Editorial

This issue of the IJEE includes contributions from authors in Australia, Canada, Chile, Denmark, France, Korea, Kuwait, Poland, Serbia, Spain, Sweden, and the USA. They address numerous interesting topics including: International Cooperation, Knowledge Building, Discovery and Presentation, Teaching Methods, Course/Curriculum Design and Assessment, Transdisciplinary Education, First Year Teaching, Motivation, Outreach, Women in Engineering, and Computer-based Learning Systems.

The first two papers relate to international cooperation. The first paper by Ortiz-Marcos et al. presents the European Summer School course that was developed by the Top International Managers of Europe, TIME, over the past several years. It aims to enable engineering students to learn the fundamentals of the European social model and gain cultural and religious awareness. It is delivered through the Internet by six European universities. It seems that the physical distance between the various campuses did not hinder the interaction among students and teachers. The authors also report on several lessons learned to enhance the benefits of such a course. The second, by Sheahan et al. reports on cooperative work between institutions in the USA and Chile. The authors describe the portability of an assessment system developed at a USA university as applied to two universities in Chile. In both the USA and Chilean implementations, the instrument was designed to assess learning in lower division engineering curricula in which the course work is delivered mainly by non-engineering departments, namely Chemistry, Mathematics, Physics, and Computer Science. The authors report on addressing some cultural differences including language issues and the level of familiarity with multiple choice questions.

The next four papers relate to the various aspects of knowledge in engineering education. Ellis et al. present a pilot study applying knowledge building in an engineering class. A narrative approach was used to initiate student knowledge building efforts. Analysis showed that knowledge building took place as demonstrated by higher level formulations of the problems, increased engagement, and more complex levels of discourse. The findings support the potential for knowledge building in engineering education. The authors then raised questions that need investigation, which relate to the types of questions or problems which are most effective for engaging a broad range of students and generating substantive discourse, the role of instructors, and the assessment of students' ability to apply knowledge effectively.

Johri and Lohani present a case study of the use of pen-based computing to improve representational literacy through dynamic knowledge construction and management activities among engineering students. The case study data was used to develop a framework that explains how students can learn to construct and manage knowledge in a participatory learning environment that allows the creation, sharing, recording, and reflection of digital representations. The framework emphasizes the contextually embedded role of technology in a learning environment.

Streveler et al. suggest that creating concept inventories in engineering subjects provides engineering educators with a methodology to measure the effect of new curricular and pedagogical approaches designed to correct misconceptions that students may have. The methodology was applied to heat transfer, thermodynamics, and fluid mechanics; the study involved over 1000 engineering undergraduates.

Campbell Murdy et al. report on the correlation between the quality of concept maps and the mark distributions in a first-year engineering biology course. Students were asked to develop concept maps and were allowed to consult their maps in a portion of the final exam. The quality of the concept map was positively correlated to student performance in questions requiring conceptual skills as well as in the overall final exam grade.

Gil-Herrera et al. applied the Rough Set Theory (RST) as the core of a knowledge discovery process for early identification of at risk students. The status of every student was analyzed based on a set of attributes collected through a series of surveys conducted in the first week of the course. The results show promise in the early identification of students who might have difficulties later.

Issues relating to first year teaching were addressed by Menacho et al., Strawderman and Ruff, and Adair et al. Menacho et al. reports on a two-year study to improve the teaching quality of a first-year Calculus course. They applied the Quality Function Deployment (QFD) matrix; a survey is used to collect data about the quality of teaching. The analysis of the data led to guidelines to be implemented for improvement the following year. Comparison of the results of two years shows that the weaknesses identified in the first year, and the improvements introduced in the second year, have created a significant increase in perceived quality.

Strawderman and Ruff discuss the design of Industrial Engineering introductory courses with a focus on career efficacy and students' perceptions of their ability to succeed in a particular career field. The study

involved 231 undergraduates; they completed a 41 question survey. Survey responses indicated a significant increase in career efficacy in discipline-specific courses when compared with general introductory courses. Also, students who reported enjoying the introductory course had higher efficacy scores.

Adair et al. compare two approaches to teaching Java to first year engineering students. One approach uses objects first and the other uses a procedural followed by an objects approach. The authors conclude that the students using the first approach gain a better understanding of programming.

