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# UNESCO International Centre for Engineering Education (UICEE)

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An overview of the status, role and activities of the UNESCO International Centre for Engineering Education (UICEE), established in the Faculty of Engineering at Monash University, Clayton, Melbourne, on 1 January 1994, is given in this article. In 1997, a decision was made to open up the Centre in order to allow other academic institutions to become members of the UICEE. As a consequence, the UICEE presently enjoys partnership agreements with 20 academic institutions worldwide. Under the partnership, the so-called satellite centres of the UICEE have been, or are being established. A wide range of research and development activities in engineering and technology education have been carried out by staff, students and associates of the UICEE over the last ten years. Some examples of key activities conducted for the professional development of academic staff, especially for junior academic staff, as well as for those in developing countries, are presented and discussed in this article.

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## INTRODUCTION

The UNESCO International Centre for Engineering Education (UICEE) is the world's first and only centre of its kind in engineering education established under the auspices of UNESCO. It is located in the Faculty of Engineering at Monash University, Clayton, Melbourne, Australia. The establishment of the Centre is widely regarded as a most significant undertaking in the globalisation of engineering education. Since its inception on 1 January 1994, the Centre's role and achievements have continued to grow and have received international recognition and support. The Centre is seen as part of the north-south dialogue on development, with Australia, in this case, standing as a country of the north located in the south, and eager to assist in developing engineering and technology education in less privileged countries.

The centrepiece of the UICEE's commission is human resources development within engineering through engineering education, a dual brief in its concern with the two principal facets of education: teachers and students - the instructors and future practitioners of engineering. To this end, the Centre's work involves the development of pedagogy, through

research and development of courseware, software and teaching methodologies, as well as of engineering curricula in consultation with industry, the primary employer of engineers.

The implications of such a brief are clearly tremendous, although by no means exclusively, in the impact of such work in developing countries: engineers are the innovators and realisers of technological and industrial development from which so many material benefits proceed.

## THE ESTABLISHMENT OF THE UICEE

Momentum for the establishment of the UICEE found impetus in the discussions of two international symposia, sponsored by UNESCO, for Engineering Deans and Industry Leaders in 1989, and again in 1991. The prime concern of the symposia was the fostering of technological advancement in developing countries through the improvement of engineering education in these countries with the assistance of institutions in developed nations. This targeted such progressive projects as:

- Partner university programmes;

- University-industry cooperation;
- Education standards/equivalency;
- Use of satellite technology;
- Development of a database on engineering education;
- Establishment of a clearinghouse of equipment and courseware.

In order to realise this agenda, UNESCO established a UNESCO Steering Committee on Technical Human Resources Development in 1992, which proposed that the then Dr Pudlowski, a senior lecturer in the School of Electrical Engineering at the University of Sydney, Sydney, Australia, and a member of the Committee, should prepare a submission to UNESCO for the establishment of an international centre for engineering education, serving as a global clearinghouse, in order to undertake this role and carry out a range of activities concerning the last project on the agenda. The Centre was to be established in a leading tertiary institution in Australia.

A submission for a UNESCO Centre in the Faculty of Engineering at Monash University was prepared and presented by Prof. Peter LeP. Darvall, then Dean of Engineering, Monash University, and Dr Pudlowski at the second meeting of the Steering Committee in Paris, June 1993. UNESCO endorsed the submission and announced the establishment of what was initially known as the UNESCO Supported International Centre for Engineering Education (USICEE). In 1997, after four years of productive operation, the Centre received the status of a fully-fledged UNESCO Centre.

### **Motto**

The UICEE, although based in Australia, has a global interest, and hence has adopted the following motto:

*Serving the International Engineering Community*

The Centre is a global entity whose paramount objective is to serve the international engineering education community by carrying out research and development activities, and by providing expertise in, and improving the quality of, engineering education (curricula and teaching methodologies) in order to better meet the needs of academic teachers, future graduates and employers, as well as to disseminate the information on engineering and technology education on a worldwide basis.

### **Mission**

In its focus on, and the commission to, engineering education, the Centre endeavours to realise UNESCO's *raison d'être*:

*... to contribute to peace and security by promoting collaboration among nations through education, science and culture in order to further universal respect for justice, for the rule of law and for the human rights and fundamental freedoms which are affirmed for the peoples of the world, without distinction of race, sex, language or religion, by the Charter of the United Nations.*

The mission of the UICEE is to facilitate the transfer of information, expertise and research on engineering education, and to act as a clearinghouse for the transfer of information on textbooks, engineering teaching courseware, software, equipment, and any other research and teaching material utilised in engineering education from developed to developing countries.

### **Principal Objectives**

The UICEE endeavours to carry out a wide range of activities, depending on the available financial and human resources. However, in its commission to cultivate the knowledge and skills essential for high quality engineering education, the UICEE has set up and pursued a number of principal objectives, the most significant of which are to:

- Conduct research into the methodology of teaching and learning processes, and assess the effectiveness of teaching programmes and programmes designed for developing technologies.
- Carry out research on equipment, textbooks, courseware and software utilised in engineering education, and to encourage further research in these areas.
- Promote collaboration in the field of engineering education between institutions in developed and developing countries.
- Collect and transfer information on advances in engineering education and develop modern techniques for the dissemination of this knowledge.

### **THE UICEE**

The UICEE commenced its vigorous operation on 1 January 1994, and is hosted by the Faculty of

Engineering at Monash University. The Centre is a unique development, which has been endorsed by a number of academic institutions and professional organisations worldwide, and has attracted to its cause many academic institutions and individuals concerned about engineering education on a worldwide basis.

### Human Resources

Other than the full-time Director, over the period of then years, the Centre has employed several support staff. By the end of 2003, the UICEE employed the following staff, and enjoyed associations with numerous professionals. The present structure of the UICEE is as follows:

#### *UICEE Director*

- Prof. Zenon J. Pudlowski (full-time)

#### *Support Staff*

- Ms Duyen Q. Nguyen, a Research Project Officer (part-time), and a PhD Candidate (full-time)
- Mr Arun S. Patil, Project Officer (full-time)
- Mr Marc J. Riemer, Administrative Officer (full-time) and a Master's Candidate (part-time)

#### *Associates of the UICEE*

- Dr Peter Lawrence
- A/Prof. Ian Marshall
- Mr Andrew Olszewski
- Prof. Marika A. Vicziany
- Mr John D. Zakis

#### *Academic Advisory Committee*

With the opening up of the Centre to academic institutions and individuals interested in engineering education in 1997, the UICEE has established an *Academic Advisory Committee* (AAC) in order to advise the Director on academic matters related to the operation of the Centre. Members of the AAC are representatives of the members of the UICEE, with representatives of partner institutions providing the largest group. The structure of the UICEE AAC is as follows:

#### *Chairman*

- Prof. Peter LeP. Darvall, the immediate past Vice-Chancellor & President of Monash University, and

Chairman of the International Liaison Group for Engineering Education (ILG-EE);

#### *Deputy Chairmen*

- Prof. Colin U. Chisholm, Dean of Development, Glasgow Caledonian University, Glasgow, Scotland, UK;
- Prof. Norbert Grünwald, Rector, Hochschule Wismar - University of Technology, Business and Design, Wismar, Germany;
- Prof. Finn Kjærdsdam, Dean, Faculty of Engineering and Science, Aalborg University, Aalborg, Denmark;
- Prof. Silas Lwakabamba, Rector, Kigali Institute of Science, Technology and Management, Kigali, Rwanda, and a Member of the Executive Board of UNESCO;
- Prof. Yuri P. Pokholkov, Rector, Tomsk Polytechnic University, Tomsk, Russia, and President of the Russian Association for Engineering Education (RAEE).

It should be noted that membership of the UICEE Academic Advisory Committee evolves from time to time to ensure proper international representation by the UICEE institutional members.

### UICEE MEMBERSHIP

At the beginning of 1997, the UICEE decided to open the Centre to academic institutions and individual persons, particularly concerned about engineering and technology education, with five grades of membership. The grades are Partner, Sponsor, Supporter, Contributing and Individual Member. As of March 2004, the membership of the UICEE included:

- Partners (20)
- Sponsor (0)
- Supporter Members (7)
- Contributing Members (11)
- Individual Members (close to 100)

Many academic institutions see the operation of the UICEE and its activities as an excellent opportunity to realise some of their own objectives in technology and engineering education. It should be mentioned that although the overall number of member institutions has not exceeded 40 academic institutions in any one year, many member institutions have upgraded their status. This is especially noticeable with regard to Partner institutions, when compared, for instance, with only five Partner Institutions in 2000 [1][2].

