

AUSTRALASIAN ASSOCIATION
FOR ENGINEERING EDUCATION

NEWSLETTER

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Members of the Interim Executive Committee of the Australasian Association for Engineering Education, the General Conference Chairman and Members of the Organising Committee cordially welcome Delegates and Participants to the 1st Annual Convention and Conference, wishing you fruitful and productive discussions, as well as an enjoyable stay in Sydney.

This newsletter coincides with the first Annual Convention and Conference of AAEE. It is an important time for AAEE and I think we all agree that it is an important time in the development of engineering in Australia.

On behalf of the Organising Committee, I have great pleasure in using this column to welcome the attendees to the meeting.

It has been very refreshing to see the strength of response to the call for papers and the number indicating attendance. Clearly we are all recognising the important role of education and, in particular, the intimate links which should exist between industry and academia, the theme of the conference.

The timing is important. For several years there has been quite positive and strong encouragement of the development of competitive industry. But today the benefits from any improvements in industry are not obviously apparent. Indeed, the Federal Government (and others) are beginning to question the validity of an argument which says that Australia can develop an internationally competitive industry, at least to the point of it making any significant impact on the balance of payments.

This has to be of great concern to us engineers. We need to resolve the issue as to whether we can achieve this success. To do that we need to determine the factors which might make such success possible. I am sure that the basic element is the quality of available professionals, their number, and the range of skills and outlook such professionals bring to their job.

In engineering education we have been subject to the Williams inquiry and, of course, the White Paper. Maybe they were not enough.

This is what the conference is about and I look forward to a detailed and even heated discussion.

AAEE is broadly based. It will be most revealing to have the perspective of engineers associated with the more traditional industries of Australia which dominate our wealth creation. Our future can be just as secure in an improved primary and secondary industry sector which is more efficient and which adds value to the material we currently export. Our future can similarly be secured in an innovative look at opportunities in services and the information sector - even if this uses imported equipment.

And of course, as engineers, we are quite used to achieving results in the context of society's standards and expectations. But these are changing to ones of environmental concern, even perhaps anti-development. When the rate of change of society's expectations moves faster than the timescale of engineering development, there are enormous pressures on the engineer, pressures perhaps eased by a revised look at what education is needed by today's engineer.

The questions are large and they affect all we do as members of AAEE. I look forward to the sharing of perspectives that our Convention and Conference can provide. I look forward to meeting you all.

Trevor W. Cole
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Chairman of the Interim Executive Committee of AAEE
General Conference Chairman

PRESENT STATUS OF THE CONFERENCE

The aim of this conference is to generate interest in engineering education among academics and industry leaders within Australia, Asia and the Pacific Region, and to become an important national and international event. This conference will present and emphasise research and developmental activities carried out mostly in this part of the world. Particular emphasis has been placed on a chosen theme, *Strengthening Academia/Industry Co-operation*, in an attempt to bridge the gap between the two parties, and to stress the importance of industry involvement in engineering education, and the need for continuing education of engineers in a rapidly changing and advancing technological era.

Also, an important objective of the conference is to provide a national and international forum for discussion and exchange of information on engineering education in general, and academia/industry collaboration in particular. There are varieties of problems which need to be identified, and topics to be discussed. However, there is also room for less formal gatherings and discussions, which will help to renew local and international contacts and establish new friendships.

Both the international and local academic and industrial communities have shown an excellent response to the call for papers. Over 40 papers from a total of seven countries have been accepted for inclusion in the Proceedings. The papers present important concepts, ideas and achievements of engineering educators and industry leaders who are involved in engineering education and industrial training. Considering the status of many of the authors, the conference should provide an excellent basis for discussions and should stimulate further collaboration on both the local and international scene. The papers cover almost every aspect of engineering education and training, emphasising the chosen theme, and thus should be of great interest to all participants.

Copies of the Proceedings are available at \$A50 per copy, plus \$A5 postage (post-free within Australia).

