Wind energy lectures and student supervising at the Asian Institute of Technology Bangkok, Thailand

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WIND ENERGY LECTURES AND STUDENT SUPERVISING
AT THE ASIAN INSTITUTE OF TECHNOLOGY
BANGKOK, THAILAND

E.H. LYSSEN*

November 1981

Steering Committee
Wind Energy
Developing Countries

*Wind Energy Group
Laboratory of Fluid Dynamics
and Heat Transfer
Eindhoven University of Technology
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WIND ENERGY LECTURES AND STUDENT SUPERVISING
AT THE ASIAN INSTITUTE OF TECHNOLOGY, BANGKOK

Periods: 3 - 21 June 1980: Introductory course
21 - 29 November 1980: Preparation two thesis
15 May - 25 July 1981: Introductory course Advanced course
Supervising two thesis

At: Energy Technology Division (ET)
Asian Institute of Technology (AIT)
Bangkok, Thailand

By: E.H. Lysen (SWD)

Funds: Netherlands Minister of Development Cooperation

1. Introduction

After first contacts in Bangkok in 1977 dr. R.H.B. Exell of AIT has invited Lysen of SWD in 1979 to give a wind energy course for the newly formed Energy Technology Division of AIT. This introductory course of 12 lecture hours has been given in June 1980, supplemented by 3 lectures by drs. B. de Vries (Groningen State University) on economics of wind energy and general energy aspects.

In 1981 the introductory course has been repeated, followed by an advanced course of 24 hours, both upon request by prof. G.Y. Saunier, chairman of the ET Division. At the same time the thesis work of two students, who had followed the 1980 course, was supervised (see section 6). These two students graduated in August 1981 as the first M.Sc. graduates of the ET Division.
2. Number of students

Both introductory courses were attended by all junior ET students (18 in 1980 and 18 in 1981). The advanced course in 1981 was attended by 9 junior students and 6 senior students, of which 4 as auditor. In 1980 the introductory course was not obligatory, but all students attended, and in 1981 it had become a part of the curriculum course ET 11 on Solar and Wind Energy (value: 1 credit point). The advanced wind energy course ET (98B) was optional (value: 2 credit points)*).

There was quite some interest from Thai universities and from the National Energy Administration to attend the lectures. It was a pity that the AIT official regulations in these matters did not permit outsiders to attend courses. It would be advisable to review these regulations, to see whether in special cases exceptions could be made.

3. Duration of the courses

At a request by SWD the first introductory course in 1980 of 12 lecture hours has been compressed from 4 weeks to 2 weeks. Because many courses at AIT are given in parallel and because the examination of this wind energy course had to take place the day after the last lecture, this period of 2 weeks turned out to be a rather heavy load for both students and teacher. This is why in 1981 the introductory course covered 3 weeks and the subsequent advanced course (24 hours) covered 6 weeks. The examinations took place roughly 3 days after the last lecture. This change proved to be satisfactory.

*) Note: The duration of a complete AIT curriculum is 20 months, during which a minimum of 36 credit points must be reached.
4. Lecture material

The lecture material in 1980 consisted of SWD publication 78-3 "Matching of wind rotors to low power electrical generators", supplemented by oral presentations, slides and transparencies. In 1981 the students received typed hand-outs before each lecture period of 2 hours. Some of these lecture notes had been written before, in the Netherlands, but most of them were written each week before the lecture and typed and copied by the secretaries of the Energy Technology Division.

All lecture notes together form a fairly complete introduction to SWD's knowledge and experience in wind energy engineering (except construction details). This first draft has been printed in Eindhoven (30 copies) to be subjected to comments of the SWD-participants and members of the ECN national wind energy programme. After modifications it will be published in the beginning of 1982 as SWD-publication 82.1, entitled "Introduction to Wind (basics and advanced)". The contents of the draft are given in Annex C.

5. Response of students and staff

The response of both students and staff to the wind energy courses was quite positive. There are a number of examples to illustrate this.