Course/curriculum design and assessment are discussed in the six papers to follow. Segonds et al. present an experiment focusing on the reverse engineering of a complex mechanical product. This experiment was carried out between two centers of the Arts et Métiers ParisTech School of Engineering, located in Paris and Angers. They propose a collaborative environment that is well suited for design education. The authors report also on modifications in collaborative design courses and the implementation of network modifications that significantly improve the design environment.

Wandahl et al. present and discuss the findings of the review an MSc course in Construction Management in the Building Industry. It confirms that internship creates added value for the students. Some of the weaknesses of internships are discussed. The authors suggest that either optional or compulsory internships should be incorporated in future programmes.

Cifuo addresses the issue of the designation of cut-off of the admission ranking could be regarded as a subjective measure in the newly introduced Australian Tertiary Admission Rank (ATAR). In that system, a student who receives a high ranking will be able to enter an engineering program of their choice without any further testing of cognitive ability. The author presents an analysis of the performance of a group of students who have completed their first year of study in electrical engineering at the University of Wollongong during the years 2000–2010. The objective is to link achievements of students in their final year of secondary school to the early stage of their degree program. The study points to the importance of cognitive maturity in addition to processing a background in advanced mathematics and physics. It seems that by categorizing the historical data, it is possible to identify students who have a high probability of performing poorly in their first year of an undergraduate engineering course.

Liu and Pomalaza-Ráez present the design, development, implementation, and assessment of an innovative energy scavenging project for an introduction to an engineering course. The overall objective of the project is to provide students with a hands-on experience of all the components of a renewable energy system. About two hundred freshman students from various engineering disciplines including civil, computer, electrical, and mechanical successfully participated in this project.

Nejkovic and Tosic present a study that spanned several years on the impact using wiki-based teaching and learning on students' motivation. Data collected and analyzed from five courses related to information systems included usage logs, questionnaires, and final examination results. The authors conclude that the adoption of the Wiki Learning System in teaching and learning increases students' motivation.

Ertas et al. parent an assessment of transdisciplinary graduate education through the analysis of a survey. The participants included research scientists, faculty members, industry and business professionals, and graduate students. The authors found that individual decisions of the groups are reasonably consistent with the entire group decision. Further they reported that for the main objective of enhancing a transdisciplinary dialogue between disciplinary courses, the assessment is almost an exact match with all the groups.

Outreach and women in engineering issues are presented in two papers. Sohan and Ju present the design, implementation and assessment of an outreach approach called Youth Engineering Adventure Program; YEAP, for Korean students. The authors suggest that YEAP differs from other youth programs in Korea in that it invites secondary school students to a school of engineering to introduce them to engineering majors and it enables them to interact with engineering professors. Beddoes presents an analysis of recent engineering education scholarship to determine what reasons are given to explain why under representation of women in engineering is a problem. The author examines an international dataset of engineering education journal articles and conference proceedings from 1995–2008 with the objective of advancing critical reflection to help moving forward discussions about under representation of women.

The last three papers relate to remote laboratories and computer-based learning systems including remote and virtual laboratories. Kolota presents the implementation and assessment of a remote laboratory for control system. The author uses two complex control and measurement systems examples to demonstrate the effectiveness of the remote laboratory. One is concerned with the control and torque measurement of a stepper motor and the second is concerned with a pumping station with two water tanks. Both remote control systems allow the users to access real-time using PLC/HMI (Programmable Logic Controllers/Human Machine Interface) controllers and build SCADA (Supervisory Control and Data Acquisition) visualization software to monitor and manage the control process.

Fernnández-Sánchez et al. introduce the Integrated Self-Learning System of Electronics, ISLE. It is an integrated learning system. The objective is to help students better relate theory to practice in the laboratory. ISLE combines a hypermedia book with a virtual laboratory and a multimedia test tool. The system was tested in a first course on Electronics. Four groups of students took part: two groups used ISLE and the other two groups did not. A statistical comparison was conducted; the observed differences are significant.

De Sande presets the development and assessment of a computer-based tool for an undergraduate Signals and Systems course. The tool consists of an automatic problem generator and an automatic self-assessment system. The proposed problem comprises the continuous time-domain characterization of a linear and time invariant system and its Fourier and Laplace domain analysis. The authors concluded that the use of the tool led to an improvement in the final exam grades.

I wish to thank all the authors for their valuable contributions. I hope the readers find this issue of the IJEE interesting, useful and thought provoking.

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