# Joint Degree Programs between European and Asian Universities: Concepts, Models, Structures and Tools

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ABSTRACT: *The goal to construct a European Higher Education Community by the year 2010 is defined in the Bologna Declaration. The resulting fundamental change for the German Higher Education Institutions is the complete transformation of all study programmes to Bachelor/Master degree courses. In Germany, the first three years of the Bologna process saw a total of 544 Bachelor degree courses and 367 Master degree courses being established.*
*In this paper it will be shown how the implementation of the Bologna process has progressed at the Faculty of Engineering at University of Duisburg-Essen (UDE) and how the resulting new study programs can be used for extensive cooperation with Southeast Asian Universities. In particular a model for a double degree program and additional measures for organisational purposes and „on site" student recruitment will be introduced.*
*In addition the implementation of two Offices at the partner universities in Southeast Asia is funded by "Stiftung Mercator GmbH, Essen". These Offices are run by UDE-Staff and support students in all questions related to their future stay at UDE. It also gives basis for joint research amongst the partners.*

## 1 INTRODUCTION

From 1997 on, University of Duisburg-Essen offers a M.Sc. degree course in "Computer Science and Communications Engineering". This degree course was implemented as an internationally oriented degree course with 50% of all lectures offered in English language, possible entrance to higher semesters for students with a foreign bachelor degree and it aims at international as well as at German students (Hunger, A., Werner, S., Schwarz, F. 2001). Beyond that, this degree course was of strategic importance for UDE and its engineering faculty as it gives basis for further developments, like the enhancement of a single degree course to a broad spectrum of degree courses, all following the same structure.

From this background, the faculty of engineering at UDE introduced a new study program consisting of six bachelor- and five master degree courses by winter semester 2002. The study program is also implemented as an internationally oriented program, and has been introduced under the name „International Studies in Engineering" (ISE). All degree courses in the ISE program follow the same structure with the following common structural characteristics:

- a joint first year for all bachelor degree courses with 100% English as language of instruction
- 50% of all lectures in English language with another 50% in German language per degree course
- compulsory semester abroad for all German students
- clearly defined transfer possibilities between the degree courses

The programme has hit worldwide resonance, with 3,700 applications from more than 40 countries in the year 2003 as evidence. Simultaneously ISE offers the possibility of broad cooperation with foreign institutions of higher education.

Therefore, it gives basis for joint developments of common bachelor- and master-degree courses, e.g. with two partner universities in Southeast Asia, the Universitas Indonesia (UI) and the Universiti Kebangsaan Malaysia (UKM). This project, called "Offshore" started in 2001 and is funded by the German Academic Exchange Service (DAAD).

## 2 A CONCEPT FOR JOINT DEVELOPMENT OF DEGREE PROGRAMMES

The concept of the Offshore project proposes close relations for education, research and culture amongst the three partner universities (Hunger et al., 2002) . The selection of the partners is one of the most important and initial steps.

### 2.1 The Partners

The University of Indonesia (UI) is one of the most prestigious and largest university in Indonesia, and by virtue of its name, the flag bearer of the nation, strives to continuously improve itself in response to the needs of the globalize world in facing the new millenium. UI has been chosen as partner because of its relevance in Indonesia and surrounding as UI is ranked as 5$^{th}$ best university in Asia, although UI feels an urgent need for upgrading research and staff and also improve quality of education. The Faculty of Engineering (FTUI) is one of the faculties in the UI that recently has grown into a level of maturity after its founding in 1964. The faculty has determined itself with the vision to become "a world class" faculty of engineering and continuously participates in international events. Due to the development of partnership between UDE and UI, an MoU on the level of faculties has been signed, also another one on the level of rectors.

Universiti Kebangsaan Malaysia (UKM) is one of the oldest and the biggest Universities in Malaysia. It is a state university located nearby Kuala Lumpur, the capitol of Malaysia. UKM is one of the three public universities in Malaysia which are in the process to be developed as research universities. Already now, UKM is amongst the few leading universities in Malaysia concerning intake of top ranking students and research funds. Its faculty of engineering is the first engineering faculty established in Malaysia and a major research faculty that continuously obtains a large amount of research funding from the government and industries around the state. The first and important contact between UDE and UKM was in 1999. Since then, both partners have committed themselves for intensive and growing cooperation in the field of research and education on the levels of faculties and rectors.