All Energy Technology students attended the introductory course, which was optional in 1980. Many requests from outside AIT to attend the course (universities, energy agencies) had to be refused (see section 2).

Two of the students of the 1980 group decided to devote their thesis to wind energy, although no regular advisor was present so most of the initiatives had to be taken by themselves. After
the 1981 courses even 4 students choose for a wind energy thesis, more or less under the same conditions. They are writing regularly to Eindhoven about the progress of their preparation and receive advice and necessary information (November 1981).

The AIT staff repeatedly requested me to join the ET Division on a long term basis, a possibility excluded because of the demands of SWD. The chairman of the ET Division, prof. Saunier, is currently pressing SWD very hard to find a suitable candidate for this position, after the positive decision of the Netherlands Government to release funds for a two-year secondment of a Dutch faculty member.

My personal experience in working with the students and the staff is very positive. There was a very warm and open relationship with the students, inside and outside the lecture rooms. Students easily came with problems they met, facilitated by the fact that I lived on the campus in 1981 and they knew where to find me. Even some students with non-wind thesis came to discuss problems they encountered. I have learned quite a lot in working and discussing with them, and the fact that I still exchange letters with the students who have finished already, confirms the good relationships we established.

6. Two thesis on wind energy

During the introductory course in 1980 two wind energy thesis proposals were discussed, which were finalized during the short visit in November 1980. The students involved were quite active in student organisations and accustomed to take initiatives by themselves; reason for the staff to agree upon the unusual situation of a distance of 10,000 km between students and main advisor. Their names and thesis subjects were:
Mr. P. Mukhia: Performance and aerodynamic analysis of the Thai four-bladed wooden waterpumping windmill.

Mr. J.M. Iqbal: Performance and aerodynamic analysis of the Sanit multibladed waterpumping windmill.

Reason for these subjects was the fact that these two windmills are available in Thailand, but hardly anything was known about their performance. Before starting to design new windmills, as is the normal desire of any wind energy student, I stressed the need to analyse the existing machines first and to modify later on.

The study on the four-bladed Thai windmill involved visits to the Chachoengsao area (east of Bangkok) where hundreds of these machines are in operation in the summer months. A windmill plus ladderpump was ordered locally and installed at the AIT energy park, at some distance from the commercial Sanit multibladed windmill. The latter was installed by the manufacturer for the energy systems exhibition "Solex 80" at AIT and left there for testing purposes.

Upon my arrival in May 1981 the students had finished the introductory and theoretical parts of their thesis more or less and were carrying out the first field tests. The measurement procedures were checked and refined and long series of data were taken by hand. A test set-up for the ladderpump of the Thai rotor was designed and built, to be driven separately by a diesel engine (of a tractor available at AIT) to determine its characteristics. Windtunnel tests of the airfoils of the two wind rotors could not be carried out elsewhere, so an existing old windtunnel of AIT had to be repaired and calibrated specifically for this purpose. The latter took a few extra weeks of hard work, but gave an immense experience to the students.
The last few weeks of the thesis work, which had to be finished before my departure, were hectic. Checking hundreds of data, writing computer programmes, editing texts etc., but 2 completely typed drafts were ready at the day of the examination, 22 July 1981. Both succeeded with the result "good" and were graduated in August as the first graduates from the Energy Technology Division.

7. Future

The Energy Technology Division of AIT is currently pressing heavily to second a Dutch wind energy faculty member, as soon as possible, now that the Dutch Government has decided positively in this matter. Four students are engaged in a wind energy thesis, to be finalized summer 1982 and although they partly can be supervised by the present AIT staff members and by outside experts in the region they would greatly benefit from an early arrival of the Dutch expert.

