
GC 2012-5616: A MULTINATIONAL MASTER'S DEGREE PROGRAM IN ELECTRONIC PRODUCT ENGINEERING

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A Multinational Master's Degree Program in Electronic System Engineering

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Abstract – This paper describes the effort of creating an international joint master program in the area of electronic system engineering (ESE) focused on the needs of the electronic industry. Three universities in the U.S., Germany and Malaysia have designed an accredited executive master program in collaboration with multinational companies operating in the electronic and semiconductor industries to push forward a lifelong learning process as well as training the academic teachers. It is intended to recruit potential students with work experience and a need to reach a higher educational level to the program. As a first step, a curriculum is implemented with Texas Tech University (TTU), U.S., and the University of Applied Sciences Landshut (UAS La), Germany, which serves as program manager. In a second step Universiti Teknikal Melaka (UTeM), Malaysia is going to join the program.

Index Terms – Multinational joint degree in the U.S., Germany and Malaysia, executive master program, train the academic teachers.

Introduction

Most universities worldwide offer higher education programs. Besides basic education at undergraduate level, master programs for employed and professionally experienced persons become more relevant in the context of lifelong learning strategies. Companies demand from academic institutions to attend to that challenge. Rapid technology developments in electronic systems and production as well as the need for additional competences for engineers such as project management, customer relations and intercultural experiences require a permanent improvement of professional skills. Several countries in South East Asia (SEA) are in the process of transformation from a production-based economy into a knowledge-based society. This leads to a vast demand and requirement with respect to education and training at university level.

Motivation

The program partners TTU, UAS La and UTeM collaborate with companies such as Texas Instruments (USA) and Infineon (Germany) who have manufacturing facilities in

Malaysia. Besides mere manufacturing, these companies also aim at innovative and applied research and development (R&D). While the transfer from manufacturing to running the entire production (including e.g. quality management and testing) is desired, a pitfall herewith lies in the suboptimal supply of engineering graduates trained at the highest level. Recognizing and tackling this challenge, the three universities and the two companies have decided to form a consortium in order to develop an unparalleled Master Degree Program with best-practice potential in “*Electronic System Engineering*”. Some other electronic companies in the U.S., Germany, and South East Asia intend to join the consortium.

The companies and universities involved anticipate a vast demand for engineers whose education is based on the high standards provided by U.S. and German universities. The focus of the new program will be application oriented and driven by industry needs (rather than basic research) which represents the mark of quality of this consortium. The aforementioned consortium is also currently working on developing PhD programs.

Methods

A similar program for Semiconductor Product Engineering (PSPE) has been in place at TTU for the past 14 years [1]. Its primary focus has been training MSEE product engineers and test engineers for the semiconductor industry. This summer (August 2012) a short course in international product engineering will be offered at UAS La, taught by a TTU faculty member, and attended by TTU and UAS La students [2].

Electronic System Engineering (ESE) is an executive postgraduate Master's program taught in English, based on the experience gained from the program outlined above. It is designed, executed, and managed by the consortium mentioned earlier. The student body is international and mainly recruits itself from nationals of South East Asian countries (mainly Malaysia) as well as U.S. and German nationals.

Especially in the first semester at UAS La, students will be made aware of intercultural aspects and enhance their intercultural competence next to improving other soft skills as well as engineering knowledge.

It is planned that industry partners will contribute towards education and training (e.g. giving guest lectures) and expenses of the program.

The program is tailored as an executive program with minimum admittance requirements as follows:

- a bachelor degree in electrical engineering or a related field,
- one year work experience,
- sabbatical leave from their employer during term period,
- students/employees are anticipated to return to their employer after completing the program of studies.

Curriculum contains the following topics:

- electronic and system engineering,
- technology and production methods,
- quality and testing,
- customer relations,
- intercultural competence,
- project management.

Didactics will be characterized by

- active rather than passive pedagogy (student centered),
- team teaching and cooperative learning,
- laboratory tutorials,
- blended-learning.

The program is structured in three semesters. While in semester 1, German, U.S. and SEA students jointly attend courses at UAS La, Germany, for semester 2, students can choose between studying at TTU, U.S., and UTeM, Malaysia. In semester 3, a Master thesis that can be prepared in conjunction with students' employers and/or industrial consortium partners is compulsory.

In order to cater for the needs of students and employers, teaching will be held in block seminars. The successful completion of the program requires students to reach 90 ECTS (European Credit Transfer System) points. The degree will be awarded to students by their home university. The program will be accredited by the corresponding German accreditation body whose accreditation standards are accepted internationally.

Learning Outcomes

Educational objectives aim to train engineering graduates as well as the next generation of academic lecturers in engineering to the highest international level. The program will promote their professional and personal development which includes aspects of outcome based education (OBE) in order to contribute to the respective countries' advancement in general and South East Asian aspiration in particular.

ESE will qualify graduates to develop electronic systems as well as to describe and keep records of the solution in close collaboration with developers and customers. Graduates will be able to implement a specification handbook of the electronic system to be developed. An electronic system is generally understood as an electronic device or assembled component which contains electronic and mechanical components (MEMS) as well as assembly and packaging technology. Aspects of technology, power management, and certification as well as quality measures are included. Graduates will gain experience of working in teams, and will be able to implement and conduct the system solution at the interface between developers and customers. A holistic and systematic approach based on physical knowledge across the value chain should be taken into account also including economic aspects.

Graduates should acknowledge customers' requirements in order to produce a marketable product. Furthermore, quality and testability should be accounted for. Since it is the program's aim to transfer knowledge of applied research and development, knowledge of pure mass production is not required and therefore not transferred during the program.

Conclusion

The presented program of Electronic System Engineering (ESE) will be promoted and partly supported by German, U.S., and Malaysian companies in an international executive program. The general course structure is aligned with industry partners on their needs and attuned with HR managers and CEOs of electronic companies.

Successful students will be awarded the academic degree of MSEE and Master's of Engineering (MEng), respectively. ESE leads to a higher educational level for participating engineers and lecturers.

References

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