A GRASS-ROOTS DIMENSION FOR AAEE

There has been a good deal of discussion recently about the formation of societies within the Institution of Engineers, Australia, to enable common interest areas to be addressed in ways not possible through the existing Division and College structures. The Australasian Association for Engineering Education is a good example of the concept, and we need to develop it a little further to facilitate the wider participation by members and others interested in engineering education.

How do societies fit into the overall organisation and functions of the Institution? We may think about the roles of various units in matrix terms. The Colleges of the Institution are on one side, and may be considered as vertical slices through the profession based upon the engineering disciplines. As such they concentrate upon fostering expertise in the engineering science and technology of the disciplines in which they are concerned. The Colleges are central to the *learned society* role of the Institution at the national level.

On the other side of the matrix, there are two types of horizontal slices across the profession. The first is geographic, based in the Divisions, integrating the activities of particular interest units within Division boundaries. Divisions include Branches and *Panels*, or Boards and *Branches*. The *Panels* and *Branches* are the *professional society* units, dealing either with a *vertical slice* activity, such as education or management or environment. In both cases, they are fundamental to the vitality of the Institution at the grass-roots level.

Horizontal slice activities in a particular field give rise to the formation of a society to provide a national focus for a *professional society* activity. A Society is intended to be broader-based than a College, and to form an integrative function across engineering disciplines. It may address a particular field of engineering, such as a Society of Manufacturing Engineering, or a Society of Automatic Control, or a Society of Engineering Management. Societies may include non-engineers among their memberships. They might forge international links and cross links to other Australian bodies. A Society has a degree of independence and financial viability difficult to achieve otherwise.

The Australasian Association for Engineering Education is such a society. So far it has been addressing the professional society issues of engineering education at the national level, and international links are being developed. Links have yet to be forged between AAEE and Division-based units in engineering education, and I suggest that as the next step in its development.

The existing Divisional engineering education panels or branches cater for engineering academics, and non-academic engineers having interest or roles engineering education. As units of AAEE, they could be broadened to attract other disciplines involved in engineering education. The existing panels or branches provide programs of lectures and other professional society activities within the Divisional framework, so there is a ready-made framework for AAEE at the grass-roots level.

What we need is an organisational structure, defining the relationships between the panels or branches, and the Divisions, with the national focus in a *committee of management* of the Association. The payoff will be a much stronger body, and an enhanced identity of engineering education as a professional society activity. We need both if we are to exert influence needed to strengthen engineering education. Is there a *champion* for this cause, ready to provide the leadership necessary to add this important dimension to AAEE?

Dr Brian E. Lloyd
Vice-President (Education and Training)
IEAust.

ENGINEERING EDUCATION ON THE LOCAL AND INTERNATIONAL SCENE

It is encouraging to see that much is happening internationally to engineering and technology education. Partly, this is due to the rapid change in technology, which has made many scientists, academics and industrialists realise that something must be done to make engineering and technology education more efficient and compatible with those technological advances.

Another reason why engineering and technology education is more attractive to many individuals is that it is probably the only bridge which links technology with the humanities. Recent developments within disciplines such as philosophy, psychology, pedagogy, economics, management etc., have generated the advent of new disciplines which now operate on the boundary between the humanities and technology. It is needless to mention the birth of disciplines like the methodology of engineering and technology training, computer-based education, instruction design, industrial training, ergonomics, and so on.

All the recently born disciplines, although conservatives still regard them suspiciously, seem to attract a new generation of scientists and academics who, as engineers or technologists can claim not only interest in engineering education but also a formal background and education in the humanities. They are the ones who stimulate interest toward and understanding of the needs of modern engineering education and industrial training among their colleagues. Simultaneously, more advanced and better-founded research projects concerning these disciplines have emerged worldwide in recent years. A better-organised

forum now exists for the exchange of information. This includes national and international societies, exchange programmes, journals, meetings and conferences etc., which are concerned with engineering and technology education.