## UICEE PARTNER INSTITUTIONS

The UICEE has been, indeed, very fortunate to attract so many respectable and diverse institutions worldwide, representing almost all of the continents. The current list of UICEE Partner institutions is as follows:

- Aalborg University, Aalborg, Denmark
- Altai State Technical University, Barnaul, Russia
- Anna University, Chennai, India
- Caledonian College of Engineering, Muscat, Sultanate of Oman
- Chinese Culture University, Taipei, Taiwan
- Gdynia Maritime University, Gdynia, Poland
- Glasgow Caledonian University, Glasgow, Scotland, UK
- Hochschule Wismar – University of Technology, Business & Design, Wismar, Germany
- Hyderabad (Sind) National Collegiate Board, Mumbai, India
- Kigali Institute of Science, Technology & Management, Kigali, Rwanda
- King Mongkut's University of Technology Thonburi, Bangkok, Thailand
- *Lucian Blaga* University of Sibiu, Sibiu, Romania
- Maharashtra Academy of Engineering and Educational Research, Pune, India
- Maharashtra State Board of Technical Education, Mumbai, India
- National Changhua University of Education, Changhua, Taiwan
- Silesian University of Technology, Gliwice, Poland
- Technical University of Częstochowa, Faculty of Management, Częstochowa, Poland
- Tomsk Polytechnic University, Tomsk, Russia
- University of Science & Technology *Houari Boumediene*, Algiers, Algeria
- University of Technology, Jamaica, Kingston, Jamaica

Negotiations are being continuously carried out with numerous academic institutions to become members of the UICEE, and UICEE partners in particular, in order to strengthen the so-called *UICEE Global Family of Engineering Educators* for the benefit of the institutions concerned and the entire global community of engineering education.

## UICEE SATELLITE CENTRES

Under the agreements on partnership signed between the UICEE and a Partner institution, the UICEE is to provide the membership services, promote the

partner institution on a global basis and assist it in setting up a UICEE sub-centre, a so-called *UICEE satellite centre*.

Numerous UICEE satellite centres have been established already, and are by now fully operational, with several satellite centres still in their infancy. Basically, there are two kinds of satellite centres. The first group includes those satellite centres that have a so-called geographic coverage and responsibility, that is to operate in certain geographic regions, whereas the second group of satellite centres are the so-called topical centres, which are concerned about, and engaged in, a specific area of engineering and technology education.

It should be stated that the first satellite centre was established at Glasgow Caledonian University in 1998 as the *Caledonian Centre for Engineering Education* (CCEE). Currently, the UICEE global network of satellite centres includes the following centres, listed in order of the time of their establishment:

- Scottish Centre For Work-Based Learning (SACEE)
- South Asia Centre For Engineering Education (SCWBL)
- Central Asia Centre for Engineering Education (CACEE)
- Gottlob Frege Centre for Engineering Science and Design (GFC)
- UICEE Centre for Problem-Based Learning (UCPBL)
- Centre for Maritime Engineering Education (CMEE)
- Centre for Education in Mechatronics (CEM)
- South-East Asia Centre for Engineering & Technology Education (SEACETE)
- African Centre for Engineering & Technology Education (ACETE)
- Balkan Region Centre for Engineering Education (BRCEE)
- North Africa Centre for Engineering & Technology Education (NACETE)
- Gulf Centre for Engineering Education (GCEE)
- North-East Asia Centre for Technology and Vocational Education (NEACTIVE)
- Centre for Cultures and Technologies in Asia (CCTA)
- Centre for Technical Teachers Training (CTTT)
- Indian Centre for Engineering Education and Research (ICEER)
- Altai Centre for Environmental Engineering Education (ACEEE)
- Centre for Engineering Education in Central America and the Caribbean (CEEAC)

- Centre for Engineering Management and Agribusiness Education (CEMAE)
- Centre for Information Technologies and Multimedia (CITM)

It is anticipated that the UICEE satellite centres will contribute significantly to international operations in engineering education in general, and to the global effort of the UICEE in particular. The following brief notes describe the nature, role and operation of the various UICEE satellite centres. More information concerning this matter on some of the well-developed UICEE satellite centres may be found elsewhere in this issue.

### **Scottish Centre For Work Based Learning (SCWBL)**

Initially established as the *Caledonian Centre for Engineering Education (CCEE)* at Glasgow Caledonian University (GCU) in July 1998, the CCEE has gradually evolved to a new and much more substantial operation. It has recently changed its name to the *Scottish Centre for Work Based Learning (SCWBL)*, which continues to be a satellite centre of the UICEE. Also, it is envisaged that the SCWBL will build on the strong foundation already established by the CCEE. Prof. Colin U. Chisholm is the Director of the Centre.

The CCEE concentrated primarily on research into the design, implementation and delivery of programmes of study in the workplace at undergraduate and postgraduate levels. It held its *1<sup>st</sup> Conference on Life-Long Learning for Engineers* at the GCU, between 22 and 25 May 1999, in collaboration with the UICEE. This resulted in a Special Edition of the *Global Journal of Engineering Education (GJEE)*, Vol.3, No.3, which published selected papers presented at the Conference [3].

It should be mentioned that the SCWBL was the host and principal co-organiser of the *3<sup>rd</sup> Global Congress on Engineering Education*, held at Glasgow Caledonian University between 30 June and 5 July 2002.

### **South Asia Centre For Engineering Education (SACEE)**

A *South Asia Centre for Engineering Education (SACEE)* was established in October 2000 at Anna University in Chennai, India, as a satellite centre of the UICEE. Prof. E. Balagurusamy, Vice-Chancellor of Anna University, is the liaison person on behalf of the SACEE.

The Centre aims to provide a focus for academic and research activities related to the work on teaching methodologies in developing countries and, in particular, on the development of teaching methodologies for education in the establishment of small and medium sized enterprises that are so vital for economies in developing countries.

The Centre was the host and co-organiser of the *5<sup>th</sup> UICEE Annual Conference on Engineering Education*, held at Anna University between 6 and 9 February 2002.

### **Central Asia Centre for Engineering Education (CACEE)**

A *Central Asia Centre for Engineering Education (CACEE)* was established at Tomsk Polytechnic University (TPU), Tomsk, Russia, as a satellite centre of the UICEE, in 2001. Prof. Alexander I. Chuchalin, 1<sup>st</sup> Vice-Rector of the TPU, has been appointed Foundation Director of the CACEE.

The Centre provides a focus for academic and research activities related to the work on the transfer of new technologies to other countries, especially to developing countries. A particular aim of the satellite centre has been to develop human resources for academic institutions on a worldwide basis, especially for new and emerging technologies.

The TPU, together with the Altai State Technical University, Barnaul, Russia, is the co-host of the *1<sup>st</sup> Euro-Asian International Conference on Ecological Aspects & Issues in Engineering Education*, under the title *Environmental Engineering Education in Siberia - Important Issues and Challenges*, to be held in Tomsk, between 7 and 8 June 2004 and in Barnaul, between 10 and 12 June 2004.

### **Gottlob Frege Centre for Engineering Science and Design (GFC)**

A *Gottlob Frege Centre for Engineering Science and Design (GFC)* was established at Hochschule Wismar - University of Technology, Business & Design (HSW), Wismar, Germany, on 7 November 2000. The Centre became a satellite centre of the UICEE in accordance with the Memorandum of Agreement between the HSW and the UICEE, signed on 25 May 2001. Prof. Norbert Grünwald and Prof. Dieter Schott are Co-Directors of the Centre.

The Centre is involved in research in basic engineering education, thereby strengthening, updating and raising basic science education to an advanced international level in tertiary education.

It should be mentioned that, apart from many research and development activities carried out by Hochschule Wismar, and more recently the GFC, the two organisations were involved in the staging of two important UICEE conferences, namely; the 2<sup>nd</sup> *Global Congress on Engineering Education*, held at the HSW between 2 and 7 July 2000, and the 6<sup>th</sup> *Baltic Region Seminar on Engineering Education*, held there between 23 and 25 September 2002.

Moreover, the HSW carries out the editorial work on the German Issue of the *Global Journal of Engineering Education*, published annually since 2000, with Prof. N. Grünwald as Guest Editor.

### **UICEE Centre for Problem-Based Learning (UCPBL)**

A *UICEE Centre for Problem-Based Learning (UCPBL)*, a satellite centre of the UICEE, was established at Aalborg University (AAU), Aalborg, Denmark, based on the Memorandum of Agreement signed between the AAU and the UICEE on 12 September 2001. Prof. Flemming K. Fink was appointed the Director of the UCPBL.

The Centre concentrates its efforts on the development of academic and research related activities in engineering education within the sphere of Problem-Based Learning (PBL).

The Centre has already undertaken a wide range of activities. For example, a special issue of the *Global Journal of Engineering Education*, Vol.6, No.2, under the title *Engineering Education in Denmark*, edited by Prof. F. Kjærdsdam and Prof. F.K. Fink, was published by the UICEE in 2002 [4].

### **Centre for Maritime Engineering Education (CMEE)**

A *Centre for Maritime Engineering Education (CMEE)* was established in September 2001 at Gdynia Maritime University (GMU), Gdynia, Poland, as a satellite centre of the UICEE. Prof. Romuald Cwilewicz, a Vice-Rector of the University, has been appointed the Foundation Director of the Centre.

The activities of the Centre concentrate on the development of academic, research and training related activities in engineering education within the sphere of global maritime engineering. A special effort is being made to cater for the continuing education needs of maritime personnel.

