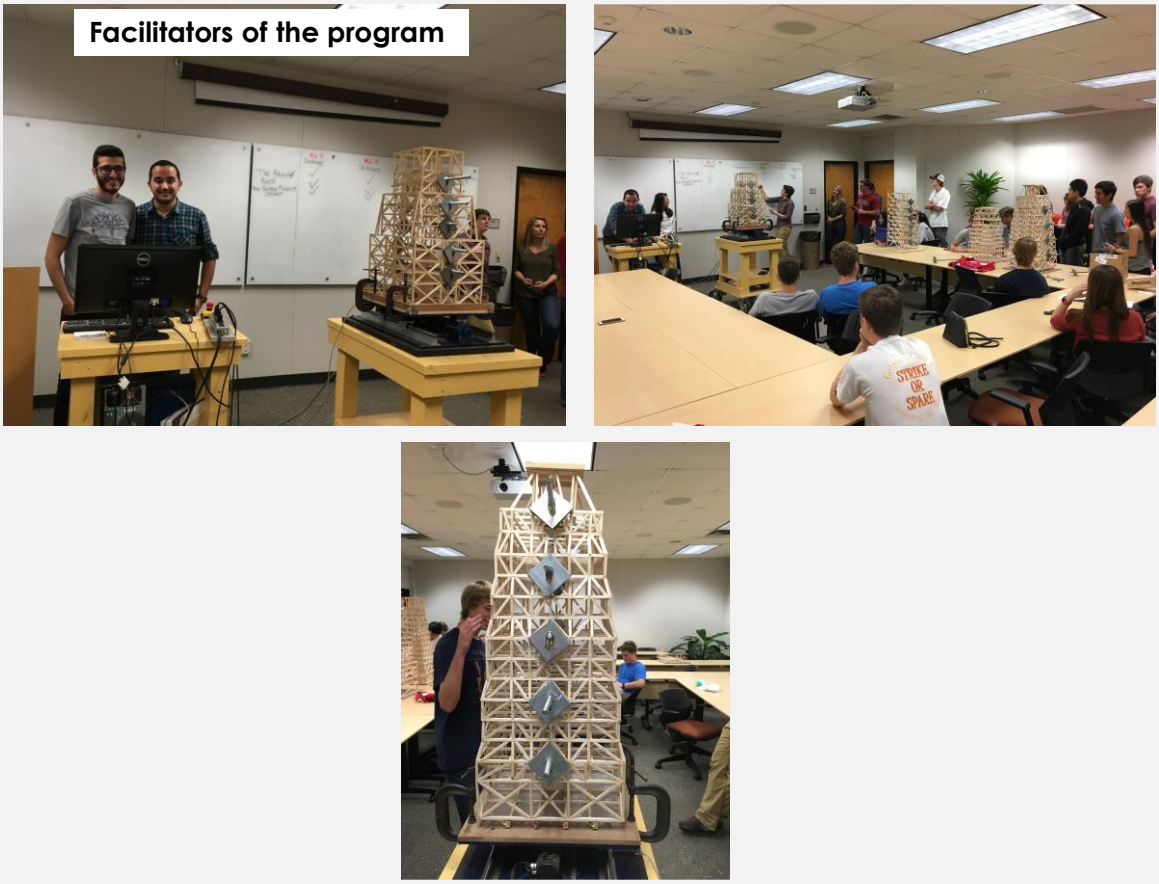

Figure 4: Shake Table Competition for St. Stephen's Episcopal School Students

SEISMIC DESIGN COMPETITION TEAM

Our undergraduate seismic design competition team consisted of 4 members traveling to Portland, Oregon to compete in the annual seismic design competition and 10 other undergraduate members who participated in the design and build process throughout the year.

SDC Team Members

A complete list of members is shown below.

Name	EERI Member Number	Email	Role
Finklea, Mackenzie	18655	macfink@att.net	President
Cheng, Christine	18431	christinecheng1119@gmail.com	Vice President
Mast, Arqa	18658	arqam110@gmail.com	Seismic Analyst
Hynes, Erin	18665	hynes.erin00@utexas.edu	Corporate Liaison
Jung, Kee Young	19324	Keeyoung.j@utexas.edu	Seismic Analyst
Galloso, Jordan	18684	jrgalloso@gmail.com	Financial Captain
Kessler, Rachel	*	rkess@utexas.edu	Build Captain
He, Katheryn	*	hewanqiao1997@utexas.edu	Design Captain
Escobar, Jessica	*	jescobar@utexas.edu	Financial Captain
Peart, Heather Ann	*	heatherpeart@sbcglobal.net	Internal Marketing Captain
Vural, Zerrin	*	zerrinvural@utexas.edu	Rulebook Expert
Haralson, Grant	*	grantharalson@sbcglobal.net	Crate Captain
Tran, Mai	*	mai.tran@utexas.edu	Fundraising Captain
Pinson, Christine	*	christinepinson1@gmail.com	Fundraising Captain

*Members were involved at the university chapter level but did not register their involvement with EERI.

SDC Team Financial Sponsors

A list of financial sponsors for the SDC team.