The International Liaison Group on Engineering Education

The last World Conference on Engineering Education, which was held in February 1989 at the University of Sydney, Australia, can already claim considerable success in stimulating interest among academics and industrialists toward engineering education. The emergence of The International Liaison Group on Engineering Education (ILG-EE) and The Australasian Association for Engineering Education (AAEE) may be regarded as the most important result of the second world conference in this series. In a short period of time the two organisations have demonstrated dynamism, and have performed a number of activities which should have a considerable impact on the future of engineering education. Obviously, there are other well known and respected organisations and institutions whose achievements will be mentioned in this short review.

The ILG-EE held its recent meeting in September 1989 in Munich in conjunction with the 18th International Symposium, *Engineering Education'89*, which was organised by The International Society for Engineering Education (Internationale Gesellschaft für Ingenieurpädagogik - IGIP) under the Chairmanship of Professor A. Melezinek of the University of Klagenfurt, Austria.

Several important issues were discussed during this meeting. For instance, the venue for the Third World Conference on Engineering Education which will be organised in 1992. Two submissions were received earlier and discussed at the meeting. The first proposal was submitted during the conference in Sydney by Prof. M. S. Agarwal of the Indian Institute of Technology at Bombay. The second request was received from Prof. Terance V. Duggan, Dean of Faculty of Engineering at Portsmouth Polytechnic in the United Kingdom. The submission was prepared on behalf of Portsmouth Polytechnic and the University of Surrey. Both institutions expressed their desire to jointly run the next conference. After a thorough discussion, the second proposal was accepted and Prof. Duggan was asked to set up a local planning committee.

The Liaison Group offered its support for preparations of this conference and will provide an international back-up. The Group also has decided to hold its Third Meeting in Portsmouth over June 29-30, 1990. The purpose of this gathering is to assist the two institutions in planning the conference, and to help in setting up a framework for the conference academic programme.

A venue for the Fourth World Conference on Engineering Education, which is scheduled for 1995 was briefly discussed, following an official letter of invitation from Prof. A. Melezinek, Austria, to hold that conference in Vienna and Budapest. According to Prof. Melezinek, the conference would be arranged within the framework of the World Exhibition in Vienna/Budapest, and official support for this event has been promised from both the Austrian and Hungarian Governments. The IGIP expressed interest in co-ordinating the local preparations.

The IGIP proposal is exciting because of the possible association of this conference with the World Exhibition, and the Liaison Group has preliminarily accepted the offer. However, Prof. Melezinek was asked to submit a formal bid which would include a more detailed proposal, indicating the conference format, objectives, venues, draft budget, expected financial and organisational support, etc.

East-West Congress on Engineering Education

In addition to the planned sequence of world conferences, the Australian and Polish representatives submitted a proposal to hold jointly an East-West Congress on Engineering Education in Krakow, Poland in September 1991. The aim of this congress is to bring together engineering educators from the East and West to discuss common problems in engineering education, in the context of a rapidly changing political climate in the Eastern Bloc. It is envisaged that the financial structure of this congress would make it easier for colleagues from Eastern Bloc countries to attend a meeting organised within a country in the Bloc. The possibility of a large international event being held in Poland has received strong support from academics at the major Polish technical universities. Jagiellonian University of Krakow, one of the oldest universities in this part of Europe (est. 1364) will host the congress. The Liaison Group, therefore, decided to promote this event on the international scene. Further details regarding the congress and the call for papers will be circulated in early 1990.

IGIP's Symposium in Munich

The IGIP's Symposium itself attracted over 200 participants from a number of countries worldwide. As an annual event of the IGIP, the Symposium was, on this occasion, specifically devoted to *Technology and Human Life*, concentrating on such important topics like Technology and Ergonomics, Development of Curriculum and Demands on Engineers, Technology of Information - Challenge for the Engineering Education, Technology Transfer, and Cognition and Behaviour. The participants were given the opportunity to select the topics of their interest, as well as to take part in a number of interesting excursions to companies like IBM Germany and Siemens AG. A forum of young engineers concluded the successful symposium. The impression was that a friendly and hospitable atmosphere encourages an exchange of information, in this case, not only on a variety of topics relating to the education of engineers but also on topics relating to the effective education of technologists and technicians. Considered also were other important topics, such as engineering teacher training.