It should be pointed out that collaboration between the GMU and the UICEE has extended for over eight years. Gdynia Maritime University and, more recently, its CMEE, were heavily involved in the staging of two

important meetings organised by the UICEE, namely: the 3<sup>rd</sup> *East-West Congress on Engineering Education*, under the title *Re-vitalising Academia/Industry Links*, held at the GMU between 15 and 20 September 1996, and the 5<sup>th</sup> *Baltic Region Seminar on Engineering Education*, held at the GMU, between 17 and 19 September 2001.

### **Centre for Education in Mechatronics (CEM)**

A *Centre for Education in Mechatronics (CEM)* was established at Silesian University of Technology (SUT), Gliwice, Poland, as a satellite centre of the UICEE, on 1 May 2002, based on the Memorandum of Agreement on Partnership signed on 14 January 2002. Prof. Krzysztof Kluszczyński has been appointed the Foundation Director of the CEM.

The activities of the Centre concentrate on the development of academic and research related activities in engineering education within the sphere of mechatronics engineering. Although in its infancy, the Centre has undertaken a wide range of academic activities, especially in publishing and the organisation of relevant national and international conferences.

### **South-East Asia Centre for Engineering & Technology Education (SEACETE)**

A *South-East Asia Centre for Engineering & Technology Education (SEACETE)* was established at the King Mongkut's University of Technology Thonburi (KMUTT), Bangkok, Thailand, as a satellite centre of the UICEE in 2002. The Memorandum of Agreement on Partnership between the KMUTT and the UICEE was signed on 13 March 2002.

The activities of the Centre will focus on the development of academic and research related activities in engineering and technology education and, where appropriate, will work together with the UICEE to further the globalisation of engineering and technology education.

The KMUTT is the principal co-sponsor and co-organiser of the 4<sup>th</sup> *Global Congress on Engineering Education*, to be held in Bangkok, between 5 and 9 July 2004, with the SEACETE playing an important role.

### **African Centre for Engineering & Technology Education (ACETE)**

An *African Centre for Engineering & Technology Education (ACETE)* has been established at the Kigali Institute of Science, Technology and Management (KIST), Kigali, Rwanda, under the Memorandum of Agreement signed between the KIST and the

UICEE on 4 July 2002. Prof. Silas Lwakamaba, Vice-Chancellor of the Institute, is the liaison person in relation to the UICEE.

The Centre focuses on academic and research activities related to the work on engineering and technology education, especially with regard to the transfer of information on engineering and technology education from developed countries to Central Africa, and Rwanda in particular. Specific attention is being given to the development of the Centre's capabilities in advancing technologies and business incubation, particularly concerning the advancement and reinforcement of capabilities in order to support modern information technologies' development in Rwanda and Central Africa.

### **Balkan Region Centre for Engineering Education (BRCEE)**

A *Balkan Region Centre for Engineering Education (BRCEE)* was established at the *Lucian Blaga University of Sibiu, Sibiu, Romania*, under the Memorandum of Agreement signed on 24 September 2002. Prof. Constantin Oprean, a Vice-Rector of the University, is the Foundation Director of the Centre.

This satellite centre places strong emphasis on academic and research activities related to the work on engineering and technology education within the UICEE Global Network of Engineering Education. In particular, the Centre's activities involve the transfer of information on engineering and technology education from developed countries to Romania and the Balkan Region. Special attention will be given to the development of effective strategies in the transfer of information on modern technologies, production processes and business ventures suitable for countries in political, social and economic transition.

The Centre was the organiser of the *2<sup>nd</sup> Balkan Region Conference on Engineering Education*, under the theme: *Bridges for Co-operation in Engineering Education*, which was held at the University between 16 and 19 September 2003. The Conference provided an excellent opportunity to inaugurate officially the BRCEE on 16 September 2003.

### **North Africa Centre for Engineering & Technology Education (NACETE)**

A *North Africa Centre for Engineering & Technology Education (NACETE)* has been established at the University of Sciences and Technology *Houari Boumediène, Algiers, Algeria*, under the Memorandum of Agreement signed on 24 September 2002. Prof. Khedidja Allia is the Foundation Director of the Centre.

The satellite Centre provides a focus for academic and research activities related to the work on engineering and technology education in the UICEE Global Network of Engineering Education, particularly on the transfer of information on engineering and technology education from developed countries to North Africa and Algeria. Special emphasis is being placed on the development of the Centre's capabilities in advancing technologies and business incubation, and in particular to advance and reinforce capabilities in order to support modern information technologies' development in Algeria and North Africa.

The Centre organised its *1<sup>st</sup> North African Region Seminar on Engineering and Technology Education*, which was held at the University between 23 and 25 September 2003. The outcome of the Seminar was a comprehensive set of recommendations developed by participants that concern engineering and technology education.

### **Gulf Centre for Engineering Education (GCEE)**

A *Gulf Centre for Engineering Education (GCEE)* has been established at the *Caledonian College of Engineering, Muscat, Sultanate of Oman*, under the Memorandum of Agreement signed on 24 September 2002. Prof. Frank McIntosh, Principal of the College, is the representative within the UICEE.

The satellite Centre will provide a focus for academic and research activities related to the work on engineering and technology education in the UICEE Global Network of Engineering Education, especially on the transfer of information on engineering and technology education from developed countries to Arab countries in the region.

It is envisaged that the Centre will collaborate strongly with the *Scottish Centre for Work Based Learning (SCWBL)*, based at Glasgow Caledonian University in Scotland, UK.

### **North-East Asia Centre for Technology and Vocational Education (NEACTVE)**

A *North-East Asia Centre for Technology and Vocational Education (NEACTVE)* has been established at the National Changhua University of Education (NCUE), Changhua, Taiwan, under the Memorandum of Agreement signed on 21 November 2002. Prof. David W.S. Tai, Dean of the College of Technology, is the Foundation Director of the Centre.

The satellite Centre is engaged in academic and research activities related to the work on the transfer

of information on new teaching and training methodologies to other countries, and to developing countries in particular. A special effort of the Centre will be to develop human resources in technology and vocational education for academia and industry on a worldwide basis.

The Centre has already undertaken a wide range of activities. For example, the *3<sup>rd</sup> Asia-Pacific Forum on Engineering and Technology Education* was staged by the UICEE at the NCUE in July 2001, with Prof. Tai and his team providing excellent support. Also, a special edition of the *Global Journal of Engineering Education*, Vol.5, No.2, under the title *Engineering and Technology Education at the National Changhua University of Education*, with Prof. Tai as Guest Editor, was published by the UICEE in 2002 [5].

Moreover, in their efforts, the *1<sup>st</sup> North-East Asia International Conference on Engineering and Technology Education* was organised by the NEACTVE, and was held at the NCUE, between 11 and 13 November 2003.

### **Centre for Cultures and Technologies in Asia (CCTA)**

A *Centre for Cultures and Technologies in Asia (CCTA)* has been established at Chinese Culture University, Taipei, Taiwan, under the Memorandum of Agreement signed on 22 November 2002. The agreement was facilitated by Prof. Fong-Ming (Franklin) Lee, Dean of the College of Engineering, who is the CCU representative within the UICEE.

It is envisaged that the Centre will focus on academic and research activities related to the work on indigenous cultures and technologies in Asia, and on how they impact on engineering and technology education. In particular, the Centre's activities will involve the transfer of information on cultures, engineering and technology education between the countries within Asia and the Pacific Rim.

### **Centre for Technical Teachers Training (CTTT)**

A *Centre for Technical Teachers Training (CTTT)* will be established at the Maharashtra State Board of Technical Education (MSBTE), Mumbai, India, under the Memorandum of Agreement signed on 30 January 2003. Mr Balwant P. Tale, Director of the MSBTE is the liaison person in relation to the Centre.

The Centre's brief is to focus on the development of education. This covers academic, research and technical teachers' training related activities in

engineering and technology within the sphere of the CTTT on a global scale.

### **Indian Centre for Engineering Education and Research (ICEER)**

An *Indian Centre for Engineering Education and Research (ICEER)* will be established at the Hyderabad (Sind) National Collegiate Board [H(S)NCB], Mumbai, India, under the Memorandum of Understanding signed on 30 January 2003. Prof. Kranti Kumar, Principal, Thadomal Shahani Engineering College, Mumbai, which is managed by the H(S)NCB, is the liaison person between the two organisations.

The Centre's main objectives will be to facilitate research, development and the transfer of information on engineering education methodologies, and in particular to promote and carry out research, development and education activities in the field of undergraduate engineering education.

### **Altai Centre for Environmental Engineering Education (ACEEE)**

An *Altai Centre for Environmental Engineering Education (ACEEE)* has been established at the Altai State Technical University (ASTU), Barnaul, Russia, under the Memorandum of Agreement signed between the ASTU and the UICEE on 4 February 2003. Prof. Oleg Khomoutov, 1<sup>st</sup> Vice-Rector of the University, has been appointed its Foundation Director.

The Centre's activities will involve research, development and the transfer of information on environmental engineering education. Special attention will be given to the development of effective strategies for environmental engineering education through the use of modern and advanced technologies, production processes and business ventures suitable for developing countries and countries in the economic transition.