### 2.2 Goals of the Offshore Project

The main goals of the Offshore project are

- the joint development of common bachelor- and master-programs in engineering subjects
- the export of German study modules
- the joint development and introduction of adequate preparation courses and language courses
- ensuring the admission of highly qualified students to common programs with partner universities
- improving the possibilities of establishing the recruitment of extraordinary foreign Master- and Doctorate-Degree candidates.

One of the final goals of the Offshore project is to award a joint diploma, signed by all participating universities, to the students after graduation.

### 2.3 The Basic Concept

Different models concerning the joint development of common degree courses have been discussed within the framework of the co-operation. First of all, it was decided that a joint degree can be the final goal, but also an unreachable at the beginning. Therefore, as a first step the partners agreed to develop a two out of three choice from a students point of view and award a double degree to the graduates.

The partners also decided to develop a concept with study structures that start with a relatively long study period at the home university leading to a final studying-abroad-period. That decision is based on the following considerations:

- A degree course with a longer period at the home university and a shorter period abroad is much cheaper for the students than a degree course completely taking place abroad; e.g. in Australia or UK.
- The double-degree nevertheless guarantees an international reputation of the degree course.
- Malaysia in contrary to Indonesia takes an important function in collecting and spreading due to its small size and many bordering countries. Therefore, UKM can attract students from the bordering countries through a common study-program with the UDE.

- Graduates of a German-Malaysian or German-Indonesian degree course are interesting candidates for the German academic and job market.

In a next step, the structure was worked out as a x+1-structure, meaning, that the study period abroad is limited to the final year. This requires a common curriculum and a closely concerted offer of lectures and exams of the participating universities and results in a master program following a so-called 1+1-scheme and a bachelor program following a so-called 3+1-scheme. In the following, the courses will be referred to as the x+1-degree courses.

The implementation of the x+1-degree courses not only requires the definition of technical orientations and contents but also considerations about selection of students and measures to prepare them for their stay abroad and also to finance that stay. Figure 1 gives an overview of the most important steps concerning the entrance to the program and the course of progression by the example of the 3+1-program.