Name	Email	Amount	Note
UT Senate of College Councils	veronicac@austin.utexas.edu	$300	Organization Funding
Engineering Career Assistance Center	Co-op@engr.utexas.edu	$200	Spring EXPO volunteering
UT Austin (Fundraising)	n/a	$1000	Panera Bread Sales

Team results and lessons learned

Our team designed a structure (Pearl Plaza) that consisted of four shear core walls to reduce the effect of torsion on our building when tested on a shake table. Team members Mackenzie Finklea, Christine Cheng, and Kee Young Jung gave a technical presentation of the structural, architectural, and economic aspects of the design of the structure to a panel of professional judges.

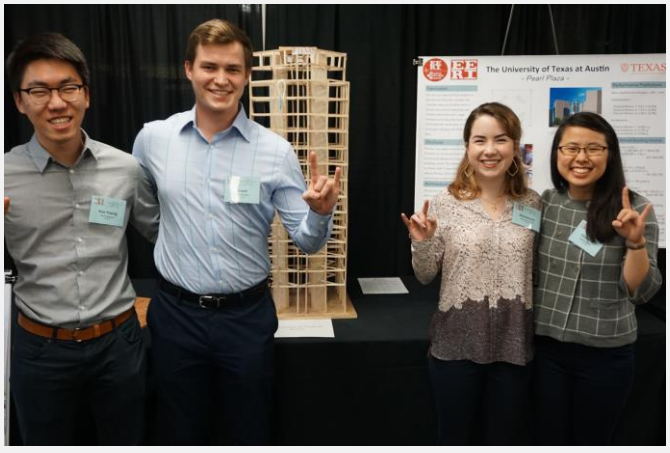

Figure 5: Members traveling to Portland, Oregon to compete in the annual seismic design competition

The design process involved fabrication using balsa wood sheets and members and a wood glue that was tested for strength and adhesion properties. Members of the team contributed throughout the course of a month leading up to the competition to construct the structure floor by floor.

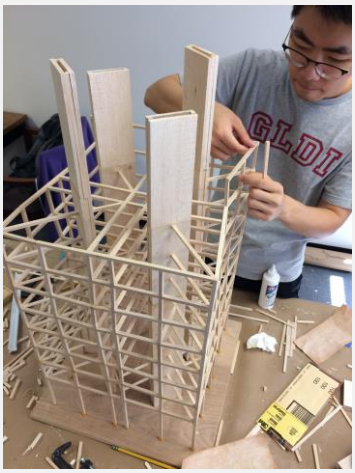

Figure 6: Pearl Plaza designed by our group

During the competition our structure performed well, surviving all three simulated ground motions with only the top floor falling through during the last "optional" motion. Overall, our team placed 28th out of 33 teams based on our Final Annual Building Income Score. EERI's SLC members awarded our team the Egor Popov Award for Structural Innovation, which recognizes a team that "makes the best use of technology and/or structural design to resist seismic loading".

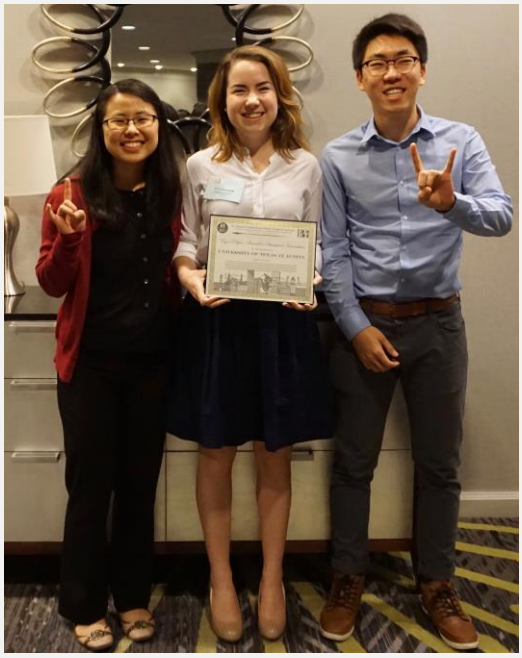

Figure 7: Winning Egor Popov Award for Structural Innovation

Over the course of this year, our team learned how to use SAP and Revit software with structural engineering graduate students and undergraduate architectural engineering students, as well as developing build and design schedules. Moving forward to next year, we hope to incorporate more precise construction methods into our build process with methods such as laser cutting, and printing individual (to-scale) floor templates. We

are looking forward to improving on what we've learned this year and competing once again in Los Angeles, California in 2018! Thank you to our sponsors who helped fund our construction and competition costs!

ELECTION & ELECTION RESULTS

An election for officers for the 2018-2019 academic year was held in May 2018. The table below shows the new officers appointed to the Chapter board who will take office on August 2018.

Role	Name	EERI Member Number	Email	Student Status
President	**Farid Khosravikia**	19382	Farid.khosravikia@utexas.edu	Graduate student
Vice President	**Ghassam Fawaz**	19938	gfawaz@utexas.edu	Graduate student
Secretory	**Yumeng Tao**		yumeng.tao@utexas.edu	Graduate student