Together with Tomsk Polytechnic University, Tomsk, Russia, the ASTU is the co-host of the *1<sup>st</sup> Euro-Asian International Conference on Ecological Aspects & Issues in Engineering Education*, under the title *Environmental Engineering Education in Siberia - Important Issues and Challenges*, to be held in Tomsk, between 7 and 8 June 2004, and in Barnaul, between 10 and 12 June 2004.

### **Centre for Engineering Education in Central America and the Caribbean (CEECAC)**

A *Centre for Engineering Education in Central America and the Caribbean (CEECAC)* will be set up in the Faculty of Engineering and Computing at the



University of Technology, Jamaica (UTJ), Kingston, Jamaica. This will be based on the Memorandum of Agreement on Partnership between the UTJ and the UICEE, which was signed on 23 February 2003. Prof. Rae A. Davis, President of the UTJ is the representative of the University within the UICEE.

It is envisaged that the activities of the Centre will involve the transfer of new teaching methodologies to other countries, and to developing countries in the region in particular. A specific objective of the satellite Centre will be to develop human resources in engineering and technology education suitable for developing countries on a worldwide basis.

### **Centre for Engineering Management and Agribusiness Education (CEMAE)**

A *Centre for Engineering Management and Agribusiness Education* (CEMAE), Częstochowa, Poland, will be established under the Memorandum of Understanding on Partnership between the Faculty of Management at the Technical University of Częstochowa (TUC) and the UICEE, which was signed on 25 September 2003.

The satellite Centre aims to be a national and international leader in the development of engineering, technology and agribusiness management education. In this role, the Centre will focus on research and development activities in this area of academic endeavour, and will transfer information on their achievements throughout the UICEE Global Network of Engineering Education.

Prof. Janusz Szopa, Dean of the Faculty, and Prof. Eugeniusz Gurgul, have been appointed Co-Directors of the CEMAЕ.

### **Centre for Information Technologies and Multimedia (CITM)**

A *Centre for Information Technologies and Multimedia* (CITM) will be established within the Maharashtra Academy of Engineering and Educational Research (MAEER), Pune, India, under the Memorandum of Agreement on Partnership between the MAEER and the UICEE, which was signed on 12 February 2004, during the 7<sup>th</sup> UICEE Annual Conference on Engineering Education, held in Mumbai. Prof. Vishwanath D. Karad, Executive President & Director General of the MAEER is the representative of the MAEER within the UICEE.

The Centre will be engaged in academic and research activities related to the work on engineering and technical education, especially in the area of information technologies and multimedia, and will

facilitate the transfer of information in this area of academic endeavour between developed and developing countries worldwide.

## **INTERNATIONAL CONTACTS**

Apart from its membership base, throughout its existence, the UICEE has established and maintained contacts with academic institutions and individual academics in over 180 countries in all corners of the world. A comprehensive database is constantly being maintained and expanded, consisting of academics particularly active in developing engineering education.

Also, the UICEE has vigorously pursued collaboration on academic and research related activities with academic organisations on a worldwide basis. The objective of this activity is to build a worldwide network of education institutions interested in developing engineering education. It should be mentioned that several new contacts have recently been established. Such contacts may lead to future memberships within the UICEE.

### **Scope of Collaboration**

The scope of such collaboration is to cover a broad range of engineering education research and development activities. The activities are:

- Training programmes, including degree and non-degree programmes.
- Research collaboration in areas of mutual interest to both parties - particularly regarding software development for engineering education.
- Exchange of scholars in the course of academic development.
- Exchange of academic material, which is made available to both organisations. Other sources, such as computer-based and printed materials, when available, are to be included in the exchange.
- Sponsorship of cooperative seminars, workshops and other meetings on matters of mutual interest.
- Establishment of a number of regional groups (sub-centres) for engineering education, linked with the UICEE.

### **UNESCO-UNITWIN Network**

In the early 1990s, the Australian Vice-Chancellor's Committee (AVCC) initiated the process of establishing a UNESCO-UNITWIN multilateral network of higher education institutions in the Asia-Pacific region. When Monash University made a decision to set up the then UNESCO Supported International Centre for

Engineering Education (USICEE) in September 1993, the leaders of the USICEE were invited by the AVCC to take part in a meeting convened at the AVCC Headquarters in Canberra, which had the objective to discuss the possibility of establishing such a network. As a result, the Asia-Pacific Higher Education Network (APHEN) was established in 1993, with eight priority areas identified, including engineering education. Then, a further resolution of the meeting was to establish APHEN sub-networks within each priority area in order to strengthen the exchange and transfer of information on new developments within the field [6].

In early 1994, an APHEN-EE (APHEN - Engineering Education) sub-network (APHEN-EE) was created within the then USICEE at Monash University, which currently has over 500 local and overseas contacts.

#### *Goals and Objectives of the APHEN-EE*

The following specific goals and objectives of the APHEN-EE sub-network were identified and formulated:

- Establish and maintain a database of engineering schools in academic institutions and of individual academics particularly interested in engineering education in Asia and the Pacific region;
- Set up an electronic means of communication between the identified partners;
- Facilitate contacts between member institutions of the sub-network;
- Collect and transfer information on research and development activities in engineering education;
- Facilitate the exchange of staff and students between partner institutions;
- Carry out joint research and development projects on engineering education;
- Organise courses, meetings, symposia and conferences on topics relevant to the activities of the UNITWIN sub-network;
- Publish and distribute material relevant to the activities of the UNITWIN sub-network;
- Initiate and prepare joint applications for grants from various national and international agencies;
- Encourage the establishment of a number of national sub-centres to be linked in the UNITWIN sub-network.

Although the UICEE has never been provided with any funding to conduct such activities within the APHEN-EE sub-network, it has held three successful meetings for the sub-network:

- The 1<sup>st</sup> Asia-Pacific Forum on Engineering and Technology Education was held at Monash University, Melbourne, Australia, between 6 and 9 July 1997 (78 papers);
- The 2<sup>nd</sup> Asia-Pacific Forum on Engineering and Technology Education was held at the University of Sydney, Sydney, Australia, between 4 and 7 July 1999 (78 papers);
- The 3<sup>rd</sup> Asia-Pacific Forum on Engineering and Technology Education was held at the National Changhua University of Education, Changhua, Taiwan, between 8 and 11 July 2001 (46 papers);
- The 4<sup>th</sup> Asia-Pacific Forum on Engineering and Technology Education was to be held in Bangkok, Thailand, between 16 and 19 July 2003, but was cancelled due to the SARS epidemic.

It should be mentioned that, despite the fact that the activities of the APHEN have slowed down due to the Asian economic crisis in the late 1990s, the UICEE has continuously pursued its work within the APHEN-EE sub-network. Moreover, despite the cancellation of the Forum in July 2003, the UICEE intends to carry out some activities, including the organisation of the 4<sup>th</sup> Asia-Pacific Forum, planned for July 2005, with the venue yet to be determined.

#### **International Liaison Group for Engineering Education (ILG-EE)**

The International Liaison Group for Engineering Education (ILG-EE) was established during the 2<sup>nd</sup> World Conference on Engineering Education, which was held at the University of Sydney, Sydney, Australia, in February 1989. It is an autonomous group that is registered as a charity organisation in the United Kingdom.

The ILG-EE has its Secretariat in the UICEE, with the Chairman of the UICEE Academic Advisory Committee as its Chairman, and the UICEE Director as its Foundation Secretary. The UICEE Chairman and the Director are both trustees of the ILG-EE.

The ILG-EE has been involved in engineering education and industrial training on a global scale. The main objectives of the ILG-EE are as follows:

- Promote the exchange of information and facilitate scientific cooperation among national institutions and programmes of common interest;
- Propose and coordinate the organisation of

meetings in the field, in particular, international conferences and workshops;

- Identify problems of practical interest and stimulate the coordination of research and development efforts;
- Assist members and sponsoring organisations in carrying out activities considered relevant to their programmes;
- Serve as a means of disseminating information on progress to members and member countries and other organisations.

In its earlier stages of existence, the ILG-EE was the sponsor and organiser of three extremely successful *World Conferences on Engineering Education*, that is in Sydney, in February 1989, in Portsmouth in September 1992, and in Minneapolis/St Paul, which was held in October 1995.

Since its inception, the ILG-EE has been organising its *Annual General Meetings*. The *15<sup>th</sup> Annual General Meeting of the ILG-EE* was prepared and carried out in conjunction with the *3<sup>rd</sup> Global Congress on Engineering Education*, held in Glasgow, Scotland, UK, in July 2002. The *16<sup>th</sup> Annual General Meeting* was scheduled to be carried out in conjunction with the *4<sup>th</sup> Asia-Pacific Forum on Engineering and Technology Education*, in Bangkok, Thailand, but was cancelled due to the SARS epidemic. It is envisaged that it will be run in conjunction with the *4<sup>th</sup> Global Congress on Engineering Education*, to be held in Bangkok, Thailand in July 2004 [7].

### UICEE Polish Network

With the growing number of UICEE member institutions in Poland, including three Partners, namely: Silesian University of Technology (SUT), Gliwice; Gdynia Maritime University (GMU), Gdynia; and the Technical University of Częstochowa, Częstochowa, a decision was made in October 2003 to create a *UICEE Polish Network* (UPN). The paramount objectives of this network are to establish collaborative ventures between the Polish members, to coordinate existing activities, and to recruit more members to the UICEE, among other targets.

