CHAPTER 2 : ACADEMIC PROGRAMMES

2.1 Undergraduate Academic Programme

The Faculty of Civil Engineering at UTM first introduced the Bachelor of Engineering (Civil Engineering) course in 1972. Over the years the syllabus and curriculum has been redeveloped several times to meet the needs of the changes that occur in the civil engineering industry. For each curriculum development, the overall philosophy of the curriculum is to provide an educational environment in which aspiring engineers will develop a sound grasp of engineering principles and their limitations, based on a thorough understanding of the underlying physical behaviour and laws; to combine technical competence with common sense, enabling them to gain indepth specialist knowledge to develop problem solving and conceptual skills; and an ability to apply such skills to solve real design and decision problems.

This emphasis of the courses is on the development of generic skills and a thorough grounding in engineering principles and their application. The key objective is the development of understanding, with a focus on Knowing Why, not simply Knowing How and Knowing What.

Undergraduate students attending lecture

The practice of civil engineering has changed and is changing dramatically. This is due to a number of external and internal factors. The external factors that impinge on the profession are :

- a high demand for development of facilities to serve an affluent society
- a sudden public sensitivity to environmental concerns
- rapid inflation and materials shortages

The internal factors affecting the profession are :

- much use of electronic computation
- new techniques for the efficient management and conduct of the construction process
- design incorporating systems analysis and the design team approach
- changes in the education of future engineers

Students undergoing registration process

The rapid technology advancements taking place in todays world, the ever changing socio-economic and political scenario as well as the demand on the professional Civil Engineer to take a leadership role not only the design team but in the social-political arena of the world in which we live serve to strengthened further the necessity for the civil engineering curriculum to be perpetually improved and updated.

The civil engineering curriculum of today must be flexible, not too standardized and emphasizing on things considered irrelevant to the current needs of the profession. Curriculum must be continually updated and developed in order to meet the challenge of producing graduates who are well qualified to enter this profession effectively and practice competently throughout their careers. In view of these needs, The Faculty of Civil Engineering, had embarked on curriculum development exercises in 1983, 1993 and 1996. The latest curriculum is being developed for the student of the year 2000 intake in order to improve further the quality of graduates produced by the University.

- The early years give a solid foundation in the behaviour and analysis of structures, civil engineering materials and fluids. The core years aim to provide the necessary education in the fundamentals of civil engineering and associated technologies to enable graduates to succeed at the highest levels in the profession. An important additional aim of the core years is to develop skills and nurture.
- Qualities relevant to professional engineering life
- The technical specialisation years aim to provide a foundation o f key technical knowledge relevant to general engineering practice around which students can build a specialised technical portfolio. An important goal of the specialisation years is to develop the ability in undergraduates to tackle

complex engineering projects of a multidisciplinary nature and of direct relevance to industry.

The total credit has been in the range of 159 – 163. These curriculum fulfills the basic requirements of the Institution of Engineers Malaysia and the Board of Engineer Malaysia. Each curriculum had also received feedback from the Faculty's Curriculum Advisory Panel whose members include representatives from Public Works Department, Department of Environment, Drainage and Irrigation Department, a few other professional bodies and consultant firms. A breakdown of the credits distribution (%) for undergraduate study is given in TABLE 2.1.

International graduate students taking a break at the Ferrocement Park

The Faculty of Civil Engineering also offers Diploma in Civil Engineering Course. The objective of the course is to train, educate and produce semi-professional graduates as Technical Assistants in the field of Civil Engineering. It aims is to develop Technical Assistants that are

TABLE 2.1 Breakdown of the credit distributions in subjects offered by the faculty for undergraduate study

CATEGORY / SUBJECTS		%
1.	Basic Sciences Mathematics Physics and Chemistry	15% - 20%
2.	GENERAL and Humanities Language Malaysian Studies Philosophy of Sciences / religious Co-Curriculum	15% - 20%
3.	SUPPORTING Mechanical and Electrical Systems Principle of Economics Computer skills	3% - 5 %
4.	CORE CIVIL Structures and Materials Hydraulics and Hydrology Geotechnique and Transportation Environment Construction Civil Engineering Laboratory Surveying	55% - 65%
5.	ENGINEERING ELECTIVES	7 % - 10%

knowledgeable, confidently experienced and skilled in planning, analysis, design and project supervision. The duration of the course is 3 years and the total credit hours has been in the range of 92-103. The breakdown of the credits distribution is given in TABLE 2.2.

