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ScienceDirect
Cement & Concrete Composites 28 (2006) 751
Cement & Concrete Composites
www.elsevier.com/locate/cemconcomp

Editorial

Many of the opportunities for furthering education in structural engineering involve either the use of novel materials or improving the performance of existing materials. Structural engineering continues to enter an age that will be dominated by the use of new materials, including smart materials, and new construction methodologies.

As taught in most educational programs, structural engineering is concerned mainly with structural safety and, to some lesser degree, with serviceability issues that are often related to structural flexibility. Whereas structural safety should remain the focal point of structural engineering course work, other performance measures also need to be emphasized, such as those related to early age properties, efficiency in construction, resistance to severe environments, service life, and green engineering design.

Cement and concrete composites are the most extensively used construction materials in the world and, therefore, adequate instruction in this area is essential. With the emergence of national programs on high performance concrete (HPC), roughly two decades ago, much attention has been given to such broader definitions of performance, with the emphasis on green engineering design growing in recent times. Have there been commensurate changes in educational curricula to go along with these developments? Lack of appropriate education and training of engineers for working with new materials, and broader sets of performance standards, can impede technology transfer within the building and construction industries. The common practice of separating materials studies from structural design should be supplemented with course work that better integrates these two subject areas. This would contribute to the growth of a materials/structural design community that is more knowledgeable and conversant in the latest developments in cement and concrete composites. Importantly, the broader topical coverage would better prepare structural engineers for working interactively (with all concerned parties and disciplines) under the various economic and environmental constraints associated with designing, constructing, and maintaining the civil infrastructure.

In general, post-graduate curricula can accommodate the introduction of specialty courses, within which the related issues of HPC, structural durability, life cycle design, etc., can be studied in detail. To be sure, some relevant topics (e.g. the durability mechanics of cement and concrete composites) require an amount of student preparation that is best found at the post-graduate level. However, the number of students who enroll in such specialty courses is often relatively small. Furthermore, such courses tend to attract students with established interests in the subject matter and, as such, are not always an effective platform for attracting new students to the area of cement and concrete composites.

The implication is that the basic science and technology of cement and concrete composites, and the important role these materials play within the civil infrastructure, should be covered within the undergraduate curriculum. The abundant scientific and technological challenges, and the opportunities to positively impact the quality of life of future generations, should be made evident at this earlier stage of academic training. How well such opportunities are realized depends largely on attracting a sufficient number of qualified, motivated students from the overall population.

As a complicating factor, undergraduate curricula are often impacted by the needs to cover other new areas of study, in addition to the established subject areas. Efforts to introduce additional undergraduate course work are likely to be met with resistance, given this constraint and the varied interests of faculty within most academic departments. We therefore need to be skillful in advocating for increased coverage of cement and concrete composites at the undergraduate level. The success of such advocacy begins with having a sound understanding of cement and concrete composites, and their applications within the civil infrastructure. The natural abilities of such course work to contribute to the desired educational outcomes of the host academic program should also be recognized.

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0958-9465/$ - see front matter
doi:10.1016/j.cemconcomp.2006.07.012