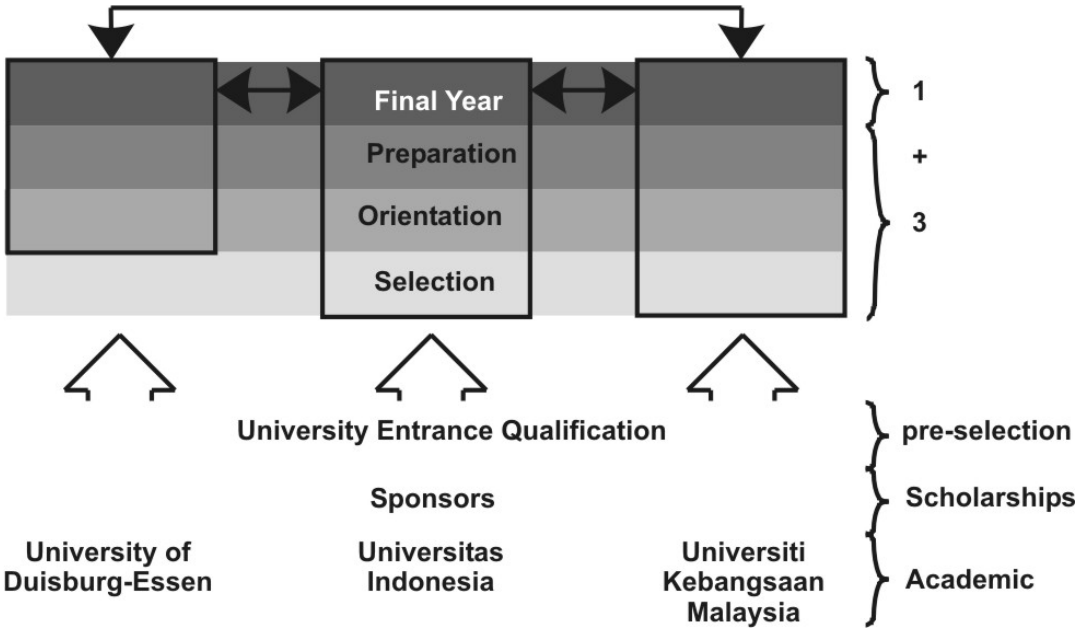


Figure 1- The x+1-program

First of all, figure one 1 that from a German point of view the 3+1-program is only a 2+1-program, as the bachelor of science program at UDE only takes three years. But, by comparing the different school education systems it can be found that the school education in Germany is 13 years instead of 12 years in Malaysia (partly) and Indonesia (in general). Apart from this, by analysing the first study year at UI and UKM it can be seen that this first year gives basis in subjects that are already taught in the last year of school education in Germany. But this additional year also gives the chance to differ in a selection and an orientation phase, where in Germany the selection and orientation phase are combined in the same year.

During the orientation phase, the students learn about the program and its individual settings and also about the involved countries and Universities. At the end of the orientation phase, students decide where to spend the final year.

During the preparation year, students get prepared for their final year. That includes language courses, special preparation courses due to the different cultures and maybe same changes in the curriculum of the original degree courses have to put into account. Those changes may happen or be required, because the x+1-programs have to fulfil the requirements from two different universities and, therefore, might differ from the curriculum of the local universities degree courses.

The final year will be spend at the partner university and requires the attendance of lectures of the main course as well as working on the final thesis.

### 2.4. How to conduct a joint development of degree courses

To develop and establish the degree courses based on the x+1-model, three annually workshops, the so called “German, Indonesian and Malaysian Academic and Cultural Workshop (GIM)”, have been conducted. The workshops took place in Duisburg (2001), Jakarta (2002) and Kuala Lumpur (2003).

The GIM 2001 in Duisburg brought together lecturers and researchers from UDE with 4 colleagues from UI and 5 colleagues from UKM. During the workshop, the basic idea of the x+1-model was developed and agreed upon by all three partners, documented by a signing ceremony of the respective deans from the three partner universities.

Between GIM 2001 and GIM 2002, additional meetings took place and the curriculum for the x+1-degree courses in "Computer Science and Communications Engineering" and "Computer Engineering" was sorted out. Also, two guest professors from UKM stayed at UDE in order to jointly develop lecturers with colleagues from UDE.

The GIM 2002 in Jakarta brought together lecturers, researchers and students from UI with 10 colleges from UDE and 7 colleagues from UKM, including the deans from the respective faculties of engineering. During the two weeks workshop, the results from the structures developed and the syllabus have been discussed. At the end, the delegates agreed on a list of topics to be covered within the common degree courses.

Additionally a first selection of UI and UKM students took part in a German language class and additional preparation classes given by lecturers from UDE.

Between GIM 2002 and GIM 2003, additional meetings took place at all three partner universities to take the final steps in developing and organizing the program.

The GIM 2003 took place in Kuala Lumpur and brought together lecturers, researchers, administratives and students from UKM with 18 colleagues from UDE and 10 Colleagues from UI, including Rectors, Vice Chancellors and Deans. This was the final meeting so far towards the development of the x+1-model in the fields of "Computer Science and Communications Engineering" and "Computer "Engineering". At the end, all partners agreed on the study plans and numerous organizational settings. The programs have been brought to the public during an open day with guests from industry, academics and politics, including the German Embassador in Malaysia. The partners declared the programs to be started and agreed on extending it to other degree courses and also other faculties, e.g. Civil Engineering.

## 3 THE X+1-MODEL

As the basic x+1-model was mainly developed during GIM 2001 Workshop, the details have been developed in numerous meetings of a so called Offshore Curriculum Group, consisting of lecturers from all three partner universities. Those details will be explained by the example of the 3+1-bachelor degree course in "Computer Science and Communications Engineering".

