

Editor-in-Chief: Michael Wald
Dublin Institute of Technology
Dublin, Ireland

Contents

M. S. Wald	221	Editorial
<i>Engineering Education Policy and Research</i>		
Sheila D. Fournier-Bonilla, Karan Watson, César Malavé and Jeffrey Froyd	222–235	Managing Curricula Change in Engineering at Texas A&M University
Scott D. Snyder	236–247	Is it Possible to Break-even in Undergraduate Engineering Education? A Cost Analysis and Costing Model
Patrick S. K. Chua	248–254	The Initiation, Organisation and Logistics of Part-Time Final-year Projects
G. R. McDowell	255–260	A Student-centred Learning Approach to Teaching Soil Mechanics
<i>Engineering Design</i>		
Ivan S. Gibson	261–266	Group Project Work in Engineering Design—Learning Goals and their Assessment
<i>Engineering Mechanics</i>		
Joseph A. Taylor, Thomas M. Dana and Mehmet F. Tasar	267–275	An Integration of Simple Materials and Complex Ideas: Description of an Instructional Sequence in Statics
<i>Chemical Engineering</i>		
Doug Cooper and Danielle Dougherty	276–287	Control Station: An Interactive Simulator for Process Control Education
Ken R. Morison	288–293	Modelling and Computation Techniques for Fluid Mechanics Experiments
<i>Aeronautical Engineering</i>		
Etsuo Morishita, Yohei Iwata, Kentaro Yuki and Haruhiko Yoshida	294–311	Spreadsheet Fluid Dynamics for Aeronautical Course Problems
<i>Electrical Engineering</i>		
K. K. Chu and H. W. Ngan	312–320	A Novel Approach for Implementing Power System Analysis and Simulation Tools

The International Journal of ENGINEERING EDUCATION

EDITOR-IN-CHIEF

M. S. Wald, Dublin Institute of Technology, Bolton Street, Dublin, Ireland
Tel: (International +353 1) 4023605; Fax: (+353 1) 4023999; E-Mail: wald@dit.ie
Website: <http://www.ijee.dit.ie>. Editor's direct phone: (+353 27) 61400.

ASSOCIATE EDITORS

C. Kuo, University of Strathclyde, 100 Montrose St., Glasgow G4 0LZ, Scotland
Tel: (International +44-141) 552 4400; E-mail: c.kuo@strath.ac.uk
L. S. Fletcher, Department of Mechanical Engineering, Texas A&M University, College Station, TX 77843, USA
D. McCarthy, Dublin Institute of Technology, Bolton St., Dublin, Ireland
M. Murphy, Dublin Institute of Technology, Bolton St., Dublin, Ireland
J. Turner, Dublin Institute of Technology, Bolton St., Dublin, Ireland

BOARD OF EDITORS

C. Y. Lam, School of Mechanical and Production Engineering, Nanyang Technological University, Singapore 639798
S. Malasri, School of Engineering, Christian Brothers University, Memphis TN 38104, USA
R. Natarajan, Director, Indian Institute of Technology, Madras 600-036, India
E. C. Roche, Jr., Chemical Engineering, University of Nevada, Reno, NV 89557, USA
C. S. Slater, Department of Chemical Engineering, Rowan College, Glassboro, NJ 08028, USA
S. Waks, Department of Education in Technology & Science, Israel Institute of Technology, Haifa 32000, Israel