TABLE 2.2 : Breakdown of the credit distributions in subject offered by the faculty for Diploma Programme

CATEGORY / SUBJECTS		%
1.	Basic Sciences Mathematics Physics and Chemistry	15% - 20%
2.	GENERAL and Humanities Language Malaysian Studies Philosophy of Sciences / religious Co-Curriculum	15% - 20%
3.	SUPPORTING Electrical Technology Computer skills	3% - 5 %
4.	CORE CIVIL Structures and Materials Hydraulics and Hydrology Geotechnique and Transportation Environment Construction Civil Engineering Laboratory Surveying	57% - 65%

Entry into the course has 3 levels. School level after SPM will be admitted into the first year. Graduates of Polytechnics will be admitted into the second year of the Diploma course, while Diploma graduates can enter directly into the third year of the B. Eng course. The entry requirements are as follows:

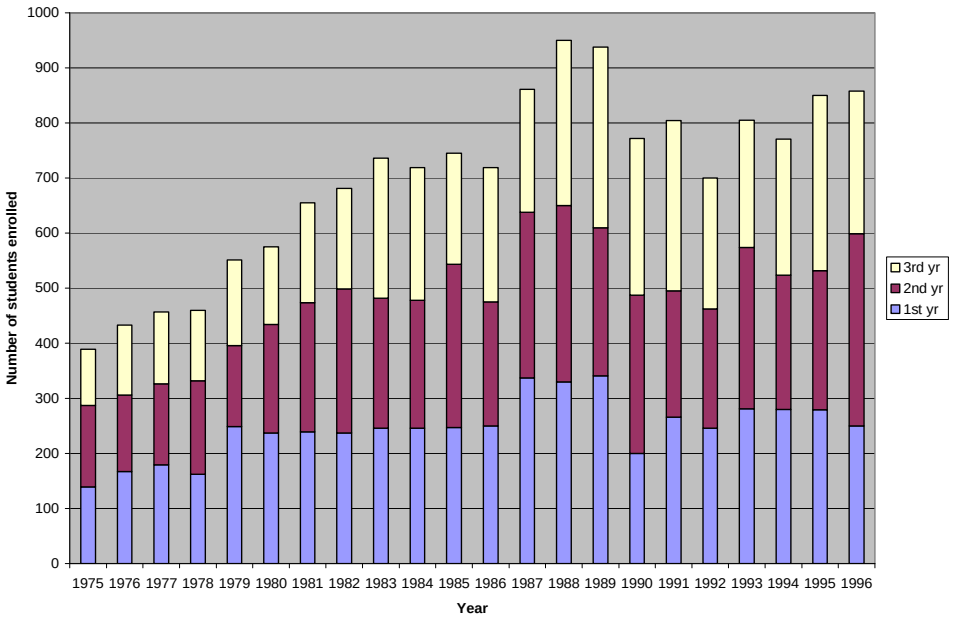
1999. From 1997 the Diploma course has been managed by the Diploma Education Centre based at the Kuala Lumpur campus.

However the standard and integrity of the course is still being scrufinised by the faculty. The full content of the curriculum used in Degree and Diploma courses listed in APPENDIX B1 and B2 respectively.

TABLE 2.3 : Entry Requirements

Entry qualification	Entrant Year	Diploma	B Eng
SPM	1st	3 credits	5 credits
Polytechnic Certificate	2nd	CPA > 2.7	N.A.
Diploma in CE	3rd	N.A.	CPA > 2.7

To date the Faculty of Civil Engineering has produced 2506 civil engineering graduates since its first graduates in 1977, and 5139 Diploma graduates from 1972 –