His task will be to give regular courses on the various aspects of wind engineering, both theoretical and practical, develop lecture material, laboratory tests, measurement equipment etc. He shall also establish good contacts with the Thai universities, with the National Energy Administration and the ministries involved and with local industries. Outside experts will be invited to lecture on special topics. Institutes and ministries in Asian countries will be encouraged to participate in the thesis subjects of their country men at AIT. This is the case for example with the Sri Lankan student who is now carrying out a study on the integration of hydro and wind power in Sri Lanka and is supported by the Sri Lankan Electricity Generating Board and the Wind Energy Unit of the Water Resources Board in Colombo.

The SWD is quite willing to fulfill a backstopping function for the Dutch wind expert at AIT.
ANNEX A. Lecture schemes

Introductory course: Sa 16 May 1981 Arrival
ET 11
We 20 May 1981 Introduction
Analysis wind regimes
Mo 25 May 1981 Power and energy output
Rotordesign
We 27 May 1981 Pumps
Coupling pumps and rotors
Mo 1 June 1981 Generators
Coupling generators and rotors
We 3 June 1981 Matching windmills and wind regimes, output calculations
Fr 5 June 1981 Measurements; safety systems
Economics
Mo 8 June 1981 Examination

Introductory course: We 4 June 1980 Arrival
ET 98
Fr 6 June 1980 Introduction
Analysis wind regimes
Tu 10 June 1980 Power and energy output
Rotordesign
Th 12 June 1980 Pumps
Coupling pumps and rotors
Fr 13 June 1980 Generators
Coupling generators and rotors
Tu 17 June 1980 Measurements
Forces, moments, safety systems
Th 19 June 1980 Economics (De Vries)
Fr 20 June 1980 Examination
Fr 20 June 1980 Departure
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<td>Advanced course: ET 98 B</td>
<td>Th 11 June 1981 Mathematical representation of wind regimes</td>
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<td>Aerodynamics</td>
<td>We 17 June 1981 Aerodynamics</td>
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<td>Fr 19 June</td>
<td>Aerodynamics</td>
<td>Fr 19 June 1981 Aerodynamics</td>
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<tr>
<td>We 24 June</td>
<td>Pumps, dynamic effects</td>
<td>We 24 June 1981 Pumps, dynamic effects</td>
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<td>Fr 26 June</td>
<td>Coupling pumps and wind rotors</td>
<td>Fr 26 June 1981 Coupling pumps and wind rotors</td>
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<tr>
<td>We 1 July</td>
<td>Coupling generators and wind rotors</td>
<td>We 1 July 1981 Coupling generators and wind rotors</td>
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<td>Fr 3 July</td>
<td>Output and availability</td>
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<td>Forces and moments</td>
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   6.1 Description and example
   Advanced: 6.2 Mathematical description windmill output
   6.3 Starting behaviour
   6.4 Piston pumps with a leakhole
   6.5 Starting behaviour including leakhole

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   7.3 Comparison of SM and AM
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   8.2 Designing a rotor for a known generator
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11. Safety systems
    11.1 Overview of different safety systems
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    11.3 Centrifugal governor
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    12.2 Elementary economics
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    12.4 Costs of a diesel powered pump
    12.5 Comparison of wind and diesel costs

13. Literature

14. Questions

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B:
C:
ANNEX C. Examinations

ET.98: Wind and Solar Energy

A.1 Give a simple approximation formula to predict the output of
(a) a waterpumping windmill
(b) an electricity generating wind turbine

A.2 Give your choice for \( V_{\text{cut-in}} \), \( V_{\text{rated}} \), \( V_{\text{furling}} \) and \( V_{\text{design}} \) of a waterpumping windmill in a wind regime with an average wind speed of 3 m/s.

A.3 If you had to design a rotor to drive a reciprocating piston pump what did you choose:
(a) for the tip speed ratio: 1, 2 or 4?
(b) for the number of blades: 2, 4 or 8?

A.4 Give a formula to calculate the windspeed at a height \( H \) with respect to the windspeed at 10 m height, for open and flat rural areas.