EDITORIAL ADVISORY BOARD

Caroline Baillie, Department of Materials, Imperial College of Science, Technology and Medicine, London SW7 2BP, United Kingdom
F. Bodendorf, Department of Information Systems, University of Nuremberg-Erlangen, Germany
E. Eder, Royal Military College of Canada, Kingston, Ontario, Canada K7K 5L0
Nesimi Ertugrul, Department of Electrical and Electronic Engineering, University of Adelaide, 5005 Australia
I. Gibson, Industrial Engineering Department, National University of Ireland, Galway, Ireland
R. C. Jones, World Expertise LLC, 2001 Mayfair McLean Court, Falls Church, VA 22043-1761, USA
R. Latorre, Naval Architecture and Marine Engineering, University of New Orleans, New Orleans, LA 70148, USA
K. Mallalieu, Electrical & Computer Engineering, University of West Indies, St. Augustine, Trinidad
B. Malys, Lehrstuhl für Kommunikationstechnik, TU Cottbus, 03044 Cottbus, Germany
J. F. Marchman, Aerospace & Ocean Engineering Department, Virginia Tech, Blacksburg, VA 24061, USA
J. H. F. Meyer, School of Education, University of Durham, UK
Etsuo Morishita, Department of Aeronautics and Astronautics, University of Tokyo, Japan
C. Newberry, Aeronautics and Astronautics, Naval Postgraduate School, Monterey, CA 93943, USA
Terrance O'Brien, Department of Curriculum and Instruction, North Carolina State University, Raleigh NC 27695, USA
T. Owens, Dept. of Electrical Engineering and Electronics, Brunel University, Uxbridge, UB8 3PH, UK
A. Petrenko, CAD Department, Kiev Polytechnical Institute, Ukraine
S. Pomeranz, Department of Mathematical and Computer Sciences, University of Tulsa, Tulsa, OK, USA
Z. J. Pudlowski, Faculty of Engineering, Monash University, Clayton, Melbourne, Vic 3168, Australia
N. J. Salamon, Engineering Science and Mechanics, The Pennsylvania State University, University Park, PA 16802, USA
Sheri D. Sheppard, Mechanical Engineering, Stanford University, Stanford, CA 94305, USA.

2001 Subscription Rates (including postage and insurance)

Annual institutional subscription rate £330. Personal subscription rate for those whose library subscribes £85. For North American institutional subscribers \$495. Subscription enquiries should be sent to TEMPUS Publications, Dublin Institute of Technology, Bolton St., Dublin, Ireland. Tel: (+353 1) 4023635, Fax (+353 1) 4023999.

Back Issues

Back issues available from TEMPUS Publications.

Copyright © 2001 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 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 copyright 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 translations. 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-fee 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 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, USA.

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

AIMS AND SCOPE

This journal serves as an international interdisciplinary forum and source of reference for engineering education. A balance between papers on developments in educational methods and technology, case studies, laboratory applications, new theoretical approaches, educational policy and survey papers is aimed for. Comprehensive coverage of new education schemes and techniques makes the journal a unique source of ideas for engineering educators who are keen to keep abreast with latest developments in educational applications in all fields of engineering. The journal will cover engineering education news and open debates on engineering education policy related topics of transnational interest.

Some of the areas covered more extensively in recent issues are: CAD, CAE, computer applications in teaching thermodynamics, materials science, electrical engineering, new courses and curricula, engineering management, control engineering, mechanical engineering, engineering design, student evaluation and institutional accreditation.

Features are a series on world educational systems with reference to engineering and a software survey section. Special issues on topics such as computer-aided engineering, engineering thermodynamics and engineering design are published periodically.

NOTES FOR CONTRIBUTORS

Papers for inclusion in the Journal should be submitted in duplicate to the Editor-in-Chief or to the most appropriate member of the Board of Editors or the Editorial Board. The Editor-in-Chief should be informed by the authors of any submission made directly to a member of either Board. The papers should include detailed information on relevance of the material to engineering education. Only papers not previously published will be accepted and, once accepted for the Journal, must not be published elsewhere. Technical Notes, Letters-to-the-Editor and Book Reviews may also be submitted. In addition to the paper in manuscript form papers should also be submitted on a diskette suitable for IBM PC or Apple Macintosh. News items of transnational interest, including courses and workshops, should be submitted to the Editor-in-Chief. Papers and Journal information are available on the World Wide Web on <http://www.ijee.dit.ie>

Papers must be submitted in English.

A brief summary (not more than 100 words) of the scope of each paper must be sent with the manuscript.

Authors are requested to submit a brief biographical sketch of up to 100 words for each author. Biographical sketches will be published with the paper unless requested otherwise.

