



CEE'06

Reforming Civil and Environmental Engineering Education Given the Societal Challenges Related to Infrastructures



Background

We expect the new Millennium to bring times of great challenge but also of great opportunity for civil and environmental engineers (CEE). In North America and many other countries CEE has lost its luster to fields like biotechnology and information technology. Yet this trend will be forced to correct itself in the coming years as a rapidly growing world population appropriates more of the natural environment for its use; demands more water, energy, waste disposal and transportation resources; produces more pollution; and expands its exposure to natural hazards. In addition, many Western civilizations are about to come abruptly face to face with infrastructure needs and environmental problems that have already been neglected for too long and will grow to crisis levels if left unattended any longer. Yet CEE will not be the profession to reap the rewards that will come in meeting these challenges if it clings to old practices and educational paradigms.

CEE clearly should have a major role to play in helping a growing population move toward sustainable prosperity rather than destruction. The world needs our expertise to meet the requirements of a growing population, while at the same time reducing the production of pollution and healing the environmental wounds of the 20th century. Innovative technologies spinning off from fields outside of civil engineering will offer new and creative tools to address the issues facing us. Indeed, the success of our profession over the formative decades of the 21st century could well depend on how well we incorporate these new technologies into our ongoing efforts to provide the infrastructure that makes a quality life possible



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for our citizens. This is a challenge for industry, government and especially for educational institutions.

The complex challenges related to reforming CEE education will serve as the backdrop for an international workshop that is being planned in Istanbul during October 4-7, 2006. Istanbul has served as the bridge between the West and East for Millennia, and would serve as an exceptionally suitable venue for this endeavor. Turkish academe, industry and government agencies associated with the education and practice of CEE are highly interested in and supportive of this workshop. The EC-supported "Structural Assessment, Monitoring and Control (SAMCO)" Network of the EC (www.samco.org) as well as the international renaissance civil engineers organization ISHMII (www.ishmii.org) representatives will be participating at the Workshop. In addition to North America, Europe and Turkey, we expect participation from Japan, China, India Russia and Korea under ISHMII's auspices. We also expect participation from Egypt and Israel representing these Middle Eastern Countries.

The objective of the proposed workshop is to develop a road map for the design and construction of a model civil and environmental engineering curriculum, incorporating flexibility given the variations in societal and institutional cultures, student backgrounds, and the regional technical and socio-economic parameters. A curriculum is not meaningful without the standards and tools that are required for its proper delivery. The issue is in creating a critical mass of educators and practicing engineers who understand the complex systems nature of the problems we face as a global society, who share the same vision and have sufficient experience to define the "new fundamentals" for educating the future civil and environmental engineers.

We are convinced that by encouraging renaissance engineers to come together and to construct model curricula, with a sufficient level of specificity and clear standards of depth, rigor and quality of delivery, we may make a difference by demonstrating how the future civil and environmental engineering students should be guided through a properly balanced applied science, systems engineering and, civil engineering arts and crafts education.

Planning and Some of the Participants

We anticipate that the delegation from the US to this International Invited Workshop will include representatives from ASCE and ABET, as well as FHWA and NSF. To represent a multi-disciplinary group of CEE educators from the US, we plan to invite Drs. Dr. Emin Aktan (Infrastructure Systems Engineering) Drexel University, Dr. Franklin Moon (Structural Engineering) Drexel University, Dr. Raimondo Betti (Structural Mechanics) Columbia University, Dr. Hasan Akay (Computational Mechanics), Purdue University, Dr. Levent Kavvas (Water



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Resources) University of California, Davis, Dr. Mehmet Tumay (Geotechnical Engineering) Louisiana State University, Dr. Pratim Biswas (Environmental Engineering) Washington University, St. Louis, Dr. Perumalsamy Balaguru (Materials Science and Engineering) Rutgers University, Dr. David Arditì (Transportation Systems) Illinois Institute of Technology, Dr. Nicholas Jones (Wind Engineering) Johns Hopkins University. From the stakeholder government agencies, Dr. Hamid Ghasemi (Long term Bridge Performance Research Program) FHWA, Dr. Sue Kemnitzer, NSF, Dr. Adnan Akay, NSF/Carnegie Mellon University, Dr. Doug Foutch, NSF/University of Illinois at Urbana-Champaign and Dr. Erdal Safak, USGS will be included.

In addition to US and Turkish participants, we will have European Community SAMCO Network's (www.samco.org) organized participation. We are further expecting participation from Canada, Japan, China, India, Africa and Egypt to be organized by ISHMII (www.ishmii.org).

