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Vereinsnachrichten: A survey of university programs in the fields of structural engineering in South, Southeast and East Asian Countries

A Survey of University Programs in the Fields of Structural Engineering in South, Southeast and East Asian Countries

Summary

A survey of undergraduate, graduate and doctoral programs as well as research programs in the field of structural engineering in universities of south, southeast and east Asian countries was carried out in 1988/89.

The results of the survey give insight into the availability of specific programs; however, it does not provide an answer with respect to quality. It is expected that this survey will lead to a better understanding of the present situation and educational needs in the field of structural engineering in this region.

It is also noticeable that the gap between developed and developing countries in civil engineering education in the Asia-Pacific region is narrowing.

Objectives

The objectives of this survey are as follows:

- to get a regional overview on the availability of graduate teaching and ongoing research programs in the fields of structural engineering and construction with emphasis on structural engineering subjects, and
- to collect data for future planning and development of new disciplines in the field of structural engineering.

Methodology

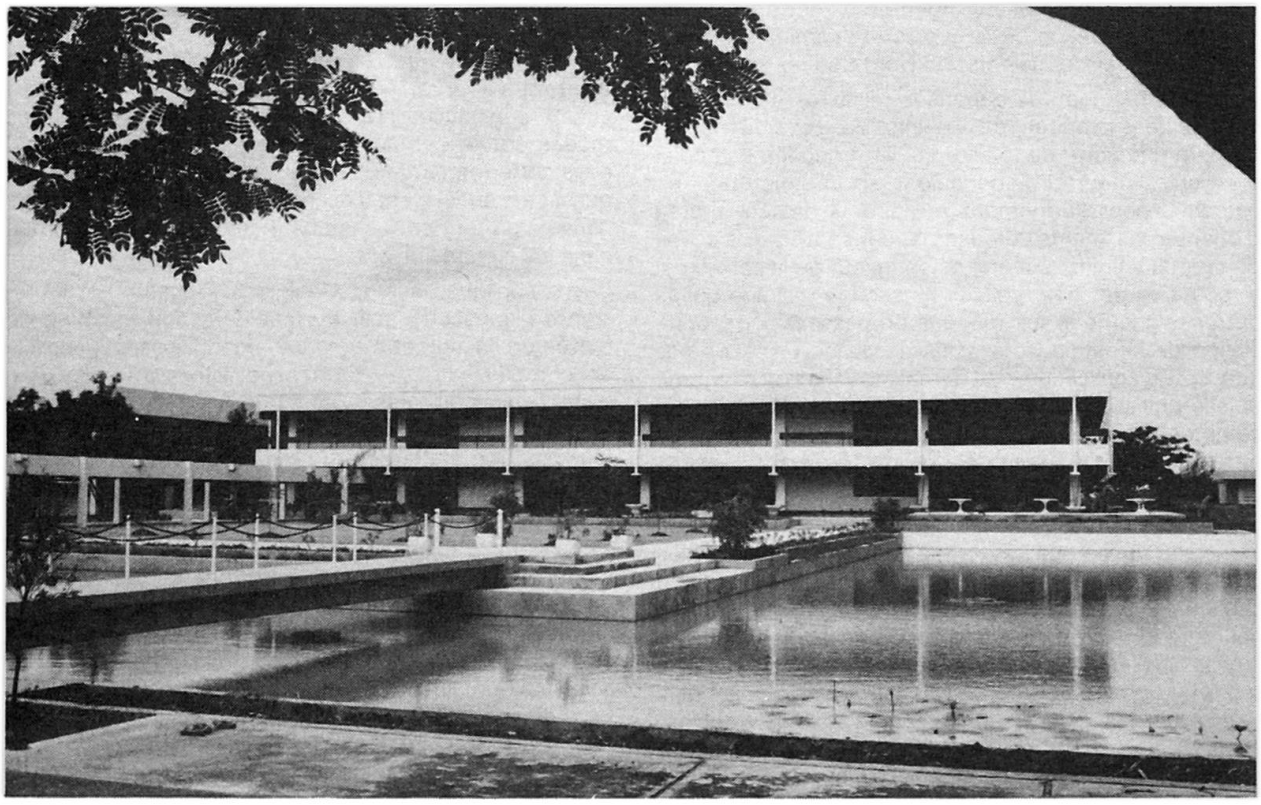
Eighty-five questionnaires were sent to chairmen of civil engineering departments of universities in seventeen countries as shown in Table 1. No questionnaires were sent to Bhutan, Cambodia and Laos, the only countries in the region who have no technical universities offering civil engineering programs. A total of twenty-nine replies were received. The reply rate of about one third is quite acceptable taking into account that universities from four countries did not reply at all. For example, communication with Burma and the Philippines is unreliable at present due to internal problems.

Also from Chinese, Japanese and Korean universities the return rate was rather low, which may be due to the fact that people of those countries only reply when they know the originator of a request personally.

The main questions of the questionnaire were as follows:

What type of study programs does your university offer:

- undergraduate program
- graduate program
- doctoral program, and
- other programs.



Regional Computer Centre at the Asian Institute of Technology in Bangkok

	Number of questionnaires mailed	Number of questionnaires completed	Percentage of replies
Bangladesh	1	1	100 %
Burma	3	0	0 %
China, Beijing	21	4	19 %
China, Taipei	4	2	50 %
Hong Kong	2	1	50 %
India	12	7	58 %
Indonesia	3	1	33 %
Japan	10	3	30 %
Korea	4	1	25 %
Malaysia	1	1	100 %
Nepal	1	0	0 %
Pakistan	2	0	0 %
Philippines	8	0	0 %
Singapore	2	1	50 %
Sri Lanka	2	2	100 %
Thailand	7	4	57 %
Viet Nam	2	1	50 %
Total: 17	85	29	34 %

Table 1: Country by country breakdown of questionnaires mailed and completed

What type of structural engineering courses are offered at your university?