IGIP's Symposium *Engineering Education 2000*

The immediate future plans of the International Society for Engineering Education include a large international symposium called *Engineering Education 2000*, which will be held in Vienna, 2-5 July 1990. This Symposium will include a scientific programme at The Technical University of Budapest, which will be one of the events organised to commemorate the 50th anniversary of the founding of the Institute of Graduate Studies. The American Society for Engineering Education (ASEE) and the Institute of Electrical and Electronic Engineers (IEEE) are also involved in the organisation of this meeting. It is anticipated that the next ASEE's Frontiers in Education Conference will coincide with the Symposium. Several institutions and organisations are among the co-sponsors of this important international event, including our Association (AAEE).

Third Meeting of ILG-EE

The Liaison Group's discussions concluded with a decision to hold its Third Meeting at Portsmouth over June 29-30, 1990, and to reconvene the Meeting at the 19th IGIP Symposium *Engineering Education - 2000* in Vienna, 2-5 July, 1990. The purpose of this additional meeting is to discuss future research programmes on engineering education and the possible involvement of centres represented by the members of the ILG-EE. A possibility also exists to convene the second part of this meeting at another venue, for instance, in Barcelona, in conjunction with the International Conference on Computer Aided

Training in Science and Technology - CATS'90, the details of which will be presented later. Professor E. Onate, Conference Chairman and a member of the ILG-EE, has expressed his willingness to arrange such a meeting. The purpose of this assembly would be to sponsor and co-ordinate a session on the impact of computer-aided instruction on effective engineering training.

ASEE's International Involvement

The 1989 Frontiers in Education Conference, held between October 15 and 17, 1989, in Binghamton, New York, was another important international event organised by the American Society for Engineering Education. This particular Society, due to a large membership, seems to be the most energetic driving force in engineering education. Obviously, our American and Canadian colleagues experience problems which are a little different to the rest of the world's, as their economy and industry operate on slightly different principles. However, the issues which emerged during the conference discussions were tremendously important to all participants. The conference attracted over 200 participants, mostly from the north-east of the USA. Apart from a number of Canadians, the three Australians formed the largest overseas contingent.

Generally, the papers presented expressed the concern about the status and quality of US engineering education. The impression was that most US efforts are dedicated towards curriculum development. Other areas targeted were the problems which high-schools face and the experiences of students in their freshman year. The Conference has realised a number of good papers which, naturally, deserve much wider distribution. It should be mentioned that the academics of the Watson School within the State University of New York at Binghamton had prepared an excellent technical programme, as well as organisation. The quality of papers presented and the number of special workshops organised and conducted deserve special praise.

However, of great concern was the lack of participants from outside North America. Just a handful attended this conference. It seems that the international engineering education community has missed out on the opportunity to exchange information and experience with their American and Canadian counterparts. Perhaps the next meeting scheduled for Vienna in 1990 will create an opportunity to foster more closer links.

Many international conferences are scheduled for next year. A 1990 ASEE Annual Conference under the theme: *Engineering Education: Technological Advancement Through Canada - U.S. - Global Interchange* will be held in Toronto, Canada, between 24-28 June 1990. This Conference, which will include a joint session with *The Canadian Conference on Engineering Education* hosted by the University of Toronto, is planned for Wednesday, June 27, 1990. A global focus of this Conference is an integral part of this new era, in which *people can learn from each other in seeking the common goal of excellence in engineering education*. Ryerson Polytechnical Institute and George Brown College of Applied Arts and Technology are the co-hosts of this Conference.

CATS'90 in Barcelona

Mentioned earlier CATS'90 International Conference on Computer Aided Training in Science and Technology will be held in Barcelona, Spain, between July 8 and 12, 1990. This conference is organised by the University Enterprise Training Partnership for Development of Numerical Methods in Engineering (COMETT Programme of the European Community) and will be hosted by the International Centre for Numerical Methods in Engineering (CIMNE) at the Technical University of Catalunya, Barcelona, Spain. The important aim of the conference is to discuss recent advances in computer-aided methods for education and training, with special emphasis on their use in science and technology. Apart from the main

organisers, the conference has attracted considerable support from several respectable institutions and organisations. The AAEE is proud to be among them. The involvement of the European Community, especially COMETT, ensures that this conference will become an important international event.