A.5 Give two functions of an airchamber.

A.6 Give a formula for the maximum capital cost of a wind turbine, delivering \( E \) kWh/year during \( T \) years at a replacement cost of 1 Baht/kWh when the discount rate is \( r \) (neglect inflation).

B.1 A rotor with a diameter of 3 m operates at a rotational speed of 10 rad/s and a power coefficient of 0.3 when the windspeed is 7.5 m/s.

Determine
(a) its tip speed ratio
(b) the torque of the rotor

B.2 If a double acting piston pump has a diameter \( D \), a stroke \( s \) and it operates at a total head \( H \) with a rotational speed \( \omega \), give expressions for:
(a) the maximum torque
(b) the average torque

Assume that the volumetric efficiency of the pump is 100%
B.3 The following frequency distribution is taken from data of Haryai August 1974. Determine the Weibull form factor K with the help of the attached Weibull probability paper.

<table>
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<td>4.8</td>
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<td>9.2</td>
<td>7.0</td>
<td>2.5</td>
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<td>17.1</td>
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<td>11.6</td>
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B.4 A tailvane with dimensions 2 x 1 m, at a given moment experiences an angle of 30° with the wind direction. If the lift coefficient of a flat plate is given to be 0.9 at α = 30° then determine the normal force on the vane (driving the vane back to the α = 0° position) at a windspeed of 7 m/s.

C.1 Describe the essential steps of the matching procedure of a rotor and a generator (without formulas) and explain a fundamental difference with respect to the matching of a rotor with a reciprocating piston pump.

C.2 Discuss the advantages and disadvantages of the utilization of wind energy for rural areas.

EHL/nt
19th June 1980
A.1 Generally windmills are classified as being either horizontal axis or vertical axis types. Are there any other types and if so, give one example.

A.2 The maximum power coefficient of an ideal wind rotor is usually related to the undisturbed flow of air reaching the swept area of the rotor and has a value of 16/27. If one wishes to relate the power coefficient to the real mass flow through the rotor instead, what is its maximum value in that case?

A.3 If the owner of a Ø 5m wind rotor wants to change his rotor in order to arrive at the same output in a 20% lower wind speed, which diameter rotor does he need?

A.4 Estimate the annual output of a Ø 3m diameter waterpumping windmill, operating in a wind regime with an annual average wind speed of 4.5 m/s, if the windmill pumps at a head of 12m.

A.5 What is the minimum CD/CL ratio needed to find a maximum power coefficient of at least 0.4 for a four-bladed wind rotor with λ_d = 5?

A.6 Give three methods to decrease the design wind speed of a waterpumping windmill by 20%.

B.1 Estimate the maximum annual output of a Ø 5m waterpumping windmill, operating in the Hambantota wind regime (assume k=2). The following data are given: head: 10m, V_r/V = 2, maximum overall efficiency is 0.2, λ_d=2 and the output curve is assumed to be linear. Determine also the necessary design wind speed and the necessary stroke for a single-acting piston pump with a diameter of 0.2 m.

B.2 A square flat plate in a flow of air experiences a force in a direction normal (perpendicular) to the plate, irrespective of the angle of attack. The normal force coefficient C_N is a linear function of α, with C_N = 0 at α=0 and C_N=1.6 at α=40°. If the square flat vane of a windmill, dimensions 2x2 m, experiences a wind speed of 5 m/s, calculate the force that drives the vane back to its equilibrium position if at a given moment its deviation angle is 30°.
B.3 Calculate the design velocity of a wind turbine with an output characteristic given by:

\[ P(V) = \text{constant} \cdot (V^2 - V_{in}^2) \quad \text{for } V > V_{in} \]

B.4 A designer wants to mount a \( \phi \) 10 m wind turbine on top of a 12 m high pipe to serve as a tower. If the wind turbine must be able to survive gusts up to 20 m/s, which size pipe (outer and inner diameter) do you advise him to use?

