Preface

Ali Elkamel

Department of Chemical Engineering,
University of Waterloo, 200 University Avenue West,
Waterloo, ON, N2L 3G1, Canada
E-mail: aelkamel@uwaterloo.ca

Khaled A. Mahdi

Chemical Engineering Department,
Kuwait University, P.O. Box 5969, Safat 13060, Kuwait
E-mail: k_mahdi@kuc01.kuniv.edu.kw

Biographical notes: Ali Elkamel is an Associate Professor of Chemical Engineering at the University of Waterloo. Prior to joining the University of Waterloo, he served at Purdue University, Procter and Gamble, Kuwait University, and the University of Wisconsin. His research has focused on the applications of systems engineering and optimisation techniques to pollution problems and sustainable development.

Khaled A. Mahdi, PhD, PMP, CE is currently an Assistant Professor of Chemical Engineering at Kuwait University. He received his BASc from the University of Toronto and PhD from Northwestern University. He is a Project Management Professional (PMP) and a certified consulting engineer in Education and Training (CE). His research has focused on statistical thermodynamics of complex systems and applications of CFD in the design of industrial processes.

The driving force of all science and technology developments is education. In return, technology serves to improve education. There currently exists a considerable interest in advancing engineering education through the use of technology. Objective oriented implementation of technology promotes active learning, broadens learning styles, allows for distant and delayed lecturing, and optimises the process of teaching engineering.

The papers in this special issue address how technology can enhance and facilitate engineering education in a wide spectrum of areas. The papers provide reliable and innovative ideas, applications, and tested implementations of technology in engineering education. The scope of the papers converge to the concept of utilising technology to serve as a supporting tool and not as a replacement of traditional teachings. Many students who perform well in problems solely requiring mathematical skills, face problems in comprehending the physical phenomena. The opposite of this statement is also true with other types of students who are not mathematically oriented. The versatility of technology provides a feasible solution to remedy this major issue in engineering education by allowing a change in the focus either to the mathematics or to the physics of

the problem based on the objective of the taught course. The latter is addressed directly and indirectly in all papers in this special issue.

The first paper by Wiesner and Lan sets the stage for the remainder of the issue and provides a comprehensive pedagogical reflection on the use of technology in engineering education and how this will help educating engineers that can meet the challenges of sustainability in this century.

The next two papers provide two interesting uses of computer-aided mathematical packages in engineering and scientific applications. The paper by Bellamine and Fgaier illustrates the use of the symbolic package MAPLE to facilitate considerably the solution of complicated mathematical models describing engineering and scientific phenomena and shows how such use can eliminate drudgery associated with routine algebraic manipulations. The paper by Mahdi makes use of another symbolic package (MATHEMATICA) to facilitate the teaching of phase equilibrium thermodynamics and shows how such use improves the students' educational experience in mastering the physical concept under consideration by shifting the focus of the student from a mere mathematical exercise to making sense and consideration of the physical model itself.

The fourth paper by Sookraj and Rivero deals with computer-aided engineering and provides a practical application in the modelling and simulation of an evaporation unit. The paper illustrates the use of computers in scientific and engineering investigations (in addition to theory and experimentation) and explains how such use can stimulate insight and understanding.

The next three papers deal with E-learning, knowledge management, and multi-media courseware and modules development. Kalaivani, Ramar, and Karthikeyan provide a generic framework that can fit all E-learning environments and help in imparting quality education irrespective of the status and location of the learner. In this same thread, the paper by Ko and Cheng discusses the development of web-based laboratories in the areas of communications and control. These are based on the remote control of real physical instruments and can be accessed through the use of common web browsers. These web-based laboratories include also the use of audio and video control, natural graphical interfaces for instrument control and experiment set-up, and data traffic reduction schemes. The labs have been proved to allow students and researchers to carry out real physical experiments at their own location anywhere with little space and manpower and are ideal for sharing expensive equipment. The paper by Tan and Fok provides another use of the web through the development of web-based courseware and discusses the different design considerations and software tools used for this purpose.

The next paper by Bellamine, Melki, and Elkamel deals with the use of Computer-aided design (CAD) packages in engineering education and describes the design and realisation of a low cost automatic real weather station. The project is aimed at enhancing the design experience of undergraduate students through a hands-on approach whereby students gain experience using a number of CAD packages and software tools.

The contribution by Tan and Fok focuses on the development of electronic resources for thermal-fluid courses with the aim of engaging and motivating students in active learning. The paper presents Java applets, interactive knowledge discovery activities, and a friendly user interface.

In a departure from the above uses of technology in engineering education, Searcy, Landaeta, Adcock, Marken, Dickerson, and Kotnour explore the benefits and impact of technology in synchronous, asynchronous, and blended engineering courses.

Their paper provides an example that shows the impact and effectiveness of distance learning technology and cooperative learning on students' self-efficacy.

Arshad, Hamouda, Ismail, and Sulaman then describe the use of virtual reality as a training tool in engineering education. Their paper presents a new desktop of a flexible manufacturing cell and demonstrates its use as a training tool for students and FMS operators which will enhance the understanding and skill of these users in manufacturing automation systems.

Finally, the paper by Khor, Elkamel, and Anderson explicitly incorporates the principles espoused by the systems approach as an essential component in the ongoing movement to revamp undergraduate engineering curricula in response to the major transformations that have taken place within the field and the profession. They accomplish this goal by bringing the use of commercial process simulators into classroom instructions in the form of process simulation computer laboratory exercises to compliment the traditional lecture format mode of teaching. This has the advantage of incorporating an industrially-relevant tool in the training of students in the engineering profession.

Coming to the end of this preface, the guest editors would like to thank all the authors who contributed to this issue and the many colleagues who participated in the review process. We would like also to thank Professor Allam Ahmed for providing us the opportunity to organise this special issue.

Finally, we wish you a fulfilling journey in savouring the breadth of the intellectual offering that this special issue offers.