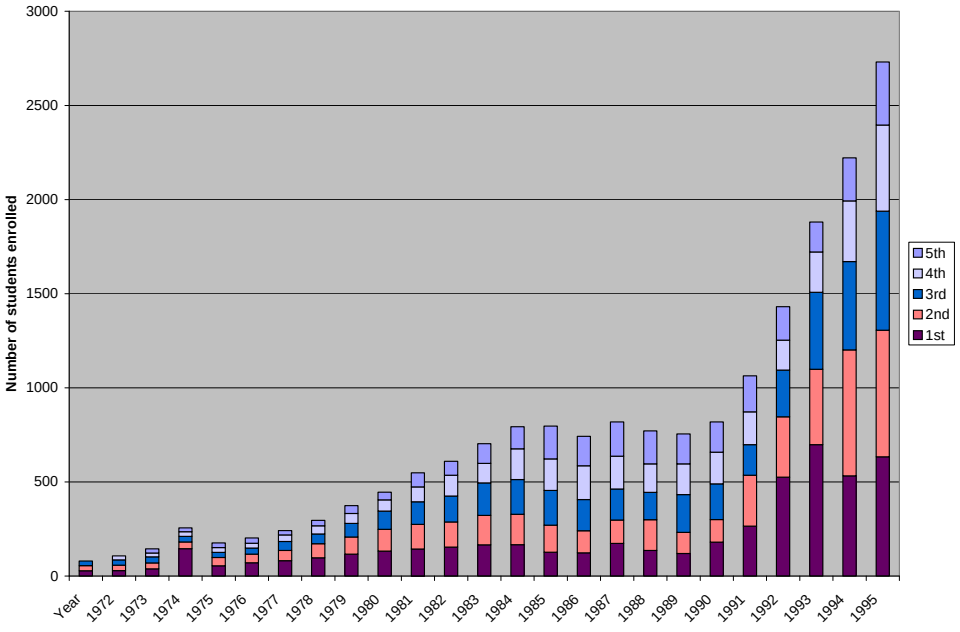


Figure 2.2 : B Eng. Students Enrolment

2.2 Postgraduate Studies

For a very long period since its establishment, the faculty had proven that it is capable in producing high quality civil engineers to fulfill the need of the country. However, as an institution of higher learning, the faculty could not ignore its duties to be excellent in promoting research and advanced knowledge in the field of Civil Engineering for the benefit of the country. It was realised that this could only be achieved through established postgraduate studies. The faculty has to develop a high quality program with adequate staffs and equipment in order to attract the enrolment of quality students from within the country and abroad.

The Faculty of Civil Engineering started its graduate program in 1981 when an army officer from the Ministry of Defence joined in as a part-time research student carried out a study on prestressed beams. The officer successfully completed his study and was awarded with a Master Degree in Structural Engineering in 1984. In 1987, the faculty had admitted two postgraduate students enrolled in the faculty as academic staff. After successful starts the faculty expanded its postgraduate programs very rapidly and received a very good response from students. In 1993 the Faculty of Civil Engineering created a

history by producing the first graduate with a PhD degree in Structural Engineering. In 1993, together with Renong Bhd., the faculty started a postgraduate diploma program to the trainees of the Second Link Project. The trainees were attached to the Second Link project and with the additional subjects offered by the faculty, the trainees were awarded with postgraduate diploma upon completion of the course. Starting from 1997 the faculty has conducted master program with the cooperation with the Indonesian universities.

During the first semester of 1999/2000 session a total of 127 enrol as postgraduate students in the faculty. 36 of them enrol in various master taught course programs. 27 students carry out research work at the PhD level and 64 students at master level. 19 of the students are from abroad such as Pakistan, Bangladesh, Japan and Middle Eastern countries. The full statistics of graduates since 1984 are shown in TABLE 2.4 and FIGURE 2.3.

Currently the faculty offers 11 programs for master by taught course in 4 major civil engineering fields i.e. structures, geotechnical, hydraulic and hydrology and environmental engineering. The programs of taught course and research are listed below.

Masters Taught Course Programmes Offered by the Faculty Since 1998.

Master of Engineering (M. Eng)

- Civil and Structural Engineering
- Civil and Environmental Engineering
- Geotechnical Engineering
- Transportation and Highway Engineering
- Structural Engineering
- Construction and Management
- Engineering Hydrology
- Irrigation and Water Resources Management
- Environmental Engineering Management
- Coastal and Maritime Engineering
- Wastewater Engineering

Master of Science (M.Sc)

- Construction Management (in collaboration with the faculty of Build Environment).

Research

Field of Research available in the Faculty are as follows :

(i) Structures and Materials

- Structural Engineering : Bridge, tall building, water retaining structure
- Ultimate Strength and Plastic Theory
- Structural Dynamics
- Civil Engineering Materials
- Construction Technology
- Construction Management
- Concrete Technology
- Structural Masonry
- Timber Technology
- Steel Design and Construction
- Computer Aided Design
- Reinforced and Prestressed Concrete

(ii) Hydraulics and Hydrology

- Ground Water Hydrology
- Water Resources Engineering
- River Engineering
- Erosion and Sedimentation
- Boundary Layer Atmosphere

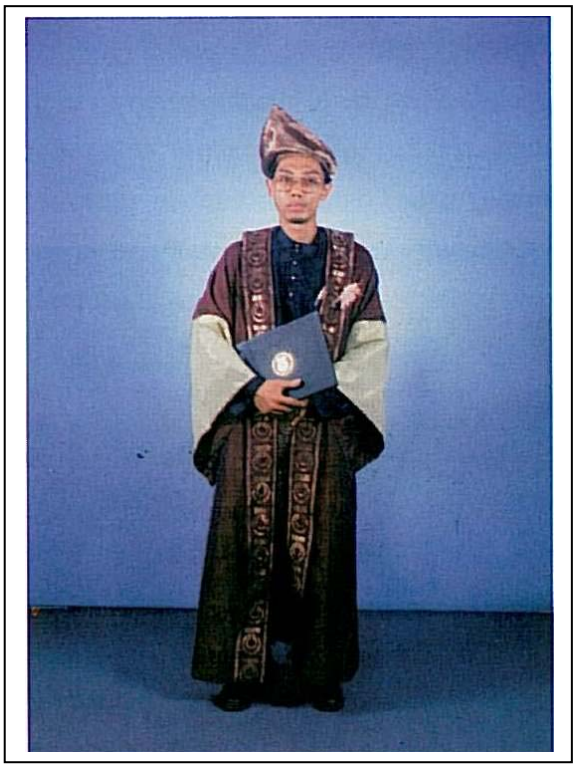
(iii) Geotechnics and Transportation

- Geotechnical Engineering
- Rock Mechanics
- Foundation Engineering
- Engineering Geology
- Transport Planning
- Highway Engineering