- structural dynamics,
- bridge engineering,
- earthquake engineering,
- offshore engineering,
- dam engineering,
- plate and shell structures,
- structural reliability,
- structural optimization,
- finite element analysis, and
- computer-aided design.

What type of research in structural engineering (topics listed above) is presently carried out at your university?

The scope of the questionnaire was quite limited and its format was intentionally kept very simple, in order to encourage the addressees to complete it. If reliable and consistent information about course contents and their quality is needed, then personal interviews have to be conducted, which was beyond the scope and means of this survey.

Unfortunately, no information about the number of students graduating each year in structural engineering was collected. This would have allowed a quantitative comparison of the student output of regional universities. It would be useful to collect this data in the future.

Results of Survey

The answers of the questionnaires were analysed. We notice that most of the universities offer undergraduate education, except for the Asian Institute of Technology in Bangkok and the Indian Institute of Science in Bangalore, which are pure graduate schools. Also, graduate programs in civil engineering, which include structural engineering, are available in 93 % of the universities who completed the questionnaire. This figure is very remarkable and clearly indicates the need for graduate training in structural engineering in the region under consideration. On the other hand, thirty years ago there was virtually no such program available.

Similarly, from the received answers we notice that doctoral programs are conducted in 69 % of the replying universities. From the responding universities only universities in Indonesia, Sri Lanka and Viet Nam do not offer doctoral programs in structural engineering. In addition, based on private discussions it was concluded that besides Bhutan, Cambodia and Laos which do not have any technical universities at all, engineering universities in Burma, Nepal, Pakistan and the Philippines do not offer doctoral programs. However, there are universities in Pakistan and the Philippines which offer masters programs in structural engineering.

In terms of overall availability the ranking of the structural engineering courses at graduate level is as shown in Table 2. In the same table the corresponding ranking at undergraduate level is given.

A comparison of the availability of undergraduate courses may indicate the academic level at which a specific graduate course should start in a regional graduate school. For example, the top ranked undergraduate course on structural dynamics should start at an advanced level whereas the lowest ranked one (offshore engineering) should begin at a rather elementary level. Again this argument would be correct if the curriculi in all universities were the same, which is unfortunately not the case.

The information about ongoing research programs is rather heterogeneous and scarce. Only 20 replies were received regarding research, whereas for the courses 29 replies were obtained. Table 3 gives the ranking of research programs in various structural engineering disciplines.

The ranking of research topics may either serve as an indicator of the regional research or industry needs, or «hot» research areas with many unresolved problems.

Graduate programs		Course title	Undergraduate programs	
Rank	Percentage* availability		Rank	Percentage* availability
1	72 %	finite element analysis	3	45 %
2	69 %	structural dynamics	1	59 %
2	69 %	plate and shell structures	4	41 %
4	45 %	earthquake engineering	6	34 %
5	38 %	bridge engineering	2	55 %
6	34 %	structural reliability	9	17 %
7	31 %	computer aided design	7	31 %
8	28 %	dam engineering	5	38 %
8	28 %	structural optimization	8	21 %
10	24 %	offshore engineering	10	10 %

* 100 % corresponds to 29 universities from which completed questionnaires were received

Table 2: Availability of graduate and undergraduate courses in structural engineering

Rank	Percentage * availability	Research subject area
1	75 %	structural dynamics
2	60 %	finite element analysis
3	45 %	earthquake engineering
3	45 %	structural reliability
5	40 %	bridge engineering
5	40 %	computer aided design
7	35 %	structural optimization
8	25 %	offshore engineering
8	25 %	dam engineering
8	25 %	plate and shell structures

* 100 % corresponds to 20 universities from which completed questionnaires were received

Table 3: Research programs in structural engineering in Asian universities

We notice from Table 3 that structural dynamics and finite element analysis are the preferred research areas, followed by earthquake engineering and structural reliability.

In addition to structural engineering information about graduate courses in construction methods and equipment, and construction management was collected. These subjects are offered in 28 % and 34 % of the universities respectively. For undergraduate programs these figures are 66 % and 69 % respectively. Also, research in construction engineering and management is practically non-existent in regional universities. In view of the fact that the construction industry in most countries of south, southeast and east Asian countries and elsewhere is the largest single industry, and in view of the fast economic development of the Asia-Pacific region, an increased need for graduate training and research in structural engineering and construction is anticipated. For example, at present there is a great demand for highly qualified structural engineers in Thailand, which exceeds the supply, whereas a few years ago there was a considerable oversupply.

Conclusions

Based on questionnaires received from 29 leading universities of 13 south, southeast and east Asian countries regarding university programs in structural and construction engineering, the following conclusions can be made:

- Master's and doctoral programs in structural engineering are offered in 93 % and 69 % of the universities of the region, respectively.
- Structural engineering at a regional graduate school like the Asian Institute of Technology must focus on quality and only top students should be admitted especially in the case of countries where similar graduate programs are available.
- Among the topics surveyed, finite element analysis and structural dynamics are the top structural engineering subjects.

(Martin Wieland, Associate Professor
Asian Institute of Technology, Bangkok, Thailand)

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