B.5 Calculate the starting wind speed of a wind turbine with the following data:

rotor: \( \lambda_d = 6 \quad D = 10 \text{ m} \)

transmission: \( i = 8 \)

generator: \( Q_{\text{start}} = 5 \text{ Nm} \)

C.1 Why is the coupling of a generator to a wind rotor so much more complicated than coupling a pump to a wind rotor? Indicate the aim of the coupling procedure in one sentence.

C.2 Why is it necessary to possess the \( C_a \) - \( \alpha \) curve of a profile if one wishes to design a blade with a constant chord for a wind rotor?

C.3 A waterpumping windmill usually has a low efficiency at high wind speeds. Why is this and which solution do you propose to solve this drawback?
1. If a piston pump with a stroke of 0.2 m must be operated at speeds up to 2 rev/sec, which type of damage might possibly occur? Give your solution to prevent the danger.

2. Give an expression for the thrust coefficient $C_T$ and the power coefficient $C_p$ of an ideal wind rotor as a function of the axial induction factor. Determine their value at maximum power extraction and draw their graphs.

3. Estimate the dimensionless energy output $e$ of a waterpumping windmill (constant torque load) in a wind regime system with a Weibull factor $k = 2$ and an average wind speed of 5 m/s, if the windmill has a design speed of 5 m/s, a rated speed of 9 m/s and an infinite cut-out speed.

4. The Weibull velocity distribution function $f(V)$ has a maximum. Derive an expression for the wind speed $V_m$ at which this maximum occurs and estimate the value of the Weibull shape $m$ factor $k$ for which $V_m = \bar{V}$, in which $\bar{V}$ is the average wind speed of the velocity distribution.

5. Calculate the leak flow of a piston of $\phi 0.1$ m with a leakhole of $\phi 3$ mm and length 6 mm, operating at a head of 10 m. If the pump starts pumping water at a speed of 0.25 rev/sec, what is its stroke?

6. Estimate the minimum volume of an airchamber for a piston pump with a suction line of 100m length, pipe diameter 5 cm, total suction head 4 m, when the minimum observed pump speed is 0.15 rev/sec.

7. Give a mathematical expression to approximate the water output of a water pumping windmill as a function of the wind speed $V$ if the output at the design speed of 3 m/s is measured to be 1 liter/sec, while at 6 m/s the output has increased to 2.9 liter/sec.

8. Describe the effect of fitting springs to the valves of a reciprocating piston pump, in such a way that the springs tend to push the valves back to their closed position.

P.T.O. Questions 9 and 10 !!!
9. A hinged vane safety system is meant to keep the rotor of a windmill into the wind at low wind speeds and to turn it out of the wind at high wind speeds. If one could suddenly decrease the angle $\varepsilon$ between the hinge axis and the vertical axis to a value of zero, what would be the effect? And what would be the behaviour of the system if the angle $\varepsilon$ would be increased to twice its original value?

10. Calculate the payback time of a windmill costing $2000, with annual operation and maintenance costs of $50/year, when the rate of interest is 15% and the general inflation rate (also for O&M costs) is 10%. It is assumed that the benefits of the windmill consist only of the saving of a yearly amount of 600 liter of fuel. The fuel costs are $0.50 per liter of fuel, increasing at a rate of 10% per year.
ANNEX D. Highlighting ET Division

astech presents: ET

THE DIVISION OF ENERGY TECHNOLOGY.

Some Americans are searching for the villain who can be blamed for energy shortages and higher prices. Some blame the oil companies, others the federal government, while the others blame the Arab governments or the environmentalists. The most convenient targets are: the energy industry, the federal government, and the environmentalists. As seen by their adversaries, the first conspires, the second bungles, and the third obstructs. The first is a knave, the second a fool, and the third a dreamer.

The first is a knave, the second bungles, and the third obstructs. The energy industry is no less dissimilar but may even be climaxing due to rapid industrialisation.