(iv) Environmental

- Water and Wastewater Treatment
- Solid and Hazardous Waste Management
- Environmental Studies

The course are conducted on full-time and part-time basis and also offered through modular system. The modular courses are conducted in major towns throughout Malaysia depending on the demand. The syllabus and curriculum has been drafted based on the need of the country and also prepared for the globalisation era. The programs are now very well received. For study through research the faculty currently has more than 60 academic staffs who are qualified to supervise research work at Master and Ph.D levels in all field of Civil Engineering. Research grants are available either from the government fund and industry. With the support of high qualified staffs and among the best equipments available in the world we are very optimistic that in the coming millenium the postgraduate studies program in the faculty will expand for the benefit of the nation and the region.



Assoc. Prof. Dr. Salihuddin Radin Sumadi the First Ph.d Graduate of the faculty

Three foreign students (Toshiro from Japan, Mazin from Iraq and Chalid from Indonesia) in the computer room of the Structural Lab

2.3 Part Time Programmes Through School of Professional and Continuing Education (SPACE)

Apart from conducting full time courses as our major core business, the faculty of Civil Enginnering actively participates in the off-campus programmes, which are managed by the School of Professional and Continuing Education (SPACE).

SPACE, approved by the Ministry of Education in July 1993, was set up with the aim to produce high quality manpower and human resources with excellent educational and training background. The manpower is needed to fulfill the local demand towards achieving industrial status by year 2020. SPACE is established with the philosophy that education is a life-long process. SPACE believes that if every individual has the intention and motivation to self-develop, he/she can be educated and trained, irrespective of age past educational performance. SPACE, as a centre of excellent in continuing education, helps to enhance and broaden opportunities in education and professionalism. It provides high quality courses with flexible management method.

SPACE coordinates with FKA in offering programmes in undergraduate levels. Its first intake comprised of about 100 students and was taught at two centers, the main campus, Johor Bahru at Skudai and campus KL at Jalan Semarak. Since then, the number of students applying for this program has increased to 313 in the following year. At present, the total number of students involved in this

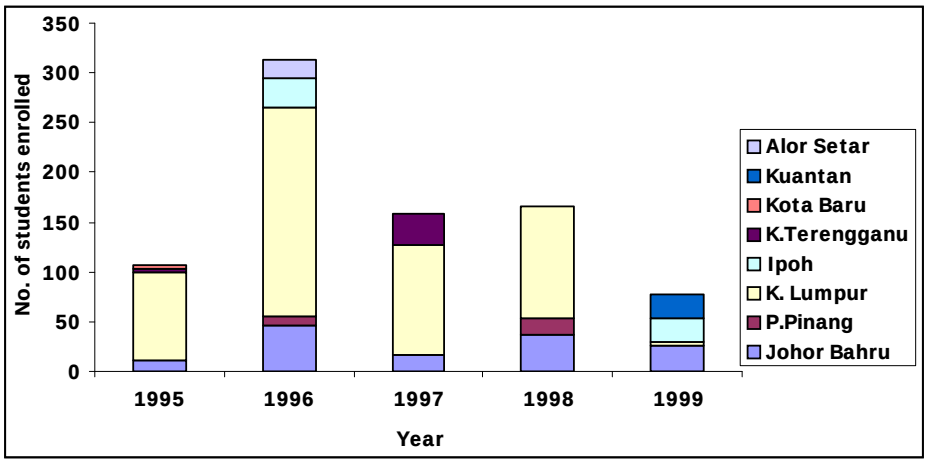


FIGURE 2.5 : Student Enrollment (1995-1999)
- Undergraduate Programme

program is 815 student. The number of centers opened for this program are also increased to other 6 new centers such as Penang, Ipoh, Kuala Terengganu, Kota Bharu, Alor Setar and Kuantan.

FIGURE 2.5 shows the number of student taken in each semester since 1995 to 1999 for degree courses under the SPACE program.

FKA is also coordinating with SPACE and Diploma Education Centre in offering Diploma courses at Johor Bahru, Penang, Kuala Lumpur, Kuala Terengganu and Kuching. The first Diploma courses started in 1995 with 52 number of students. Now the number of students enrolled for the diploma courses has increased to 461 students in 1999. FIGURE 2.6 shows the number of student enrols for diploma courses since 1995 to 1998. The curriculum used for the SPACE Program was based on the full time courses.

FKA with the assistance from the SPACE has successfully produced its first batch diploma programme of part time graduates in civil engineering in 1998. The total figure of graduates until 1998/99 session stands at 242.