Prof. Bolesław Pochopień, the former Rector of the SUT, has kindly accepted the position of the Coordinator of the Network, with Prof. Stanisław Mitkowski, Head of the Department of Electrotechnics at the University of Mining & Metallurgy, Kraków, Poland, to act as the Co-coordinator.

It is envisaged that other UICEE national networks will be established in countries where the UICEE has a significant number of institutional members.

### RESEARCH PROGRAMMES AND ACTIVITIES

The UICEE has undertaken a number of research and developmental projects in engineering education. The following projects and research activities have been accomplished, or are presently underway:

- A survey of industry views on important issues concerning engineering education and industrial training;
- Research into the nature and effectiveness of international engineering curricula and the development of a global engineering education curriculum;
- The development of a global electronic database of research activities and academics involved in research into engineering education;
- The investigation of the status and quality of environmental engineering education;
- Electronic publishing;
- A UICEE Urban Design and Education Programme (UICEE/UDEP);
- The development of Graduate Courses in Engineering Education (GCEE);
- The design and investigation of the effectiveness of computer-based comprehensive self-study procedures in basic electrical engineering;
- English as a *lingua franca* for intercultural business communication; investigations into the nature of business communication between at least two non-native speakers and the cultural influences on the negotiation process;
- Investigations into the development of English and communication skills for the modern engineer;
- A new pedagogy for intelligent computer-assisted learning systems in engineering education.

The ten years of operation of the UICEE has seen a vigorous pursuit of research and development activities for the benefit of the national and international engineering education communities. Many local and international engineering academics, especially those from UICEE Partner institutions, are actively involved in the activities of the Centre. Limited financial resources are the only serious impediment to the rapid expansion of the UICEE's research base and programmes. A few key activities are elaborated on in this chapter.

### UNESCO Course

A training course for academic teachers on *The Application of Computer-Assisted Training Programs*

in *Engineering Education*, sponsored by UNESCO, has been developed and implemented by the UICEE. The objective of this course is to develop or enhance the understanding of young engineering academics of the role of computers in engineering education. The course consists of ten units, which are largely stand-alone.

Twelve academics from countries in South-East Asia and the Pacific region were invited to participate in the course, which was carried out, for the first time, in November 1994.

In 1995, work was carried out on a comprehensive course teaching manual for academic teachers. This manual was published in book form in 1996 with the sponsorship of UNESCO [8].

The UICEE was awarded financial assistance to offer this course to young engineering academics from South-East Asia and the Pacific in July 1997. The course structure, units and duration of the training are shown in Table 1. A number of academic institutions worldwide have expressed their interest in running this course in their institutions in collaboration with the UICEE. Also, the UICEE has encouraged the former trainees to organise and conduct this course in their home countries with, unfortunately, no success.

### Electronic Publishing

The Monash University Library, the UICEE and the Unit of Medical Informatics at Monash University received a grant in 1995 to research the possibility of establishing an electronic journal. The journal was to be distributed worldwide through a global electronic network, such as the Internet. The *Australasian Journal of Engineering Education* (AJEE), then

edited by the UICEE Director, and published by the UICEE, was identified and selected as the most suitable journal published at Monash University to be made available electronically [9].

It should be mentioned that the AJEE was the world's first and only journal on engineering education fully available via the Internet, commencing in the middle of 1995. Comprehensive research was then initiated, concerning the efficiency of the use of this medium for the electronic publication of technical journals and other materials, which provided the opportunity to gain considerable experience in using this medium in engineering education, notably when using the Internet.

Several other UICEE publications have been prepared in electronic form and are presently available through the Internet, including the UICEE's two journals and its Newsletter. The *Global Journal of Engineering Education* (GJEE), in its electronic form, has been available on the Internet since its foundation in April 1997, as is the *UICEE Newsletter*. It should be pointed out that the GJEE is the world's only journal of engineering education fully available on the Internet free of charge. More recently, the UICEE's *World Transactions on Engineering and Technology Education* (WTE&TE) has a comprehensive site on the Internet, which includes abstracts of the articles published in the journal.

### Research Unit on Cultures and Technologies in Asia (RUCA)

The UICEE, in a joint application with the Monash Asia Institute (MAI) at Monash University, Melbourne, Australia, was successful in receiving a Monash Special Research Fund grant (MSRF) of \$A90,000

Table 1: Structure of the training course.

|    | Day 1  | Day 2   | Day 3  | Day 4  | Day 5  |
|----|--|---|--|--|--|
|    | Principles   | Authoring   | Multimedia & Testing                               | Mathematics & Graphics                       | The Internet & Emerging Trends   |
| AM | Principles of the teaching and learning process                                      | Authoring tools<br>Hardware and software requirements | Hypermedia in a Problem-Based Learning environment | Mathematics packages in teaching engineering | Using the Internet<br>The electronic library                                     |
| PM | Roles for the computer in the learning process<br>Principles of instructional design | A multimedia authoring tool                           | Computer-managed testing                           | Computer tools to aid visualisation          | Trends: Expert Systems and Intelligent tutoring systems<br>Review and evaluation |

for 2002. This facilitated the establishment of interfaculty research activities and the setting up of a *Research Unit on Cultures and Technologies in Asia* (RUCTA). It is anticipated that a series of publications on research into the impact of new cultures and technologies on countries in the Asia-Pacific region will emerge from this activity in the near future.

Prof. Marika Vicziany, Director of the Monash Asia Institute and a close associate of the UICEE, was instrumental in preparing the successful application. Work is underway on the preparation of applications to other relevant granting bodies for financial assistance in order to sustain the operation of the new Unit.

RUCTA brings together expertise on Asia in five Faculties of Monash University: Arts, Business and Economics, Engineering, Law and Information Technology. Having secured seed funding from the Monash Special Research Fund, RUCTA aims to establish itself as an independent research group. Drawing on their global networks and partnerships, including FAO, UNESCO, various think-tanks and international companies, the MAI and UICEE have agreed to work together for their mutual benefit and, even more importantly, the benefit of others in this joint research initiative. Cross-faculty collaboration is realised with the involvement of six research centres located within the Monash Asia Institute, plus seven others, including the UICEE. Prof. Marika A. Vicziany, MAI Director, is the Coordinator of the RUCTA [10].

### **Urban Design and Education Programme (UDEP)**

An Urban Design and Education Programme (UDEP) was carried out between 1999 and 2001 as a joint venture between the UICEE and the Department of Infrastructure of the State Government of Victoria, Australia, which provided funding for this programme [11]. This project can be seen as an extension of the UICEE's involvement in sustainable development and environmental engineering education.

The UDEP's prime objective was to serve the international urban design profession by undertaking research, providing expertise in, and improving the quality of urban design education and practice, thereby promoting a sustainable approach to urban design, as well as to develop a better understanding of global issues in architecture, engineering, urban design and planning, with particular emphasis on their relevance to the State of Victoria. The key objectives of the programme were:

- Improvement of urban design skills;

- Development of innovative urban design processes and tools;
- Enhancement of public awareness of urban design issues and opportunities.

The programme consisted of five stand-alone projects, which were to address issues of critical importance and develop tools relevant to the project's objectives. The UDEP projects included:

- Design Assessment Criteria and Methods for Outcome Oriented Planning;
- Design Mediation and Community Consultation;
- Urban Design Tools;
- International Urban Design Fellowship Programme;
- Urban Design Training Courses.

The projects were formulated after comprehensive discussions within the Department of Infrastructure to meet various local challenges, while using Australian development models as a starting point for potential global action.

A wide range of research and development activities, the running of courses, the staging of public and professional fora, the production of publications and the transfer of information activities were carried out in the projects, and the results were subsequently included in the projects' reports. Some of the outcomes included the following:

- Establishment of design assessment criteria and objectives in planning;
- Development of options for design assessment processes;
- Formulation of appropriate design mediation processes for the new planning system;
- A set of important proposals in relation to several established, as well as contemplated, urban design techniques;
- Conduct of various activities, such as public fora, media debate and interviews, conferences and seminars, design workshops, lectures, design studios, supported by top professional international visitors;
- Development and conduct of two urban design training courses for executives and practitioners.

Urban design is, at times, in conflict with engineering practice. The UDEP helped to address these issues through the international exchange of ideas and professionals as one of its key objectives. This supported and informed public and professional debate on the urban design of cities and provided

examples of best international practice in this field. Furthermore, the UDEP's Visiting Fellows Programme contributed directly to this benchmarking process.

The UDEP programme was an initiative of Mr Andrew Olszewski, a leading Victorian architect and urban designer, who provided the leadership and execution of the project as the UDEP Programme Director. Unfortunately, due to declining funds, the operations of the UDEP had to be terminated at the end of 2001, despite its successful history and a positive impact. However, it was the most substantial project run by the UICEE thus far.

### **Graduate Courses in Engineering Education (GCEE)**

In June 1999, at the request of the then UNESCO International Committee on Engineering Education (ICEE), the UICEE developed curricula of a range of graduate courses in engineering education with the objective of facilitating academic teaching staff development.