Energy, undoubtedly, is the source of life, wealth, and quality. It is the measure of living standards. Our profligacy with energy in the past is truly condemning. Random deforestation, rapid unheeded depletion of oil reserves, unrealistic policies, have now burdened the society to search for substitutions and alternatives. That once cheap and abundant energy is now no more. The spiralling costs and rocketing demands of energy is apparently shaking the very foundations of political stability, economic prosperity, and national development of many a country. Even so, the Asian countries, already with the balance of payment deficits aggravated by the quadrupling of the oil prices, face serious energy problems in the near future.

If this decade was to be dedicated to any particular happening, it would aptly suffice as an "Energy Conscious Decade".

THE BEGINNING

In 1976, President Robert B. Banks proposed that a new Division of Energy Resources Engineering be established in AIT. With the appointment of Dr. Fuji, I and Dr. Robert H. B. Exell as co-chairmen of the subcommittee of the ARDC in February 1978, the ball was in play. Five consultants were approached namely; Professor E.W. George (Vice-Chancellor of the University of Newcastle and Chairman of the Australian Atomic Energy Commission), Mr. Prapat Premani (Director of Technical Division of the National Energy Administration of Thailand), Professor J.P. Harnett (Director, Energy Resource Centre, University of Illinois), Professor Yasuo Mori (Department of Physical Engineering, Tokyo Institute of Technology), and Professor Ian Fells (Professor of Energy Conversion, University of Newcastle upon Tyne). Firm recommendations were given by all the consultants for the establishment of an energy program in AIT. "AIT's involvement in this field is important and by taking the initiative in setting up the program AIT can play a leadership role in Asia. The achievement of the special inter-disciplinary coverage envisaged in the absence of readily available models in Western Universities would be original and notable," commented Prof. George.

Prof. Fells reported, "It is clear from talking to people from ESCAP that there is a shortage of properly qualified people for this purpose (understanding of special problems regarding energy). They will be required for energy planning, for negotiation with international energy companies, for the development of alternate indigenous energy supplies, for energy education, etc., at a national level."

The objective of the division was then laid down as "to produce graduates with a broad knowledge of the energy field and profound knowledge in a selected area (renewable energy resource, energy planning and energy conservation), the main thrust being towards the application of the thermal sciences to the practical energy systems for Asia."

After a thorough compilation of drafted documents by Dr. Exell, the digest of the consultants report, philosophical principles, curriculum outlines, name of division, fields of study, staff recruitment schemes, the Division of the Energy Technology came into life in January 1980, the Dawn of the Decade.

THE DIVISION PROFILE

Facilities and Division Affairs: Two terms over and it shrouded with plans, actions, more plans, more actions. Sprouting from a meagre one-roomed office and a few more for the faculty, no lab, no internal library, the division now has a brightly-painted temporary laboratory in the WRE division, a French wind generator spinning behind RCC, Solar refrigerator and several solar dryers in the AFE compound. With a considerable grant from the German government for the Energy Division Building, plans are off the drawing table and work has started on the complex. Soon the division will be having one of the most elegant buildings located behind RCC, equipped with Yazaki solar air-conditioners, Solar TV, and sophisticated energy devices, surrounded by a large Energy Demonstration Park. An ambitious plan and a unique chapter is rapidly unfolding now in the history of AIT, and as a matter of fact, in the history of ASIA.

With primary intentions of introducing the Energy perspective in the early terms, the division, overall excelled in providing little of everything. It started with the ebullient Chairman Prof. Gerard Y. Saunier, typified by his French-cut beard, whose lecture had more energy concentration than the topic he spoke on, namely; Solar Energy, and Associate Chairman, Dr. Robert H.B. Exell, who worked on the thermal sciences fundamentals for the benefit of the non-Mechanical engineering students. Formerly from AFE, Dr. Exell, Oxford...
educated, has been in Thailand for 18 years spending nearly a decade in AIT. Apart from his work in the Energy field, his musical talent, plus interest in Chinese calligraphy and Buddhist philosophy is notable. Strengthening the division's solar energy staff are Dr. Harang and Dr. Fullea. Just opposite of quiet and serious, Dr. Fullea (expert in his treatment of Solar cells) the young Dr. Harang has an enviable outdoor record including the 50-mile non-stop across Atlantic, touring with the Touring French Musicians around Europe and U.S.A., gliding, rockclimbing, skiing, deep water diving and what have you.