Tentative Workshop Agenda

The Workshop AGENDA will be finalized by the International Organizing Committee and reviewed by the Advisory Committee. The committee's are currently being formed. Drs. Emin Aktan (Drexel University), Hamid Ghasemi (FHWA), Aftab Mufti (ISIS Canada and ISHMII), Helmut Wenzel (VCE and EC-SAMCO), Hitoshi Furuta (Kansai University, Japan) and Mehmet Tumay (LSU, USA) are members of the International Organizing Committee from outside Turkey. Dr. Cengiz Toklu and Dr. Metin Ger (Bahcesehir University, the host of the Workshop), Gokmen Ergun (Bogazici University), Aysen Ergin (METU) and Sumru Pala (Istanbul Technical University) are the organizing members from the leading Turkish Universities.

The product expected from the Workshop is to establish the "new fundamentals" and the outline of a generic model curriculum for a contemporary CEE education that is capable of preparing the graduates to respond to the challenges we face in relation to the performance, preservation and protection of critical infrastructures. The minimum requirements in terms of academic expertise resources, research laboratories (testing of materials, components and complete system physical models), field laboratories (consulting practices, operating infrastructures and construction sites), and the IT resources that are necessary for a proper delivery of the envisioned model curriculum would also be outlined. The Workshop Report will include the outline of the model curriculum and also detail a road-map for its detailed development, customization and pilot implementation in participating countries.



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In order to assure the intellectual success of the Workshop, the AGENDA will include invited presentations followed by panel and audience discussions on the following topics:

1. What are the principal challenges related to infrastructures in your Country? Are you satisfied with the availability and current conditions of infrastructures? Do you have an organization similar to ASCE that issues a report card on infrastructures?
2. What are the overlaps, more distant coupling and perhaps any possible conflicts between critical infrastructure performance concerns, natural hazards mitigation, sustainability and any other concerns that civil and environmental engineers are expected to respond to? For example, are there conflicts in the availability of resources for education and research on infrastructures and hazards mitigation?
3. To what extent do civil and environmental engineers participate in the planning, policy, financing and management of infrastructures in your Country? What are the positive or negative impacts of politics and socio-political drivers impacting infrastructure policy and expenditures?
4. Do you believe the public is satisfied with the services of CEE in academe, government and industry? What is the order of prestige, demand and salary for various professions and for various engineering disciplines in your Country? Are CEE programs able to attract highly qualified and motivated students in your Country? If not, what may be the reasons for this?
5. What other factors should be considered in the contextual background of CEE education in your Country? Do you concur with the related evaluations by the NAE report "Educating the Engineer 2020" or is this applicable only to the US?
6. What experiences have you had in your Institution/Country regarding coordinated, collaborative, multi-disciplinary education and research on infrastructures within the framework of an academe-government-industry partnership? What are your thoughts about such endeavors? Who are the necessary champions and what other conditions would be needed to foster such education and research?
7. Out of the list of critical infrastructures (Congressional Research Service, 2003, <<http://www.fas.org/irp/crs/RL31556.pdf>>) which ones in your opinion can be effectively planned, engineered, managed and protected without the coordination of CEE? What are the likely disciplines and in what hierarchy and role should they participate for the resolution of societal concerns related to critical infrastructures?
8. What are the most critical and pressing knowledge needs for resolving infrastructure concerns? What would be a proper research framework to generate such knowledge? What are the prudent ways of developing, integrating and leveraging technology for addressing infrastructure concerns?
9. What are the fundamental concepts that are currently included in a typical CEE undergraduate curriculum in your Country, and in what depth/rigor and



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- with which delivery methods are these covered? What are the minimum craft skills that are required for graduation? Do you think these concepts and skills are adequate?
10. What are the new fundamentals for a contemporary civil and environmental engineering education responsive to societal concerns on infrastructures? What are the classical fundamentals that should remain as fundamental? What are the classical fundamentals, knowledge delivery mechanisms and craft skill training methods that have become obsolete? What are the reasons that they have become obsolete?
 11. What are the strengths and the weaknesses of the current generation of students that enroll in CEE education?
 12. What are the strengths and weaknesses of the current generation of young assistant professors and senior professors given the 11 issues listed above? How can we transform perceived liabilities of the new generation of students and the faculty into assets?

Critical Events and Dates:

The Organizing Committee has submitted proposals to US-NSF and Turkish-TUBITAK for their support and auspices. The workshop dates are tentatively set for October 4-7, to be held at the Besiktas facilities of Bahcesehir University on the Bosphorus. A delegation from the organizing group will participate at ICEE-2006, San Juan, Puerto Rico July 23-28, 2006 <http://icee2006.uprm.edu/> and will arrange a Panel to solicit the auspices of ICEE for the Workshop.

The web-site of the Workshop is www.eng.bahcesehir.edu.tr/educee/ and the invitations to the Workshop will be distributed to invited participants by March 15. Registration via the web will be cut-off on April 30. Invited papers will be due August 1. Preliminary Proceedings will be available during the Workshop and final Report will be distributed within a month following it.

An excellent spousal program is being prepared. We expect to offer technical tours to Bosphorus Bridges, the Bosphorus Tunnel Construction and to the St Sophie to interested participants during Oct 2 and 3.