The text, and as much of the mathematics as possible, must be typed with double spacing and ample margins on successively numbered pages.

The manuscript and diagrams will be discarded one month after publication unless the publisher is requested to return the original material to the author.

All photographs, schematics and diagrams should be referred to as figures and should be numbered consecutively and not included in the typescript. Name(s) of author(s), figure number and an indication of the orientation should be written on the back of each figure. Line diagrams should be drawn clearly in black ink with open lettering and be of sufficiently large size to allow for the necessary reduction. Photographs should be kept to a minimum and submitted as glossy prints. It is preferred to have graphics on diskette in GIF format.

In the interest of economy and in order to avoid the introduction of errors, tables will be reproduced directly from the authors' manuscripts. In case of difficulty please consult the Photoreprographic Unit of your institution. The following points should be observed during their preparation.

1. Insert heavy rules at the head and foot of each table, and fine rules below column headings.
2. The type should be clear and even.

Captions for figures and tables must be given on a separate sheet and included at the end of the manuscript.

The journal follows Le Système International d'Unités.

All Greek characters and unusual symbols must be identified by name in the margin the first time they appear.

References in the text to published literature should be given by numbers in square brackets on the line and the references should be listed at the end of the paper in numerical order.

Journal references should be arranged thus:

1. L. A. Pipes, Matrix analysis of heat transfer problems. *J. Franklin Inst.* **263**, 195–206 (1957).

Book references should be given as:

2. P. H. Parkin and H. R. Humphreys, *Acoustics, Noise and Buildings*, p. 84. Faber, London (1961).

Abbreviations of journal titles will follow *World List of Scientific Periodicals*.

Proofs will be sent to the first-named author for correction, unless otherwise specified. Corrections must be restricted to printer's errors only. Other than these, any substantial changes may be charged to the author.

A selection of papers accepted for publication

Johari, Abdullah, Osman, Sapuan, Mariun, Jaafar, Ghazali, Omar, Rosnah—A New Engineering Education Model for Malaysia

Snyder—Vertically Integrated Projects and the Importance of Organisational Culture Amongst the Student Body

Yeomans, Atrens—A Methodology for Discipline-Specific Curriculum Development

Petty, Hooker, Barber—The Federal-Mogul Business Game: The Development and Application of an Educational Aid for Planning and Control

Box, Munroe, Crosky, Hoffman, Krauklis, Ford—Increasing Student Involvement in Materials Engineering Service Subjects for Mechanical Engineers

Bender—Conceptions for Purposive and Motivating Teaching and Learning in Engineering Design Courses

Hirose—Creative Education at Tokyo Institute of Technology

Bernitsas—Engineering for the Marine Environment at an American Research University

Regan, Zhang, Cunniff, Shmidt, Dally—Curriculum Integrated Engineering Design and Product Realization

Farrel, Hesketh, Newell, Slater—Introducing Freshmen Reverse Process Engineering and Design through Investigation of the Brewing Process

R. Morris, G. A. Ottewill, D. Barker, F. Walsh—The Aluminum-Air Cell. A hands On Approach to the Teaching of Electrochemical Technology

Chang—A New Undergraduate Semiconductor Manufacturing Option in a Chemical Engineering Curriculum

Nowak, Korst, Leicht—Feasibility Study for a Two-Stage Axial Flow Automotive Cooling Pump

Ramachandran, Marchese, Ordonez, Sun, Constans, Schmalzel, Newell, Benavidez, Haynes—Integration of Multidisciplinary Design and Technical Communication: An Inexorable Link

Ziemian—A Systems Approach to Manufacturing as Implemented within a Mechanical Engineering Curriculum

Hesketh, J. A. Newell, C. S. Slater—Introducing Freshmen Reverse Process Engineering and Design through Investigation of the Brewing Process

Pratt—Optimizing Student Performance under a Government Mandated Quota System

Hsieh—Intelligent Tutoring Systems for Manufacturing Engineering Education