Field Trip: From the local side, the students will not forget Dr. Charan Achalabuti and Mr. Prakal Oudom-ugson both from the National Gas Commission of Thailand. Their informative lecture and most of all the efficiently organized field trip to the northern rock climbing, his musical are from the National Gas Commission solar an enviable outdoor record including the project sites (Tar sands, Oil refinery, Geo-thermal projects) at Chiangmai, Fang, and Lampang districts covered a term's work in just 7 observation packed days.

Apart from the daily routine, a lot of seminars were held. Lectures by visiting personalities from Norway, Egypt, Holland, U.S.A., India, France (COMES) varied from Wind energy systems to energy from controlled Nuclear Fusion, energy policy to the socio-economic effects. Topics were diverse, informative and sometimes fascinating.

Additionally, the division obtains its groundwork from five undercover men they are the non-teaching staff members namely, Mr. Rasaratnam Lugendo, Kunh Sompan Kuroseko, Khun B. Sompan Boonthum Juddi, Khun Kamtai Chowchuen and Kunh Puchai Chantaraphun. From installations to testings of all equipments and structures, and the follow-up jobs, the toils of these men are only compensated by the satisfaction of being the ones to build up this new division of Energy Technology.

HIGHLIGHTING THE STUDENTS

The energy group, hailing from more than 10 countries, comprise of only eighteen students. Out of these, one is the ROC students President, five are holding Chairman positions in the Students Union Executive Council (EC), while some others serve as treasurers or general secretaries of various societies.

From Pakistan, acquiring his Bachelor's degree in Mechanical Engineering and his American accent from the University of Texas is Mohammed Jawaid Iqbal. The star's war emcee for the division, now a whiz, he has been recently appointed the Chairman of the SRC (first person to read all the new magazines) and treasurer of the Pakistani Student Association. Incidentally, he shares a lot of common grounds with the students from ROC.

With Tsai Sing-Tsu (Mayor), President of the Chinese Association, Iqbal shares a common experience of the Steel industry prior to coming to AIT. Tsai, pronounced chai, a chemical engineer from the National Taiwan University sports a robust structure (Cafeteria committee?) which he tries to trim by daily jogging, swimming and again eating. A keen TT player (a Chinese heritage), his energy conservation plans, he emphasizes, should concentrate on the female species, the key energy consumers. The sincerity of his tone makes us abandon our suspicions of his possible biasing during his two-year army career. Another member from ROC is Mrs. Hai Ti Loong.

"...division to produce graduates with a broad knowledge of the energy field and profound knowledge in a selected area, applicable to the practical energy systems for Asia."

Quiet and motherly, Mrs. Loong has only one problem in mind. Like papa Iqbal, she leaves behind a pudgy son, (Iqbal leaves behind two cute daughters) and whenever he is thinking hard in class, you bet, she is thinking about home. Chemist and a lecturer back at ROC, her slow, stumbling English shoots off into rapid Mandarin when Tan or Ang is in sight.

Fast talking, gib and articulate, jolly yet moody, tending to develop a punch is our Student Union Photography Committee Chairman, basketball player for the Institute, Malaysian 'foreign minister' Tan Kah Hock. Educated in Scotland and four years with Rollon Singapura Pt. Ltd., he is keenly interested in "natural beauty (who isn't), sentimental and romantic music and outdoor life". When asked how he would describe himself, he replies, "If you are friendly to me, I will be friendly to you. If you are crafty, I am craftier". His former room-mate Ang, should know better.

