Editor: Ahmad Ibrahim

Volume 26 Number 1

Contributions in: Mechatronics, Robotics, Electric Machines, Civil Engineering, Computer Aided Design and Modelling, Multidisciplinary Teaching, Collaborative Learning, Teacher Training, Evaluation, Relationship with Industry, and Education Research

The International Journal of ENGINEERING EDUCATION

FOUNDER AND FIRST EDITOR-IN-CHIEF MICHAEL S. WALD (1932–2008)

EDITOR

Ahmad Ibrahim, PhD, PEng Toronto, Ontario, Canada E-mail: ijee.editor@gmail.com

ASSOCIATE EDITORS

Thomas R. Kurfess, Ph.D., P.E. Professor and BMW Chair of Manufacturing, Dept. of Mech. Engineering; Director, Carroll A. Campbell Jr. Graduate Engineering Center, International Center for Automotive Research, Clemson University, Clemson SC 29634-0921, USA. E-mail: kurfess@clemson.edu

D. McCarthy, Dublin Institute of Technology, Bolton Street, Dublin 1, Ireland E-mail: dmccart@dit.ie

J. Turner, Dublin Institute of Technology, Bolton Street, Dublin 1, Ireland E-mail: jturner@dit.ie

BOARD OF EDITORS

Augusto Beléndez, Dept. Física, Ingeniería de Sistemas y Teoría de la Señal, Universidad de Alicante, Apartado 99, E-03080 Alicante, Spain.

Ahmed Hussein, Physics Department, University of Northern British Columbia, Prince George, B.C., Canada.

C. Y. Lam, School of Mechanical and Aerospace Engineering, Nanyang Technological, Singapore 639798.

C. S. Slater, Rowan University, Department of Chemical Engineering, Glassboro, NJ, USA.

EDITORIAL ADVISORY BOARD

Alice Agogino, Mechanical Engineering, University of California, Berkeley, 94720-1740, USA.

Caroline Baillie, Integrated Learning Centre, Queens University, Kingston, Ontario, Canada K7L 3N6.

Stuart Burgess, Department of Mechanical Engineering, University of Bristol, UK.

Clive Dym, Fletcher Jones Chair of Engineering Design, Harvey-Mudd College, Claremont CA 91711, USA.

Nesimi Ertugrul, Department of Electrical and Electronic Engineering, University of Adelaide, Adelaide 5005, Australia.

R. Felder, North Carolina State University, Raleigh NC 27695, USA.

Lawrence Genalo, Department of Materials Science and Engineering, Iowa State University, Ames IA 50011, USA.

Denis Gillet, EPFL, Swiss Federal Institute of Technology, CH-1015, Switzerland.

Wilmar Hernandez, Department of Circuits and Systems, EUIT de Telecomunicacion, Universidad Politecnica de Madrid, Ctra. Valencia km 7, 28031 Madrid, Spain.

Dogan Ibrahim, Department of Biomedical Engineering, Near East University, Nicosia, Cyprus.

J. Jawitz, Centre for Higher Education Development, University of Cape Town, South Africa.

Russel C. Jones, Managing Partner, World Expertise LLC, Falls Church VA, USA.

Kok Kiong Tan, Department of Electrical and Computer Engineering, National University of Singapore, Singapore.

Paul King, Department of Biomedical Engineering, Vanderbilt University, Nashville TN 37253, USA.

J. F. Marchman, Virginia Polytechnic Institute and State University, Blacksburg VA 24061, USA.

Tom Owens, Department of Electrical Engineering & Electronics, Brunel University, Uxbridge, UK.

Shirley Pomeranz, Department of Mathematical and Computer Sciences, The University of Tulsa, OK 74104-3189, USA.

Z. J. Pudlowski, Faculty of Engineering, Monash University, Clayton, Melbourne, Vic 3168, Australia.

Nicholas Salamon, Engineering Science & Mechanics, Penn State University, University Park, PA 16802, USA.

D. Schaefer, Georgia Institute of Technology, Savannah, GA 31407, USA.

Sheri D. Sheppard, Department of Mechanical Engineering, Stanford University, Stanford, CA 94305, USA.

P. Shiue, Christian Brothers University, Memphis TN 38104, USA.

I.Verner, Department of Education in Technology & Science, Israel Institute of Technology, Haifa 32000, Israel.

B.Wagner, Center for Didactics of Technology, University of Hannover, Germany.

Levent Yilmaz, Computer Science and Software Engineering, Auburn University, Auburn AL 36849, USA

Subscription Rates

For complete price information, please contact ijee@eircom.net

International Journal of Engineering Education, CIO John Turner, Dublin Institute of Technology, Bolton St., Dublin 1, Ireland.

Copyright © 2010 TEMPUS Publications Published 6 per annum

It is a condition of publication that manuscripts submitted to this journal have not been published and will not to be simultaneously submitted or published elsewhere. By submitting a manuscript, the authors agree that the copyright for their article is transferred to the publisher, if and when the article is accepted for publication. However, assignment of copying is not required from authors who work for organizations which do not permit such assignment. The copyright covers the exclusive rights to reproduce and distribute the article, including reprints, photographic reproductions, microform or any other reproductions of similar nature and transactions. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, electrostatic, magnetic tape, mechanical, photocopying, recording or otherwise, without permission in writing from the copyright holder.

Photocopying Information for Users in the U.S.A.

The Item-free Code for this publication indicates that authorization to photocopy items for internal or personal use is granted by the copyright holder for libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service provided by the stated fee for copying beyond that permitted by Section 107 or 108 of the United States Copyright Law, is paid. The appropriate remittance of \$3.00 per copy per article is paid directly to the Copyright Clearance Center Inc., 27 Congress Street, Salem, MA 01970.