Interest in this area has grown considerably due to the pressures brought about by the recent influx of new technologies, particularly multimedia and the Internet, among other elements. The situation is now critical for engineering education and is particularly relevant as many universities now seek to establish and implement staff development programmes in engineering education.

The concept of the university as a research organisation has created a situation in which academic institutions are the only education establishments that allow their teaching personnel to undertake educational activities without any formal teaching qualification and preparation. It is unthinkable that other professions would permit unqualified individuals to practice.

An invitation was initially circulated via the Internet in July 1999, resulting in a two-day workshop concerning the programmes in early February 2000, prior to the 3<sup>rd</sup> UICEE Annual Conference on Engineering Education held in Hobart, Australia, with over 30 international academics attending. The interest shown, and the attendance at the workshop, have been remarkable. The objective of the courses is to provide the many professional engineers who are involved with engineering education and industrial training with an important additional qualification [12].

Another meeting of developers of the Graduate Courses in Engineering Education was held in conjunction with the 2<sup>nd</sup> Global Congress on Engineering Education, held in Wismar in July 2000, with several developers attending. Unfortunately, not all of the developers were able to attend the meeting and,

therefore, several subjects have not been looked at and discussed. However, two or three subjects have demonstrated progress, particularly with regard to GCEE07: *Educational Technology & Computers in Engineering Education*, by the then Ryerson Centre for Engineering Education. This particular subject was at the forefront of the whole development with the target of making it available on the Web by October 2001.

At the third meeting of the developers held in conjunction with the 4<sup>th</sup> UICEE Annual Conference on Engineering Education, which was held in Bangkok in February 2001, it became apparent that no further development was possible without substantial external financial support, being in the vicinity of \$A500,000. Potential sources of funding were discussed without any firm resolution.

In early October 2002, on the invitation of the then Dean of Engineering at Monash University, Prof. Michael L. Brisk, the UICEE Director submitted a comprehensive proposal to the office of the Dean to be considered for financial support coming from the Faculty. One of the potential sources of funding was the Faculty Foundation, which considered the proposal. However, with the earlier than anticipated retirement of Prof. Brisk, the application has never come back to the agenda of the Foundation Board. Unfortunately, no further progress can be reported concerning this development.

### **Postgraduate Research Activities**

The UICEE gives particular attention to the development of human resources in engineering and technology education. To this end, it has established its postgraduate programme in engineering education for the benefit of the local and international engineering communities.

In the programme, particular emphasis is being placed on research into human aspects of engineering, engineering pedagogy, training methodologies in engineering, educational technology, multimedia and computer-aided engineering education.

#### *UICEE Scholarships in Engineering Education*

The UICEE has established *UICEE Scholarships in Engineering Education*. The purpose of this research scholarship system is to provide financial assistance to those willing to conduct research in engineering and technology education.

The objective of such scholarships is to lead to the award the degree of Master of Engineering Science or Doctor of Philosophy (PhD) by research.

Between 2001 and 2003, the UICEE offered one scholarship to support a postgraduate research projects leading to the award of the degree of Master of Engineering Science (MESc) by research, and Mr Arun S. Patil of the UICEE was the recipient of this scholarship.

Mr Patil's project concerned the design and investigation of the effectiveness of a hypermedia knowledge base for comprehensive self-study procedures in electrical engineering education. However, due to the unexpected complexity of the project, about midway in his candidacy, it was decided that the candidate would concentrate only on certain aspects of the research and development carried out. A thesis, entitled *Issues in the design and development of Web-based computer-assisted tutorial and laboratory procedures in Basic Electrical Engineering*, was submitted in October 2003, and the degree of MESc was awarded in February 2004.

#### *UICEE Women in Engineering Education Scheme*

Recognising the under-representation of women on the academic staff of engineering faculties worldwide, the UICEE has established a scholarship scheme to counter this. The *UICEE Women in Engineering Education Scheme* is offering research scholarships in engineering education leading to the award of the degree of Master of Engineering Science by research, in the first instance. The possibility also exists to continue exceptional research projects, leading to the award of the degree of Doctor of Philosophy.

Between mid-1997 and mid-2000, the UICEE offered one scholarship under this scheme to Ms Duyen Q. Nguyen of the UICEE. Her project concerned an investigation of the inclusion of environmental engineering and sustainable development issues and topics in general engineering education curricula. The completion of the project, and the accomplishment of a research thesis, titled: *An analysis of the inclusion of sustainability and environmental issue in engineering education*, led to the award of the degree of Master of Engineering Science (MESc) by research in June 2000.

Also, Ms D.Q. Nguyen was the recipient of a prestigious Australian Postgraduate Research Award (APRA), between 2001 and 2003. This scholarship supported her postgraduate research project towards the award of a PhD by research for three years. Presently, in the last year of her candidacy, she is again the recipient a scholarship under the *UICEE Women in Engineering Education Scheme*.

#### *UICEE External Higher Degree Programme in Engineering Education*

In 2001, the UICEE established a *UICEE External Higher Degree Programme in Engineering Education* to provide international colleagues with the opportunity for their personal development by undertaking research projects leading to the award of a higher degree.

Presently, the UICEE conducts two postgraduate research projects leading to the award of a Master of Engineering Science (Research). The following persons are external candidates under this scheme:

- Mr Detlev E. Jansen (Germany)
- Mr Paul Wilson (New Zealand)

The first project's objective is to research the use of the English language as *lingua franca* for business negotiations in the field of engineering. The candidate is carrying out investigations into the nature of business communication in non-native/non-native speaker discourse and the cultural influences on the negotiation process. This project is being run in collaboration with the Department of Mechanical Engineering at Monash University, with A/Prof. Ian Marshall acting as the associate supervisor.

The second project is concerned with research into a new pedagogy for computer-assisted learning systems in engineering education. It is a joint venture between the UICEE and the Monash School of Business Systems at the Faculty of Information Technology, with joint supervision by the UICEE Director and Dr Peter Lawrence of the School.

#### *Part-time Postgraduate Studies by Research*

In 2003, the UICEE, in conjunction with the Monash Asia Institute (MAI), under the Directorship of Prof. Marika A. Vicziany, established another research project, which is being carried out on a part-time basis. The main thrust is the investigation of the development of English and communication skills for the modern engineer within a cultural context. The candidate under this scheme is Mr Marc J. Riemer of the UICEE.

Mr Riemer commenced his postgraduate studies on a part-time basis at the MAI in July 2003 with the UICEE Director as the main supervisor and Prof. M.A. Vicziany as the associate supervisor. It is envisaged that this part-time candidacy will lead to the award of the degree of Master of Arts at Monash University.

## General Issues

The UICEE would definitely like to expand its post-graduate activities. However, one of the obstacles is the fact that potential candidates, without a permanent residency status in Australia, are required to pay an annual tuition fee of close to \$18,000. About the same amount of money would be needed to cover very modest living expenses. Potential full-time candidates with a permanent residency, on the other hand, would expect the level of the scholarship to be at least similar to the salaries offered by industry to fresh graduates, which is not the case as the allowed awards are substantially lower.

There is a growing concern in Australian academia about the diminishing interest of young graduates to pursue research as a career path. However, no satisfactory national system of support of higher degree programmes by research has been put in place, as the existing APRA system does not provide adequate level of support and many excellent potential candidates are being turned away every year due to a lack of money.

As a partial remedy, many departments have offered financial support to potential postgraduate students as so-called *departmental scholarships*, which basically originated from external earnings. However, with the introduction of the new Strategic Cost Management (SCM) system, more external funding will be needed to complement the growing cost of basic statutory activities. As a consequence, fewer funds will be available to support such scholarship schemes, and this will lead to an even further erosion of postgraduate research activities. This is, unfortunately, the case with the UICEE. So far, the UICEE has diverted a substantial part of its revenue to support such scholarships and living expenses but this will not be possible under the new financial regime.

## ACADEMIC COMMUNICATIONS

The UICEE places particular emphasis on the dissemination of information concerning engineering and technology education, and its activities in particular.

Since its inception, the UICEE has published a large number of resource materials, including books, journals, conference proceedings, newsletters and other publications, and has continued to supply them to UICEE members, libraries and individuals on a worldwide basis. In the period from 1994-1996, the UICEE supplied books, conference proceedings, journals and other material on engineering education to libraries at technical universities in 11 countries of Central and Eastern Europe, under the Australian

Programme of Training for Eurasia (APTEA). However, the Federal Government axed this entire Programme in late 1996.

Electronic communication using the Internet is a new, and extremely powerful medium. Several existing ventures have been maintained and new initiatives, involving the use of the electronic medium, have been instigated.

### The UICEE Newsletter

The UICEE has established its own Newsletter, which is widely distributed to UICEE members and, on a worldwide basis, to those on the relevant databases, and to visitors to the Centre.

Three issues of the *UICEE Newsletter* are being published and circulated in March, July and November of each year, not only in hard copy, but also electronically via the Internet.