Unfortunately, another major international conference on computers in education is scheduled for the same week as the CATS'90. It is a Fifth World Conference on Computers in Education (WCCE/90), which will be held between July 9 and 13, 1990 in Sydney, Australia. The conference programme looks rather spectacular, with 6 major topics, such as Informatics Education at the Secondary Level, Advanced Curriculum Projects in Information Processing, Research on Education Applications of Information Technologies, Vocational Education and Training, Informatics in Elementary Education and Distance Learning, as well as two associated mini-conferences. One of the mini-conferences, entitled *Advanced Research on Computers in Education* will be held in Japan (July 18-20), the other, *Computers in Education: National Perspectives*, in New Zealand (July 4-6).

This clash proves that an international organisation is needed to co-ordinate activities to avoid situations where two conferences on a similar topic are arranged in the same time. Therefore, the Liaison Group, consisting of representatives in more than 20 countries worldwide, assumes this important role and endeavours to co-ordinate events at an international level.

Regional Activities

Occurring in December 1989 is the First Annual Convention and Conference of the Australasian Association for Engineering Education which will be held at the University of Sydney, Australia, between the 10th and 12th. The general mission of this new association, which operates under the *umbrella* of the Institution of Engineers, Australia, is to improve the supply and quality of those engineering skills needed to develop and advance Australia, Asia and the Pacific Region. The main objective of this gathering, apart from having its first convention, is to generate useful discussions on the most important topic at present, namely: *Strengthening Academia/Industry*. It is also anticipated that during the conference, the AAEE will launch its journal, the *Australasian Journal of Engineering Education*.

Other, smaller organisations also endeavour to expand their activities by organising their own meeting. One should probably mention an AEESEAP - FEISEAP Joint International Conference on Engineering Education, organised by the Association for Engineering Education in Southeast Asia and the Pacific and the Federation of Engineering Institutions in South East Asia and the Pacific. The first organisation, better known as the Association for Engineering Education in Southeast Asia, has already organised a number of relatively small local conferences on engineering education. It appears that the conference's main objective is to discuss innovative programmes in engineering education in the context of the future development of the countries within the region. The conference will be held on Penang Island, Malaysia, between May 22 and 24, 1990.

New Ventures in Curriculum Development

Also, an interesting experiment in curriculum development should be mentioned in this short review. The *Ecole des Mines de Paris*, France, regarded as one of the most respectable tertiary institutions in France, has developed a new engineering curriculum. According to Professor Gilbert Frade, Deputy Director and Dean, also a member of the ILG-EE, around 20 per cent of courses offered to engineering students are of non-engineering content. This helps to introduce more humanities into the engineering programme. According to Prof. Frade industries have found graduates from this institution extremely useful, and support this novel idea. The students experience a better academic coverage, not only of engineering

concepts and topics but also a widening of their horizons through learning other important subjects, such as philosophy, economics, management, foreign languages, etc. Hundreds of high-school leavers dream about being accepted into this prestigious institution. The Ecole des Mines enrolls about 100 students in its engineering courses, and selects the students from around 8000 candidates. The selection process includes a special entry examination, so only the top students are accepted into the institution.

Fortunately, the Massachusetts Institute of Technology at Cambridge, USA, appears to adopt a similar approach in designing its engineering curriculum. According to Professor J. L. Kerrebrock, Dean of Engineering, more non-engineering content has been introduced into its four-year engineering degree, and it does not jeopardize accreditation of graduates to professional associations in the USA. In addition, a one-year Master's degree by course is planned in order to expand further the coverage of engineering concepts and topics, and to better prepare graduates for professional life.