2.4 External Examiners and Visiting Professors/Professionals

Since the establishment of the Technical School, Kuala Lumpur, external examiners and visiting professors/professionals have been appointed and invited to the department/faculty

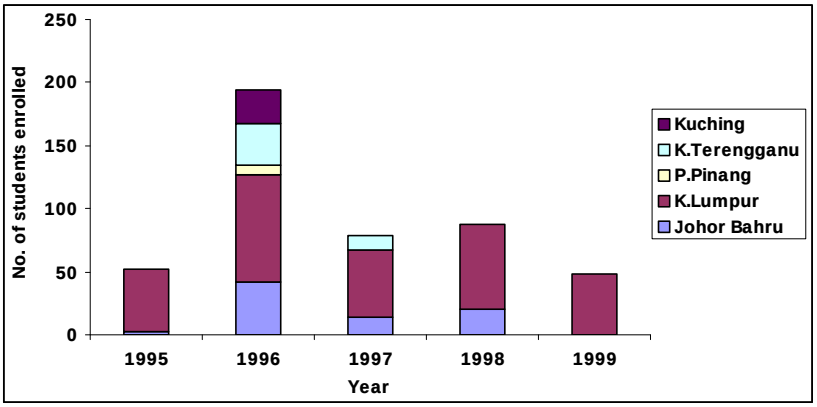


FIGURE 2.6 : Student enrolment (1995-1999)
- Diploma Programme

i) To advise and to give recommendation for the development of curriculum and syllabus of core and related subjects.

ii) To review and assess the quality of test/examination questions & solutions and students thesis and to provide guidelines and to comments on related matters/subjects

iii) To give lectures/seminars/short course/dialogue in related subjects or expertise to the academic staff and/or students

iv) To give an expert opinion and advise on the existing facilities/equipment

v) To assist or to give opinions in related researches

vi) To assist departments/faculty in related issues in an effect to get a recognition from a professional body/agency for any new courses that has not been recognised

vii) To encourage/promote collaboration between the department/faculty (FKA) and the faculty/department where the visiting professor/external examiner works.

Prior to 1975, the main tasks of any visiting professors/external examiners are to advise and to recommend for the development of curriculum and syllabus of core and related subjects and to assist department/faculty in an effort for the recognition of its diploma/degree programme. The late Prof. David Gemmel McKinlay of University of Strathclyde, United Kingdom was the main contributor in assisting the Department of Civil Engineering of Universiti Teknologi Malaysia to get the recognition of the diploma/degree programme in 1977 from the Board of Engineers, Malaysia (BEM), the Institution of Engineers, Malaysia (IEM) and the Public Services Department, Malaysia (PSD). He is the well-known academician from Strathclyde University, who played important role in the concept of the planning of the Faculty of Civil Engineering in Skudai, Johor. The late Professor Chin Fung Kee of Universiti Malaya and Professor J.V. Huddleston of State University of New York (SUNY) at Buffalo, USA, the external examiners/moderators, were also the main contributors in the recognition of our civil engineering programme (1972 – 1982). Prof. David G. McKinlay was re-appointed as an external examiner (overseas) for the faculty for the 1982–1986 period, in which, the undergraduate programme of the Faculty of Civil was awarded a 8-year recognition from Board of Engineers, Malaysia, the Institution of Engineers, Malaysia (IEM) and Public Services Department, Malaysia (PSD) from 1982 to 1990. Mr. Wan Mohamed Ismail and Mr. Syed Mohamad Shahabudin of Association

of Consulting Engineers, Malaysia (ACEM) was appointed as the local external examiner in 1983–85 and 1985–1986, respectively. Prof. P. G. Lowe of University of Auckland, New Zealand was appointed as the second external examiner (overseas) in 1990. Some prominent visiting professors/professionals were :

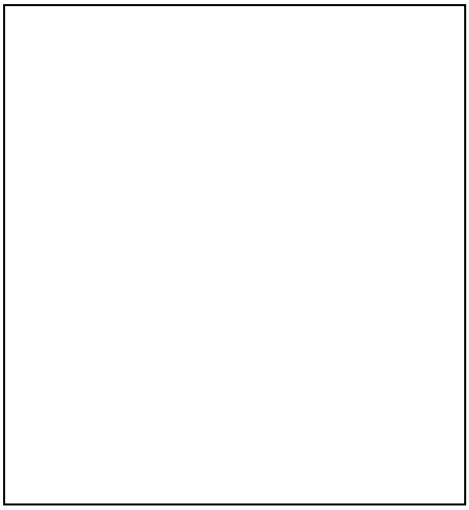
i. Prof. R.N. Swamy – expert in structural materials, University of Sheffield, United Kingdom
ii. Prof. Leroy Z. Emkin – founder of GTSTRUDL, Georgia Technological University, USA
iii. Prof. G. K. Anderson – expert in environment engineering, University of Newcastle Upon Tyne, United Kingdom
iv. Prof. Kiyisho Kono – expert in hydraulics and offshore studies, University of Tokushima, Japan.
v. Prof. B. G. Clarke – expert in soil stabilisation/reinforcement, University of Newcastle Upon Tyne, United Kingdom
vi. Prof. Bernhard A. Schrefler – expert in environmental geomechanics and numerical methods, University of Padua, Italy
vii. Prof. Age Van Randen – expert in open building system research, Delft University, Netherlands

Lists of the visiting professors/professionals incorporated with the faculty since 1995 are as shown in APPENDIX B3.