The 3+1-bachelor program designates the longer part of the studies, which means about three years, at the home-university, while the shorter, final part is spent at a partner university. The more restrictive selection of the students by the partner universities ensures a high quality of participants to the 3+1-bachelor program and thus a high number of potential master and doctorate candidates in the following study phases.

The Indonesian education system includes a nationwide standardized university entrance qualification, and the UI receives leading candidates from the nationwide result list.

In the case of the UKM similar conditions are given. The demands on candidates for being admitted to the master program are similarly high.

Each partner makes his own contribution to set up the program, in case of UDE the study program ISE gives basis for all developments. The UI and UKM also plan to use most parts of their current degree course offers, from which the last year has to be taught in English language from now on, instead of Bahasa Malaysia.

### 3.1 Common degree course structures

All partners agreed on the structure given in figure 2 for the common bachelor program. This structure is described by the example of a common bachelor degree course in "Computer Science and Communications Engineering", following the 3+1-model:

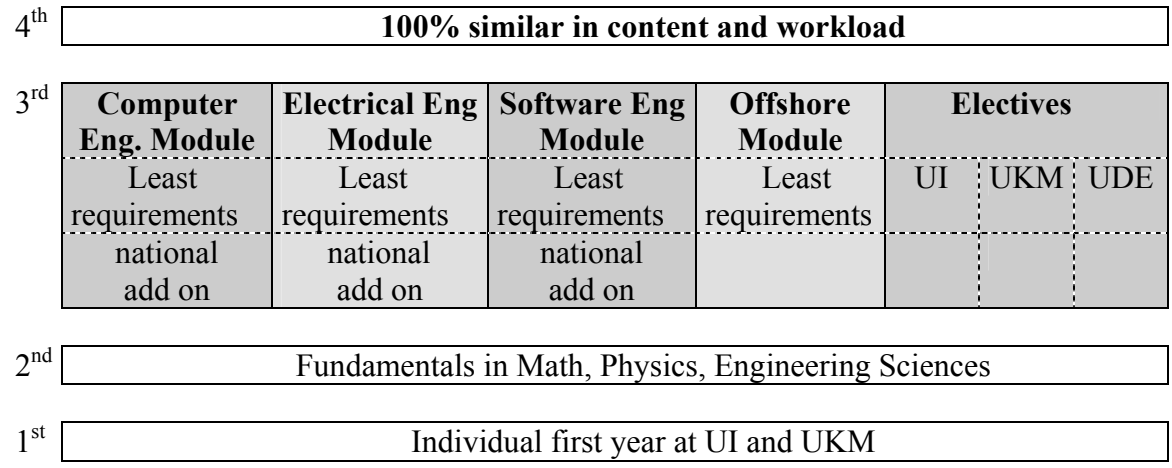

Figure 2- The 3+1-model

The structure given above allows all partners to make use of lectures from their existing degree programs. In a first step towards the development of a common degree course, a final year completely equivalent in content and workload has to be defined. In some cases this requires the export of existing lectures from one of the partner universities to the others or the cooperative development of new lectures.

The second step is to set up a study structure for the 2nd and the 3rd year that allows the usage of as much of the existing study modules as possible. On the other hand, it has to be guaranteed that students at all three partner universities are prepared in a similar way for their last year in terms of content and quality. In doing so, the specific local requirements from every country have to put into consideration.

That leads to a number of topics referred to as least requirements in every module shown in figure 2. These topics are available at all three partner universities and students have to study them.

In case of requirements for special topics from only one or two of the partners the related subjects can be moved either to a national add on block in one of the modules or they can be defined as electives, where elective modules can be different at all partners. In the above mentioned structure, the Offshore module and the national add on blocks make the difference between the double degree program and the national bachelor degree programs.

After comparing the workload of the actual B.Sc. programs it was shown that the workload per year is nearly the same at all three partner universities. Differences can be explained by different educational systems.