International Journal of Applied Engineering Education

The Pergamon's *International Journal of Applied Engineering Education* under the leadership of Professor Michael S. Wald of Fachhochschule Hamburg, Federal Republic of Germany, has made great advances in its persistent efforts to improve the status and quality of engineering and technology education. This refers to the fact that, apart from publishing excellent papers, the Journal's new venture is to become an official forum for the International Liaison Group on Engineering Education (ILG-EE). This undertaking will create an important means for further improvement of information dissemination on all kinds of activities at the international level. This includes information on future conferences, seminars, workshops, activities of engineering education societies and also research projects which the ILG-EE undertakes and co-ordinates.

Obviously, we would prefer to hear more from those who are active in research on engineering education. These, and other, important developments, such as experiments with engineering and technology curricula, examples of structured syllabi, particular teaching instructions, original approaches to training, results of engineering education research, etc., should be better publicised, as many institutions worldwide face similar problems and would like to exchange ideas on how to solve them. This short review demonstrates that a special journal or supplement to the Pergamon's Journal is urgently needed to satisfy this demand.

STUDENTS' INVOLVEMENT IN ENGINEERING EDUCATION

The increasing demand for expertise in engineering education and training at tertiary level has led to the School of Electrical Engineering establishing a new area of activity. Most of the effort is focused on a systematic and comprehensive research into the methodology of engineering training, modern curriculum development, as well as the design and implementation of teaching courseware and hardware. Particular support is received from the Electrical Engineering Foundation within the University of Sydney.

So far, The School has accomplished several projects. One of these is a computerised version of an electrical engineering aptitude test. This test assesses high-school students' aptitude for electrical and electronic engineering. Particular emphasis is placed on electrical circuit theory, with reliance on pattern recognition and the ability to absorb high-school physics. Over 20 tertiary institutions in Australia and overseas are users of this tool.

The School's philosophy is to engage students in this area by offering final year projects. An Interactive Computer Aided Authoring Programme (ICAAP) designed for PC-DOS, MS-DOS, which supports both monochrome and EGA graphics cards, was developed in 1988 by P. T. Nguyen and Y.D. Heng. The ICAAP system includes an authoring mode

graphics programme and text editor. The graphics editor offers an easy way to create specific computer graphics, and is therefore especially useful for generating all kinds of electrical and electronic diagrams. The ICAAP system is designed to meet the requirement of all categories of users and offers the end-user (the author) a friendly, interactive environment.

Other interesting projects were undertaken and completed this year. Further expansion of the ICAAP system has led to the development of teaching software and, subsequently, to the development of a comprehensive computer courseware interactive package by H.C. Quach, S.C. Han, B. Fan and D.H. Loo. This courseware aims at the initial stages of training in electrical engineering and includes a set of computerised laboratory and tutorial instructions.

And special equipment for supporting the teaching of electrical engineering has been developed over the past few years. This includes an experimental unit for teaching basic phenomena and behaviour of electrical machines. The unit consists of a DC machine coupled with an AC induction motor, through a mechanical or an electro-dynamic brake. A family of dynamic characteristics can be obtained while braking the machines. The process of investigation of the behaviour of electrical machines may be simplified considerably by interfacing the unit with a personal computer. An Automated Retrieval of Motor dAta (AROMA) suitable for a squirrel-cage induction motor has been developed by Zoran Hlebar, a final-year student (pictured below). The system allows for the testing of an induction motor by obtaining all the dynamic characteristics, such as torque, speed, efficiency, power factor and line current in real time by the computer. Obtained data viewed on the computer screen in either numeric or graphic form, is later printed. It should be mentioned that Zoran began his project in 1988 as part of the activities of the Student Research Interest Group, a Group which the Electrical Engineering Foundation vigorously sponsors. Apart from this project's educational value, it may also have an industrial application for testing small electric motors.