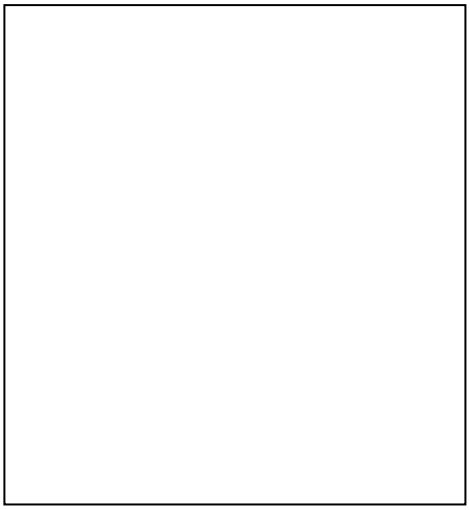
2.5 Student Exchange Programme

The student exchange programme at the Faculty of civil Engineering has been actively promoted in the early 1990's. One of the main objectives of the programme is to promote research collaborations between the faculty and other foreign institutions/universities. For example, in 1995, four students from the University of Newcastle Upon Tyne did their M.Sc projects at the Faculty of Civil Engineering, Universiti Teknologi Malaysia for 3-4 months under the co-supervision of Prof. G.K.Anderson (University of Newcastle Upon Tyne, United Kingdom and Prof. Dr. Mohd. Azraai Kassim (Universiti Teknologi Malaysia).

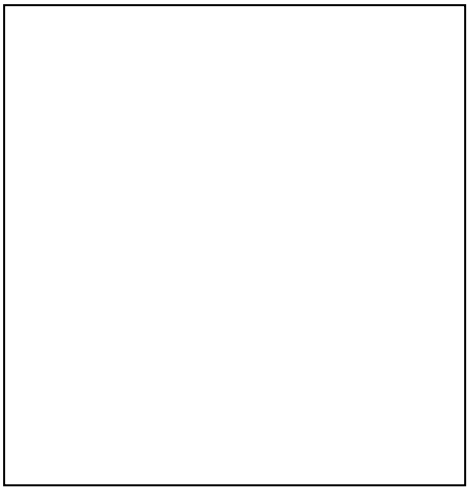
In 1999, there were three students from Denmark spent a few months as visiting students/researchers at the Institute of Environment and Water Resources Management (IEWRM), Faculty of Civil Engineering, UTM under the coordination of Assoc. Prof. Dr. Zaini Ujang. Table 2.5 show a full lists of exchange student undertake this programme since 1995.



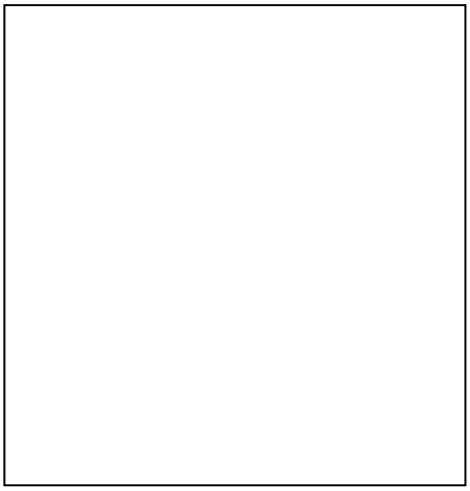
Helping hands from Joanne Casey and Mary Farrel at the registration table for a short course organised by the IEWRM in 1999



Tina Nielsen and Silas Mogensen were in Malaysia from February to September 1999.



Morten Larsen of the Technical University of Denmark at work.



Students from the University of Newcastle Upon Tyne in discussions with the Dean of Faculty of Civil Engineering, UTM