In addition, the common bachelor degree courses are not only supposed to make the course offers at the partner universities more attractive and more fastidious, but it is also a preparation for the above mentioned 1+1-master degree program. During the last year, students can either take part in a practical course, work on the final thesis or participate in lectures and taking exams afterwards. The partners adjust their credit point system within the context of the offshore project, in order to facilitate the acknowledgment of courses and ease the organization. In principle, the 1+1-master structure follows the same basic structure given in figure 2.

### 3.2 Import and Export of Study Modules

In some cases, lectures, or complete study modules consisting of more than only a lecture had to be exported from one of the partner universities to one or both of the others. That requires a close cooperation of the involved lecturers. In doing so, within the Offshore project the following forms of cooperation had been established arrange an effective import and export:

- A lecturer from the exporting partner university offers an entire presentation (lecture, exercises, practical training etc.) at the importing partner university.
- A lecturer from the exporting partner university offers (exports) a lecture at the importing partner university in a compressed version at the beginning of a semester in a sort of block presentation. The importing partner university organizes exercises and lab exercises with their own lecturers during the semester.
- Lecturers from an importing partner university inform themselves about a particular course offered at the exporting partner university, which will be introduced later at the importing partner university.

- Additionally, tools for tele-teaching will respectively support the lectures at the partner universities.

## 4 STRUCTURES AND TOOLS

Although the development and introduction of common degree courses and the award of double degrees is under preparation at many universities all over the world, it is still a new branch in university education that requires innovative ideas. The presented x+1-model is such an innovative idea, that requires numerous measures for student counselling and structures to guarantee the students transition from national degree programs into the new x+1-program.

### 4.1 Organizational Structures

One of the most important measures is the setup of Memorandums of Understanding and/or Intend on University or faculty and rectors level, due to national requirements. Therefore, to win the support of rectors and vice-chancellors is one of the most important steps in the beginning. After that, the setup of permanent program committees and curriculum groups is also of outstanding importance, with a permanent presence of all participating universities at all of the involved universities as the highest form of cooperation.

In case of introducing the x+1-programs the situation can be described as follow,

- As the distance between UI and UKM is a short one, a permanent presence of members from UI and/or UKM at the partner sites is not of strategic importance.
- As the distance between Asian and the European sites is a long distance one, a permanent presence of members from the European University in Asia is of outstanding importance.

Therefore, a concept for the setup of UDE-Offices at both partner Universities in Asia, UI and UKM, has been developed and UDE managed to acquire approval from a German private foundation, the Stiftung Gerhard-Mercator, Essen.

In 2002, the first steps towards the realization of that concept had been taken: the implementation of the so-called UDE Mercator Offices and Multimedia Labs at the partner sites in Kuala Lumpur and Jakarta. With the help of those offices UDE, that are runned by a UDE staff member, UDE obtains a permanent presence in Asia and is able to

- assist students and lecturers from the Asian partner universities on their way to UDE,
- assist students from UDE during their stay at the partner universities,
- enhance and promote joint research activities ,
- further develop common degree programs.

On November 5th, 2002 the Mercator Office at UKM was opened. Guests at the opening ceremony included, amongst others, UDE Dean for International Affairs of Faculty of Engineering, the German Embassador in Malaysia, and the UKM rector, see figure 3 (from left to right).


Figure 3- Opening Ceremony Mercator Office and Multimedia Lab at UKM

The Mercator Office at UI was opened in August 2003 prior to GIM 2003. Since that time, the offices host numerous meetings of the program and curriculum meeting as well as students and lecturers from all three partner universities.

After the introduction of the first x+1-degree courses in "Computer Science and Communications Engineering" and "Computer Engineering", the introduction of degree courses from additional disciplines has been discussed as well as extending the existing cooperation towards the setup of a German Campus at UKM.