### Electronic Mailing Lists

Since its inception, in order to facilitate the transfer of information throughout the national and international engineering education communities and, in particular, to disseminate information on the work of research interest groups, the UICEE has established several electronic mailing lists. These included the following groups:

- UICEE: the Centre's Newsletter.
- CBLG: Computer-Based Learning Group.
- PBL-LIST: Problem-Based Learning.
- APHEN-EE: Asia-Pacific Higher Education Sub-Network on Engineering Education.
- MATHCAD: Use of the *MathCAD* program.

However, due to the lack of interest in this method of communication (!), the Centre has reduced the number of mailing list to the following:

- UICEE: the Centre's Newsletter.
- APHEN-EE: Asia-Pacific Higher Education Sub-Network on Engineering Education.

### World Wide Web Site

Since the early existence of the Internet, the UICEE has continued the publication of its homepage, which presents a wide range of activities, as well as UICEE publications. It is an excellent way to introduce other engineering educators to the Centre, and its work is to broadcast the Centre's Internet address. Feedback concerning the usefulness of information has been encouraging. Ms Duyen Q. Nguyen and Mr John D.



Zakis have continuously maintained the homepage throughout 2003. The Web site can be accessed using any of the World Wide Web browsers at:  
<http://www.eng.monash.edu.au/uicee/>

A comprehensive listing of UICEE publications that are available for purchase by libraries and individuals can also be found through the Centre's homepage at the following address: <http://www.eng.monash.edu.au/uicee/publicat/publicat.htm>

### Annual Reports

Since the beginning of its existence, the UICEE has been producing a *UICEE Annual Report*, giving comprehensive information on the year's activities and achievements. The Report is usually published in February the next year and is placed on the Internet.

Copies of the Annual Report, as well as other reports undertaken by the UICEE, are available at the following Internet address: <http://www.eng.monash.edu.au/uicee/reports/reports.htm>

### Monash Engineering Education Series

The establishment of the *Monash Engineering Education Series* in 1995 began a new stage in the activities of the UICEE. It added a further dimension to Australian and international engineering education by creating a source of information on research and development activities in engineering and technology education.

The establishment of this series follows from the Centre's mission to stimulate research and development activities in engineering education and to facilitate the transfer of information, expertise and research results in this field. The series is open to all academics involved in engineering education research and seeks to promote a dialogue between engineering educators worldwide.

Close to 20 works, including books and conference proceedings have been published in this series. The most notable publications include the following:

- *Computers in Electrical Engineering Education - Research, Development and Application*, by Z.J. Pudlowski, et al, 165p (1995).
- *1995 International Congress of Engineering Deans and Industry Leaders* (Congress Proceedings), edited by Z.J. Pudlowski and P.LeP. Darvall, 683p (1995).
- *The Application of Computer-Assisted Training Programs in Engineering Education*, edited by Z.J. Pudlowski and R.G. Hadgraft, 224p (1996).

- *ALLTED - A Computer-Aided Engineering System for Electronic Circuit Design*, by A.I. Petrenko, V.V. Ladogubets, V.V. Tchkalov and Z.J. Pudlowski, 205p (1997).

It should be mentioned that the ALLTED book was a collaborative venture with engineering academics from the Ukraine.

The complete list of publications can be found at the following UICEE Internet address: <http://www.eng.monash.edu.au/uicee/publications/index.html>

### Global Journal of Engineering Education

The UICEE's internationally focused engineering education journal is titled the *Global Journal of Engineering Education* (GJEE). Although it was intended to publish nominally two issues per annum, the GJEE has been published in three issues per year as regular and special issues, as well as special editions. For example, a special edition that focused on *Engineering and Technology Education at the National Changhua University of Education* was published in 2001 as Vol.5, No.2, with Prof. David W.S. Tai of National Changhua University of Education, Changhua, Taiwan, as Guest Editor. Also, another special edition titled: *Engineering Education in Denmark*, which presented papers from across Denmark, was published in 2002, as Vol.6, No.1, with Prof. Finn Kjærdsdam and Prof. Flemming K. Fink, both of Aalborg University, Aalborg, Denmark, as Guest Editors.

Since 2000, one issue of the GJEE per annum has been published in the German language with Prof. Norbert Grünwald, Rector of Hochschule Wismar, Wismar, Germany, being Guest Editor of those issues. So far, the issues have centred on the *German Network of Engineering Education*. Published entirely in the German language, it demonstrates the Centre's commitment to diverse dissemination of information to overcome international borders generated by different languages. Such a publication targets engineers and educators for whom German may be the first or second language. Such a strategy empowers those whose English skills may not be so strong, and reinforces the international nature of engineering education in the UICEE's global community. German remains one of the dominant languages internationally and, as such, does not confine itself to one nation with regard to its impact. Indeed, to maintain relevance to the international globalised community, a monolingual culture must be overcome so that other languages, cultures and perspectives may be considered.

Importantly, the Journal is also fully available on the Internet (with a delay of one issue so as to advantage subscribers). This elevates international access to the diverse range and strengths of this engineering education Journal for all peoples and academics the world over [13].

### **World Transactions on Engineering and Technology Education**

In 2002, the UICEE established a new journal called the *World Transactions on Engineering and Technology Education*, which seeks to fill the gap between conference papers and journal articles. This publishes high quality international papers on engineering and technology education, thereby facilitating the transfer of information, expertise and research and development on engineering education and thus realising the UICEE's mission.

The World Transactions contributes to the publication of engineering education papers globally, essential for academic life and the continued growth and evolution in knowledge and understanding. High quality is being maintained through strict peer referee evaluations by distinguished academics, language correction, editing, as well as standard formatting, as with all UICEE publications.

The inaugural issue of the World Transactions was released in early 2002. The first volume consisted of two issues, which included 52 articles that spanned 276 pages. The second volume included three issues, with 94 articles and 466 pages. Both volumes covered a diverse range of topics connected to, and focused on, engineering education, and have seen participation from contributors from all around the world, emphasising the international nature of this new journal that is not restricted by country or region.

Potential contributors can find more information concerning the *World Transactions on Engineering and Technology Education* at the following Internet address: <http://www.eng.monash.edu.au/uicee/worldtransactions/wtete.html>

### **UICEE'S INVOLVEMENT IN CONFERENCES AND MEETINGS**

In recognition that international cooperative networks are effectively developed through direct contact between individuals, a central tenet of the UICEE's mission is to coordinate, promote and support national, regional and international conferences and meetings.

The paramount objective of this activity is to raise the national and international profile of the UICEE as an organisation fully committed to the progress of

engineering education and to generate opportunities for the exchange of information on engineering education.

Since its inception, the UICEE has organised and co-sponsored many local and international conferences and meetings. Several extremely successful conferences were organised in the early life of the UICEE, with the most notable being:

- *1995 International Congress of Engineering Deans and Industry Leaders* (Melbourne, Australia, 3-6 July 1995);
- *3<sup>rd</sup> East-West Congress on Engineering Education* (Gdynia, Poland, 15-20 September 1996).

In 1997, a decision was made to establish several streams of the conferences and meetings to be organised by the UICEE. The most important of them was the establishment of the *Global Congress on Engineering Education*, as a so-called *flagship* conference activity of the UICEE. The first Congress was held at the University of Mining & Metallurgy in Kraków, Poland, between 6 and 11 September 1998. The Congress incorporated three significant international meetings of engineering educators, which were organised earlier by the then Electrical Engineering Education Research Group (EEERG) based at the University of Sydney between 1988-2003 under the Directorship of Z.J. Pudlowski, and later by the USICEE and the UICEE:

- *5<sup>th</sup> World Conference on Engineering Education*;
- *4<sup>th</sup> East-West Congress on Engineering Education*;
- *1998 Congress of Engineering Deans and Industry Leaders*.

A number of regional conferences on engineering and technology education were organised as a forerunner to the *1<sup>st</sup> Global Congress on Engineering Education*. This series of conferences had the objective to promote engineering education among the international community, to address prevailing problems and issues falling within the compass of engineering and technology education and, more broadly, to raise the profile of engineering and technology education in individual regions. Emphasis in these initiatives was placed on Africa, Central and South America, the Middle East, the Asia-Pacific and countries of the former socialist bloc.

Since 1997, the UICEE has been strongly involved in the organisation of local and international conferences and meetings on engineering education. Apart from

the organisation of some one-off conferences, the UICEE has developed four significant series of conferences, namely:

- *Global Congress on Engineering Education* (Kraków, 1998; Wismar, 2000; Glasgow, 2002; planned Bangkok, 2004).
- *UICEE Annual Conference on Engineering Education* (Melbourne, 1998; Auckland, 1999; Hobart, 2000; Bangkok, 2001; Chennai, 2002; Cairns, 2003; Mumbai, 2004; planned Hong Kong, 2005).
- *Asia-Pacific Forum on Engineering & Technology Education* (Melbourne, 1997; Sydney, 1999; Changhua, 2001; Bangkok, 2003 – cancelled due to SARS, planned Bangkok, 2005).
- *Baltic Region Seminar on Engineering Education* (Vilnius, 1997; Riga, 1998; Göteborg, 1999; Copenhagen, 2000; Gdynia, 2001; Wismar, 2002; St Petersburg, 2003; planned Kaunas, 2004).