TABLE 2.5 : **Lists of students involved in the student exchange programme.**

Name	Title of project	Supervisor/s	Year
Andrew Rochester*	The Treatment of Palm Oil Mill Effluent using a Pilot Scale RBC	Prof. Dr. Mohd. Azraai Kassim and Prof. Dr. G. K. Anderson	1995
Sebastian Head*	A Study on Aerobic Pilot Scale RBC Palm Oil Mill Effluent Treatment in Malaysia	Prof. Dr. Mohd. Azraai Kassim and Prof. Dr. G. K. Anderson	1995
Ourania Tsoumani*	Removal of Colour in Textile Effluent using a Pilot scale Reverse Osmosis	Prof. Dr. Mohd. Azraai Kassim and Prof. Dr. G. K. Anderson	1995
Jayne Preece*	A Study on the Aeration of the Oxidation Pond at the Universiti Teknologi Malaysia	Assoc. Prof. Dr. Mohd. Razman Salim and Prof. Dr. G. K. Anderson	1995
Emily Payne*	Domestic Wastewater Treatment using Reed Beds	Prof. Dr. Mohd. Azraai Kassim, Prof. Dr. G. K. Anderson and Dr. Mohd. Ismid Said	1996
Alan Stewart*	Solid Waste Recycling in Johor Bahru	Assoc. Prof. Dr. Mohd. Razman Salim and Prof. Dr. G. K. Anderson	1996
Mary Hussey*	Treatment of Textile effluent using Biological Aerated Filters (BAF)	Prof. Dr. Mohd. Azraai Kassim and Prof. Dr. G. K. Anderson	1997
Edwina Heavy*	Leachate Treatment using Constructed Wetlands	Prof. Dr. Mohd. Azraai Kassim and Prof. Dr. G. K. Anderson	1997
Alison Blackshaw*	Hazardous Waste in Johor Bahru	Assoc. Prof. Dr. Mohd. Razman Salim and Prof. Dr. G. K. Anderson	1997
John Edward McCormack*	Two-Stage Anaerobic/Aerobic Biological Treatment of a Textile Effluent and Selected Dyes	Prof. Dr. Mohd. Azraai Kassim and Prof. Dr. G. K. Anderson	1998
Daniel Stewart Ledger*	Assessment of Aeration in Improving River Water Quality	Prof. Dr. Mohd. Azraai Kassim and Prof. Dr. G. K. Anderson	1998
Steve D. W. Hunt*	Improvement of Water Quality in Sungai Terip Reservoir through Aeration	Prof. Dr. Mohd. Azraai Kassim and Prof. Dr. G. K. Anderson	1998
Kevin Patrick Kelly*	An Environmental Management Plan for the Straits of Johore and the Johor Bahru Waterfront City	Assoc. Prof. Zainudin Mohamed Shamsudin and Prof. Dr. G. K. Anderson	1998

Name	Title of project	Supervisor/s	Year
Sally Wong*	Using Micronutrients to Enhance Wastewater Treatment	Prof. Dr. Mohd. Azraai Kassim and Prof. Dr. G. K. Anderson	1999
Mary Frances Farrell#	Virtual Reality Simulation of Sanitary Landfill Site	Assoc. Prof. Dr. Zaini Ujang	1999
Joanne Casey#	Virtual Reality Simulation of Sanitary Landfill Site	Assoc. Prof. Dr. Zaini Ujang	1999
Jaroonsit Chantrahada*	The Effects of Agricultural Fly Ash on Turbidity Removal from Water Sample	Assoc. Prof. Dr. Fadil Othman and Prof. Dr. G. K. Anderson	1999
Silas Blak Mogensen •	Distribution and Health Risk of Arsenic and other Compounds Related to Abandoned Tin-mining Pools in Malaysia	Assoc. Prof. Dr. Zaini Ujang and Prof. Dr. T. C. Tjell	1999
Tina Mundeling Nielsen •	Distribution and Health Risk of Arsenic and other Compounds Related to Abandoned Tin-mining Pools in Malaysia	Assoc. Prof. Dr. Zaini Ujang and Prof. Dr. T. C. Tjell	1999
Kirsty McHugh#	River Classification Based on Water Quality	Assoc. Prof. Zainudin Mohamed Shamsudin	1999
Joanna Lambert#	Dye Treatment from Textile Industry	Azmi Aris	1999
Morten Larsen •	Reclamation and Reuse of Wastewater at Universiti Teknologi Malaysia Campus	Assoc. Prof. Dr. Zaini Ujang and Prof. Dr. Mogens Henze	1999

*Co-supervision under CICHE Collaborative Research Projects with Department of Civil Engineeering, University of Newcastle Upon Tyne, United Kingdom

Students from Strathclyde University, Scotland, United Kingdom

• Students from the Technical University of Denmark under the Malaysian Universities' Consortium of Environmental Development (MUCED) – Denmark Universities' Consortium of Environmental Development (DUCED) collaboration programme