### 4.2 Tools to support the setup of degree programs following the x+1-model

The above described joint development of degree courses would not have been possible without adequate tool support. Especially tools are required that support the curriculum design, student counseling, virtual meetings and distance learning. As the field of joint development of degree courses is still a young one, it is lacking of custom-made tools. Therefore, most of the tools used within the Offshore project are self-developments, some of them as part of research projects (Hunger et al., 2003). In the following, a brief overview is given on some of these tools

- CONGA: a tool to support curriculum design,
- CongaXpert: an internet platform to support student counseling,
- PASSENGER: a synchronous groupware to support virtual meetings and
- MODULO: an e-learning environment to support distance learning

### 4.3 CONGA and CongaXpert: Tool to support curriculum design and student counseling

Planning new degree courses is marked by producing and updating numerous tables and documents. Furthermore, different views on these data are required depending on a certain action to be taken, like:

- scheduling and room planning,
- generating study plans, etc.

The joint development of common degree courses places further requirements on these tools, as students are interested

- in acknowledgements of their former studies,
- in personal study plans and schedules for detailed planning of their stay abroad, etc.

As the first of the above mentioned tasks can be solved with a data base application, the latter ones require more "intelligence" and lead to the development of a web based expert systems, named CongaXpert.

CongaXpert comprises a student consultation system with feature of some human expertise in the academic area. Services include an academic consultation service to student or student's candidates, advice on recognition processes and guide foreign students through the "jungle" of preparation.

### 4.4 PASSENGER: A synchronous groupware to support virtual meetings

Once the basic x+1-model was defined, a so called Offshore-curriculum for the next steps in joint developments. This group consists of permanent staff members at all three partner Universities and is completed by PhD-, Master- and Bachelor-Students from all three partner Universities. Project meetings are held several times a year with a two weeks summer school each year, hosted by one of the partners. Apart from those face-to-face meetings, from time to time additional meetings are required, not an easy task with team members located in different parts of the world. The scenario of worldwide distributed teams is well known and the resulting problems are in the focus of the research field CSCW (computer supported cooperative working). The outcome of CSCW research are so called groupware systems that support the distributed teams in their cooperative actions. At UDE, a synchronous groupware called PASSENGER has been developed and was used for conduction of meetings with members at UDE and the Mercator Office at UKM (Werner et al. 2003).

The synchronous groupware PASSENGER can support synchronous meetings with up to four members. It provides video- and audio channels for communication purposes, a floor control mechanism to support the course of discussion and several measures for carrying out group awareness information. Due to the actual situation that most computer labs at the three partner universities are equipped with

windows-based systems this operating system has be chosen as the target platform and the global internet as its transport medium.

The client user interface contains of video screens for each member and a whiteboard area that is divided up in a public window and a private window (see figure 4). Each member has the same view of the public window according to the WYSIWIS principle, but only one of them can alter the document at a certain time due to the implemented floor control. A telepointer serves to elucidate and to present facts.