The objective of these conferences and meetings has been to endeavour to build up links among international engineering educators; to air and discuss important issues, problems and challenges faced by engineering and technology education; to attract more engineering educators to the cause of engineering education, and to bring them closer to the UICEE.

Since 2003, also the UICEE Partner institutions began organising regional international conferences in order to promote their UICEE satellite centres and attract potential collaborators. There have been three such conferences organised in the later part of 2003, namely:

- *2<sup>nd</sup> Balkan Region Conference on Engineering Education*, held at *Lucian Blaga University of Sibiu*, Sibiu, Romania, between 16 and 19 September 2003.
- *1<sup>st</sup> North African Regional Seminar on Engineering and Technology Education*, held at the *University of Science and Technology Houari Boumediene*, Algiers, Algeria, between 23 and 25 September 2003.
- *1<sup>st</sup> North-East Asia Conference on Engineering and Technology Education*, held at the *National Changhua University of Education (NCUE)*, Changhua, Taiwan, between 10 and 13 November 2003.

Several other conferences, to be organised by the UICEE Partner institutions in various locations, are planned for 2004 and beyond.

## RESEARCH PUBLICATIONS

The UICEE staff and postgraduate students pay particular attention to the dissemination of information concerning their research work and academic achievements. Over the period of 10 years, a large number of research publications authored, co-authored and edited has been published in the UICEE or externally. Table 2 shows the UICEE's research publications, including the so-called Research Quantum score, which is one of the important measures used by Australian academia in the assessment of research output.

### UICEE Earnings

During the entire period of its successful operation,

Table 2: UICEE's research publications in the period from 1994 to 2003.

|       | Books | Book Chapters | Publication as Editor | Journal Papers | Conference Papers | Reports | Research Quantum Points |
|-------|-------|---------------|-----------------------|----------------|-------------------|---------|-------------------------|
| 1994  |       |               | 2                     | 8              | 12                | 2       | 16.07                   |
| 1995  |       | 8             | 5                     | 4              | 13                | 2       | 21.13                   |
| 1996  |       | 2             | 5                     | 4              | 14                | 1       | 17.05                   |
| 1997  | 1     |               | 2                     | 7              | 9                 | 2       | 15.70                   |
| 1998  |       |               | 4                     | 6              | 19                | 1       | 20.40                   |
| 1999  |       |               | 4                     | 6              | 14                | 1       | 18.66                   |
| 2000  |       |               | 4                     | 6              | 21                | 1       | 22.03                   |
| 2001  |       |               | 5                     | 1              | 20                | 1       | 15.91                   |
| 2002  |       |               | 5                     | 9              | 16                | 1       | 23.40                   |
| 2003  |       |               | 4                     | 9              | 12                | 1       | 22.23                   |
| Total | 1     | 10            | 40                    | 60             | 150               | 13      | 192.58                  |

the UICEE has concentrated its effort on the expansion of its research, development and publication activities. Numerous grant applications have been prepared to various funding bodies and agencies for financial support with a modest success rate.

Since the opening up of the Centre to other institutions in 1997, membership fees have also formed a substantial part of the UICEE earnings. Moreover, external activities, such as conferences and publications, have also generated substantial annual revenue for the UICEE.

All of these earnings have been used to support UICEE activities, the employment of UICEE staff, the sponsorship of postgraduate scholarships, etc.

Table 3 shows the level of earnings of the UICEE for the period from 1994 to 2003. Altogether, the UICEE was able to raise close to 3 million Australian dollars, which can be regarded as an enormous effort and demonstrates a huge success of a small centre, which has been operating in a very difficult academic environment and tough economic conditions.

Table 3: The UICEE's revenue for the period from 1994 to 2003.

| Year   | Revenue (\$A) |
|--------|---------------|
| 1994   | 118,000       |
| 1995   | 200,000       |
| 1996   | 170,000       |
| 1997   | 225,000       |
| 1998   | 200,000       |
| 1999   | 430,000       |
| 2000   | 500,000       |
| 2001   | 360,000       |
| 2002   | 380,000       |
| 2003   | 400,000       |
| Total: | 2,983,000     |

## CONCLUSIONS

The successful operation of the UICEE between 1994 and 2003, including a wide range of research, development and publication activities for the professional and continuing development of academic staff in engineering and technology education carried out by the UICEE, are presented and discussed in this article.

In the work of the UICEE, particular emphasis has been placed on the development and advancement of educational skills by junior staff and those academics working in developing countries. The

UICEE has built a system of professional development for academic staff, which is reflected in the wide range of its activities, such as continuing education courses, engineering education seminars and conferences, communication using a variety of means, and the professional activities of societies based within the UICEE.

New methods applied in the teaching/learning process, as well as various ways and means of information transfer, and how they relate to the effectiveness of university education as a whole, are of particular interest to those who are engaged in engineering and technology education. It is believed that the UICEE has been able to position itself at the forefront of global achievements in engineering education; indeed, it is proud to have been able to promote best practice in academia on a worldwide basis.

It is hoped that this article gives a fair account of the activities and achievements of the UICEE, as well as some shortcomings, and that readers will find in it comprehensive information on the Centre's life and welfare over the first ten years of its operation.

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## BIOGRAPHIES



Zenon Jan Pudlowski graduated Master of Electrical Engineering from the Academy of Mining and Metallurgy (Kraków, Poland), and Doctor of Philosophy from Jagiellonian University (Kraków), in 1968 and 1979 respectively. From 1969 to 1976, he was a lecturer in the Institute of Technology

within the University of Pedagogy (Kraków). Between 1976 and 1979, he was a researcher at the Institute of Vocational Education (Warsaw), and from 1979 to 1981, was an Adjunct Professor at the Institute of Pedagogy within Jagiellonian University. From 1981 to 1993, he was with the Department of Electrical Engineering at The University of Sydney where, in recent years, he was a Senior Lecturer.

He is presently Professor and Director of the UNESCO International Centre for Engineering Education (UICEE) in the Faculty of Engineering at Monash University, Clayton, Melbourne, Australia. He was Associate Dean (Engineering Education) of the Faculty of Engineering between 1994 and 1998. His achievements to date have been published in more than 300 works, including books, manuals and scientific papers in refereed journals and conference proceedings.

In 1992, he was instrumental in establishing an International Faculty of Engineering at the Technical University of Lodz, Poland, of which he was the Foundation Dean and Professor (in absentia) (1992-1999). He was also appointed Honorary Dean of the English Engineering Faculty at the Donetsk National Technical University (DonNTU) in the Ukraine in 1995.

Professor Pudlowski is a Fellow of the Institution of Engineers, Australia. He is a member of the editorial advisory boards of many international

journals. He was the 1<sup>st</sup> Vice-President and Executive Director of the AAEE and the Editor-in-Chief of the AJEE since its inception in 1989 until 1997. Currently he is the Editor-in-Chief of the *Global Journal of Engineering Education*, and is the Foundation Secretary of the International Liaison Group for Engineering Education (ILG-EE).

Professor Pudlowski has chaired and organised many international conferences and meetings. He received the inaugural AAEE Medal for Distinguished Contributions to Engineering Education (Australasia) in 1991 and was awarded the Order of the Egyptian Syndicate of Engineers for Contributions to the Development of Engineering Education on both National and International Levels in 1994.

In June 1996, Professor Pudlowski received an honorary doctorate from the then Donetsk State Technical University in the Ukraine in recognition of his contributions to international engineering education, and in July 1998 he was awarded an honorary Doctorate of Technology from Glasgow Caledonian University, Glasgow, Scotland, United Kingdom. In 1997, he was elected a member of the Ukrainian Academy of Engineering Sciences. In 2002, he was awarded the title of an Honorary Professor of the Tomsk Polytechnic University, Tomsk, Russia, and was appointed an External Professor at Aalborg University, Aalborg, Denmark.



Peter LePoer Darvall retired as the Vice-Chancellor and President of Monash University on 31 August 2003. He was previously the Dean of Engineering at Monash University between 1988 and 1994, and the Deputy Vice-Chancellor (Research & Development) between 1993 and 2002.

He graduated in engineering from the University of Melbourne in 1963 and gained higher degrees at Ohio State University and Princeton University and a DipEd at Monash University. He joined Monash as a Lecturer in Civil Engineering in 1970 after experience with Maunsell and Partners, with Freeman, Fox and Partners, as a surveyor for a glaciological expedition in Alaska, and as site engineer for an archaeological expedition in Egypt. He has held visiting appointments at UNAM in Mexico, the University of California at Berkeley and the University of Wisconsin.

Prof. Darvall authored and co-authored books on mechanics and structures, and reinforced and

pre-stressed concrete. His many research papers have covered a variety of areas, but in recent years he has concentrated on softening in concrete structures and high strength concrete, and more recently on engineering education.

Prof. Darvall was for many years a member of the Monash University Council and was National President of the Federation of Australian University

Staff Associations (FAUSA) from 1979-1981. He was President of the Australasian Association of Engineering Education (AAEE) between 1991 and 1995. He is currently Chairman and a Trustee of the International Liaison Group for Engineering Education (ILG-EE) and Chairman of the Academic Advisory Committee of the UNESCO International Centre for Engineering Education (UICEE).