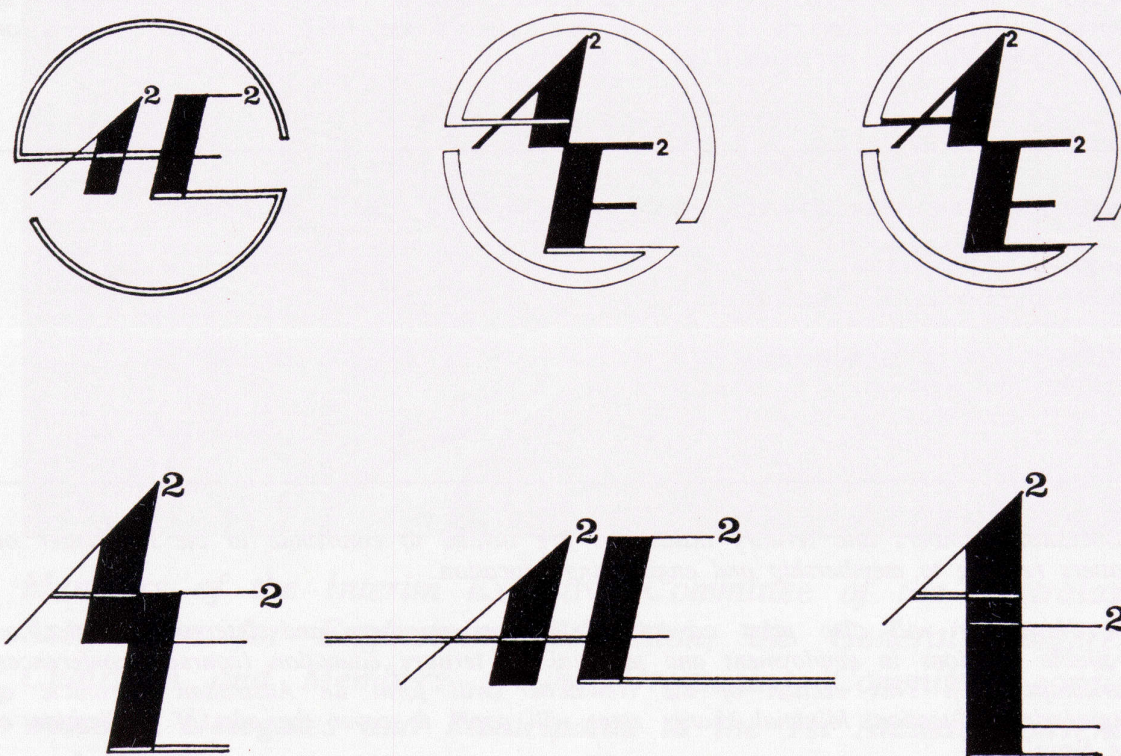


Final-year student Zoran Hlebar demonstrates the set-up of project AROMA.

To satisfy the demand for highly qualified and specialised personnel for engineering education and training in a continuously changing and advancing technological era, the Electrical Engineering Education Group has expanded its research activities beyond the undergraduate programmes, by offering postgraduate research projects. Several Master's and Ph.D. degree candidates, both from Australia and overseas, enrolled as postgraduate students. This novel, and unique, initiative in this country should obviously intensify research work on the methodology of engineering and technology education, and opens new opportunities for individuals who are seriously engaged in research in this area. Several other enquiries from potential candidates asked if the programme is offered externally. But more resources are needed to satisfy this demand.

AAEE'S LOGO

A haste to develop the AAEE did not allow for broad discussion of the Association's logo. When the AAEE brochure was being prepared, a few members of the Interim Executive Committee suggested that the link with the Institution of Engineers, Australia, should be reflected in the logo. However, other proposals have also been prepared for discussion at the Annual Meeting (pictured below). It is anticipated that AAEE members will offer their own ideas on a suitable logo for the AAEE.



Some suggestions for a new AAEE logo.



Autumn in Krakow, Poland. A view of Marketplace with St. Mary's Church, the centre of Krakow's Old Town. Krakow will be the host city of the 1991 East-West Congress on Engineering Education. See page 6 for further details.

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Association members and tertiary institutions are invited to contribute to the Newsletter on matters relating to membership and engineering education.

The Newsletter will also print advertisements from members and interested parties on available positions in employment and material on tertiary education (courses, conferences, workshops etc.). This section of the Newsletter will form an Australian Chronicle of Engineering Education. Minimal charge rates will apply to cover the cost of publication of the Newsletter.

Send contributions to the Editor at the address above.