Ang Koo Soon, the only Singaporean of the batch, in his own words describes himself as "friendly, self-confident... sometimes stubborn". General Assembly member and Division representative topped in one, also educated in UK, Ang goes deep into nostalgia whenever Singapore is mentioned. Learning Thai is easy for Ang, it should be because he benefits from the friendly Thai companionship of Sompan Poolpool.

Our factory lady, Miss Sompan is rumoured to be engaged-I am sure the handsome, husky police officer whose photograph adorns her study table is no blood relation. Chemical Engineer from Chulalongkorn University, she is quite outstanding among the Thais, being a good debater, and a guitar-playing songstress. Always in her company is Miss Ora Rojanastien.

No hard guessing, Ora is the only
MAGiC BOX IN THE VM ROOM

This is a one-time dream, and then a revolutionary idea that has now come true with the development of communication technology, although it is left unnoticed by many when it is in the VM room of RCC. The name of it is Modem, and the term is an acronym from Modulator-Demodulator.

Modem has now become a must for modern computing systems. When a terminal is situated more than about 1000 meters away from the computer, it's direct connection to computer become impossible. In such cases, the digital dc pulses from terminal are first converted to analog form, a form that can be communicated to a long distance using normal telecommunication media (e.g., telephones, microwave etc.) by the modem. It then acts as a converter or modulator. At the receiving end near CPU, the other modem, acting as a demodulator converts the message to dc pulses back again, which the computer can accept. Message transfer from CPU to terminal also takes place in the same manner except that modulator become demodulator this time.

Although in RCC, the terminal and CPU are close by, modem enables a student in Bangkok to dial his telephone and find access to RCC computer from his terminal in Bangkok. The time is not far to see the busiest ones dialling to Computers on the other side of the world from RCC terminal room, when they find the RCC computer is heavily loaded.
1. **ACTING CHAIRMAN**

Dr. John C.S. Tang will serve as Acting Chairman of the IE & M Division from November 24 to November 28. I will be in the Philippines during this period for interviewing and thesis supervision.

(Dirk L. van Oudheusden)

2. **NEW FACULTY**

The Division of Energy Technology welcomes the arrival of Mr. Walter L. M. Despiegelaere as Assistant Professor, seconded by the Government of Belgium. His special interests are in heat transfer, combustion electric power generation, and bio-energy. Mr. Walter can be reached through telephone number 319 and his office is in Room N111.

(G. Y. Saunier)

3. **VISITING FACULTY MEMBER**

The Energy Technology Division is pleased to welcome Visiting Faculty Member, Ir. Erik Lysen. He is connected with SWD, Steering Committee Wind Energy in Developing Countries, University of Technology Eindhoven. His visit, from November 22-29, 1980, is made possible by the sponsorship of Netherlands Government. Ir. Lysen was here for two weeks last June 1980 and delivered lectures on Wind Energy. His lectures inspired the students to take up thesis work on wind energy. On this visit, Ir. Lysen will serve as consultant to assist the ET Staff in Wind Energy research work. He is expected to visit again for 2 months, May and June 1981, to look into the wind energy research of the division and to deliver an Advanced Course in Wind energy.

Ir. Lysen is residing at the Amarin Hotel, and his office is in Room No.W129 with telephone No.122.

(G.Y. Saunier)

4. **SEMINAR**

Dr Vincent Vitarliano, IBM, U.S.A. will give a seminar on "Graphics Applications in Engineering"

- **Date:** Friday, 28 November 1980
- **Time:** 13:00 p.m.
- **Place:** RCC Auditorium

Students in Computer Applications are expected to attend, and others interested are welcome.

(Prof R.J. Hosking)

5. **FRENCH LANGUAGE**

Advanced students are kindly invited to an informal meeting in my office B118 Thursday 27 November from 9.15 a.m.