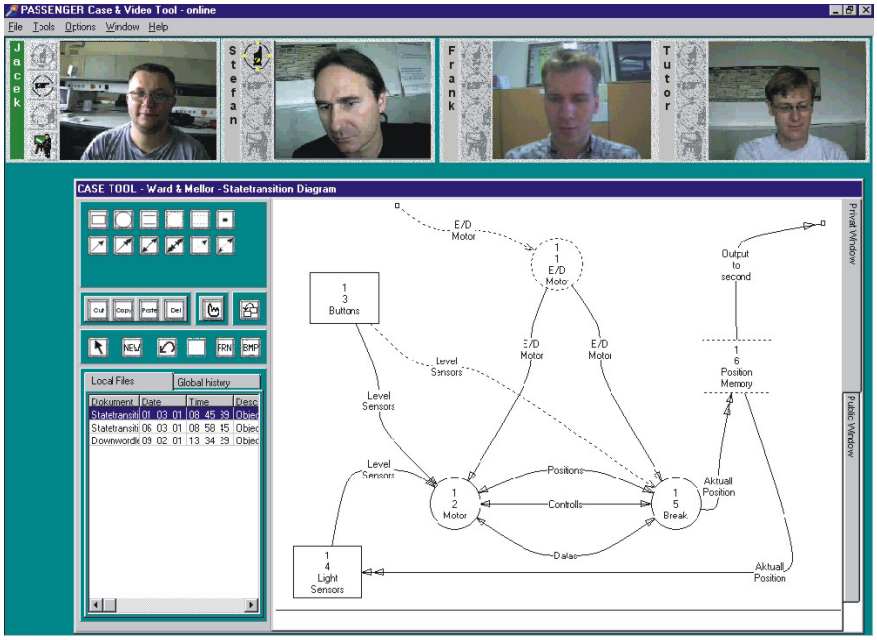


Figure 4- The PASSENGER Client User Interface

From a qualitative point of view it can be said that sessions done via Passenger took place without any problems. Especially the video connection was much better than during session using tools like Microsoft Netmeeting. This is because of the high fault tolerance of the Passenger video component that implements fault detection and error handling mechanisms on the application layer. In the future, PASSENGER should also be available for students in the x+1-programs to stay in contact with their student fellows, friends and lecturers at their home university during their stay at the guest university, but also to get into first contact with people at the guest university during the preparation phase.

### 4.5 MODULO: an e-learning environment to support distance learning

Carrying out common degree courses, on the one hand means same lectures with same content are offered at all involved universities. It also has the meaning of learning in different cultures with different learning and teaching styles. As most e-learning tools mainly focus on content, the x+1-model additionally requires to put the different learning styles and learning cultures into account. For this purpose, the e-learning environment MODULO has been developed at UDE.

MODULO is intended to create new possibilities for differentiation and decentralized learning through a multimedia teaching and learning concept. The didactical new concept should accommodate the students‘ diverse learning requirements. Thus, procurement methods are striven for that enable individual preparation, consultation and practice dependent on the students’ educational background.

The concept of the interactive, multimedia enhanced teaching and learning software is built up in such a way that the different learning methods of the students are taken into account. Thus, the software can be accessed through different entry points.

One way of accessing is the subject structure. Here, the student is able to choose the learning path according to the content structure of the lecture. This so called “script module” can be seen as the traditional way of implementing a learning software. There are several learning modules which contain a lot of graphics and animations for illustrating the content. From the script module it is possible to switch to the exercise module which refers directly to the accompanying topic of the script. Going over the

problems enables students to make use of the obtained knowledge. Each topic includes numerous exercises, which can be solved either independently or successively.

The second entry point can be chosen by a learning goal oriented or rather a problem based learning scenario. By means of the second entry possibility, the interaction between the theories, that needs to be learned, and the later practical experience will be clarified on the basis of a concrete task of the technical development environment.

At the moment the system is set up exemplary for two subjects, „Fundamentals of Computer Science“ as well as “Logical Design of Digital Systems”. Throughout the first half of 2004 it will be put into practice use at UDE and also at UKM. In parallel, it will be evaluated at both sides in order to examine that the project goals are reached.

## 5 CONCLUSION AND OUTLOOK

Within this paper, we reported on our experiences so far with the joint development and introduction of double degree courses between partner universities in Europe and Southeast Asia. A so-called x+1-model has been developed in the frame of the Offshore project that will give basis for all future developments. At the moment, degree courses following this structure have been implemented in the fields

- Computer Science and Communications Engineering
- Computer Engineering

Additional degree courses following the x+1-model are under development in the fields

- Mechanical Engineering
- Electrical and Electronics Engineering
- Civil Engineering

Although it took three years to develop the first two degree courses, further developments are supposed to require not more than one year, as they follow the same structure and procedures and can make use of tools that are proven to be suitable. By example, the 3+1-bachelor degree course in “Electrical and Electronics Engineering” will be introduced in April 2004, after a development period of only nine month.

One of the lessons learned in the beginning of the co-operation was the lack of permanent presence due to the long distance co-operations between the partner sites. Due to the financial support by the private foundation “Stiftung Mercator GmbH, Essen”, UDE was able to open and run an office at each partner university. Those offices have been of strategic importance for all past developments, and will be of major importance for future developments like the set up of a German Campus in Malaysia.

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