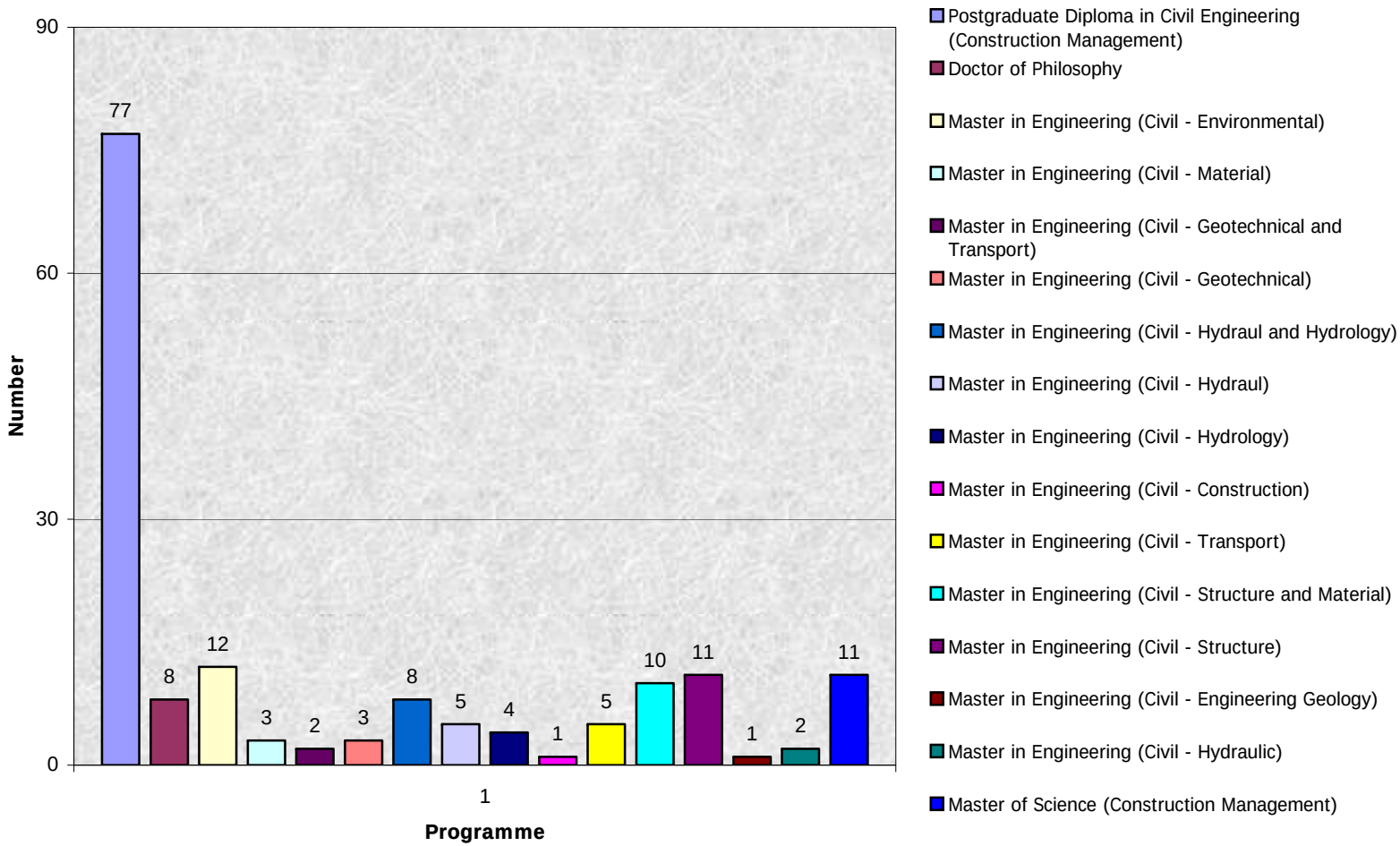


FIGURE 2.3 : The Statistics of Postgraduate Students Graduating From 1984 to 1999

TABLE 2.4 : The Statistics of Postgraduate Students Graduating From 1984 to 1999
D : Local Student L : Foreign Student

COURSES	1984		1988		1989		1990		1991		1992		1993		1994		1995		1996		1997		1998		1999		TOTAL	
	D	L	D	L	D	L	D	L	D	L	D	L	D	L	D	L	D	L	D	L	D	L	D	L	D	L	D	L
Postgraduate Diploma (Construction Management)																			17		34		26				77	
Doctor of Philosophy															3		1						2	1	1		7	1
Master of Engineering (Civil-Environment)											2		1		2		2		1				3		1		12	
Master of Engineering (Civil-Material)															1				1							1	2	1
Master of Engineering (Geotechincal & Transportation)							2																				2	
Master of Engineering (Civil-Geotechnics)									1						1									1			2	1
Master of Engineering (Civil-Hydraulics and Hydrology)							3		2		1		2														8	
Master of Engineering (Civil-Hydraulics)						2			2																	1	2	3
Master of Engineering (Civil-Hydrology)															2				1				1				4	
Master of Engineering (Civil-Construction)							1																				1	
Master of Engineering (Civil-Transportation)									1		1		1		1								1				5	
Master of Engineering (Civil-Structure and Material)					1		1						3		2										2	1	9	1
Master of Engineering (Civil-Structure)	1				3				1						1		2				1			1		1	9	2
Master of Engineering (Civil-Engineering Geology)																					1						1	
Master of Engineering (Civil-Hydraulics)																						1	1				1	1
Master of Science (Construction Management)																									1	10	1	10
																								TOTAL :			143	20