Permission for Other Use

The copyright owner's consent does not extend to copying for general distribution, for promotion, for creating new works, or for resale. Specific written permission must be obtained from the publisher for such copying.

The Item-fee Code for this publication is: 0949-149X/92 \$3.00 + 0.00

The International Journal of ENGINEERING EDUCATION

The International Journal of Engineering Education (IJEE) is an independent, peer-reviewed journal. It serves as an international archival forum of scholarly research related to engineering education. The Journal publishes six issues per year.

The journal has published recently in numerous areas of engineering education including:

Electrical Engineering, Mechanical Engineering, Civil Engineering, Chemical Engineering, Computer Engineering, Agricultural Engineering, Aerospace Engineering, Thermodynamics, Structural Engineering, Control Engineering, Robotics, Mechatronics, Fluid Mechanics, Nanotechnology, Simulators, Web-based Learning, Remote Laboratories, Engineering Design Methods, Education Research, and Assessment.

MANUSCRIPT SUBMISSION

Manuscripts are to be submitted to the Editor, Dr. Ahmad Ibrahim by e-mail at: ijee.editor@gmail.com

Manuscripts should be submitted in English as MSWord documents (.doc).

Authors submitting a revised manuscript need to outline separately the response to the reviewers' comments and the changes introduced to the manuscript.

Manuscripts will be reviewed; all accepted revised manuscripts should be submitted following the style of the Journal (a short guide is provided at the homepage of the IJEE). They will be copy-edited and typeset. The proofs in PDF format will be sent to the authors for their approval before publication.

COPYRIGHT

By submitting a manuscript the author(s) declares that the manuscript was not published before, that it is not being considered for publication elsewhere, and that if accepted for publication in the IJEE will not be published anywhere else. If accepted for publication in the IJEE, the authors agree to transfer the copyrights to the Journal and to honour the page charges.

REVIEW CRITERIA

Manuscripts that appear to be within the scope of the Journal will be peer-reviewed. Reviewers are asked to consider several aspects of the manuscript, including:

Content: clarity of objective, technical correctness, scope covered, conclusions drawn as supported by the data presented, proper literature survey, impact on teaching and learning, contribution to engineering education, etc.

Originality: presence of new ideas or innovative contribution.

Structure: logical layout, proper use and adequate number of figures, diagrams, tables, etc.

Quality of text: being concise, correct grammar and spelling, clarity of expression, consistency, readability, citation appropriate references, etc.

PAGE CHARGES

Authors of accepted manuscripts are asked to pay page charges; the total page charges are calculated according to the number of pages to be published based on the proofs sent to the authors. Details are provided at the home page of the IJEE.

Vol. 26, No. 1, pp. 1–236 INT. J. ENGINEERING EDUCATION 2010

A selection of papers accepted for publication

Dym—Sustainability: Affirming Engineering Values

Lewis—Sustainability: The View from a Practitioner's Perspective

Lau—Sustainable Design: A New Paradigm for Engineering Education

Corson—Sustainable Design as a Sustained Upstream Effort

Jitesh et al.—A Collective-Learning Approach to Sustainable Design Education

Lande and Leifer—Difficulties Student Engineers Face Designing the Future

Johri—Open Organizing: Designing Sustainable Work Practices for the Engineering Workforce

Cardenas et al.—Sustaining Sustainable Design through Systemic Thinking

Linder—Achieving a Sustainable Environmental Perspective

Oliver—Experiences with Life-Cycle Aware Computer Architecture

Kilgore *et al.*—From beginning to end: How engineering students think and talk about sustainability across the life cycle

Gerber—Learning to Waste and Wasting to Learn? How to Use Cradle to Cradle Principles to Improve the Teaching of Design

Adams et al.—Exploring student differences in formulating cross-disciplinary sustainability problems

Strobel *et al.*—Not all Constraints are Equal: Stewardship and Boundaries of Sustainability as Viewed by First-Year Engineering Students

Goff et al.—ROXIE: Real Outreach eXperiences In Engineering First-Year Engineering Students Designing for Community Partners

Thompson—Green Design in Cornerstone Course at KAISY: Theory and Practice

Cardella et al.—Sustaining Sustainable Design through "Normalized Sustainability" in a First-Year Engineering Course

Stiver—Sustainable Design in a Second Year Engineering Design Course

Morris and Steiner—Quantifying Sustainability through Reverse Engineering: A Multi-Disciplinary Senior Capstone Experience

Rhee et al.—Pilot Implementation of an Interdisciplinary Course on Climate Solutions

Lambert—Sustainable Design Throughout the Curriculum Using Case Studies

Williams et al.—Designing Hands-On Teaming Activities: Exploring Sustainability Tradeoffs for Courses with Large Enrollments

Tate et al.—Transdisciplinary Approaches for Teaching and Assessing Sustainable Design

Bremer—Teaching Creativity and Innovation using Sustainability as driving force

Vanasupa et al.—The systemic correlation between mental models and sustainable design: Implications for engineering educators

Linsev and Viswanathan—Innovation Skills for Tomorrow's Sustainable Designers

Paretti et al.—Sustaining Interdisciplinary Projects in Green Engineering: Teaching to Support Distributed Work

Doepker—Sustaining Sustainable Engineering Design Projects

Fleischmann et al.—Sustainability: A Campus Initiative

Oehlberg *et al.*—Sustainable Product Design: Designing for Diversity in Engineering Education

Wesner—What We Have Learned at Mudd Design Workshop VII: "Sustaining Sustainable Design"