



The Development of International Collaborative Undergraduate Degree Programs

Peter A. COOPER¹, Asaf VAROL*²

¹Department of Computer Science, Sam Houston State University, Huntsville, TX, US

² Department of Software Engineering, Firat University, Elazığ/Turkey

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Abstract: In this paper, we describe the process by which Sam Houston State University, United States, (SHSU) and Firat University (FU), Turkey developed collaborative undergraduate degree programs in Software Engineering and Digital Forensics Engineering. The paper explores the administrative, curricular, accreditation, and financial issues that needed to be addressed in order to bring the agreement to a successful conclusion.

Uluslararası Ortak Lisans Derecesi Programları Geliştirilme

Anahtar Kelimeler

Uluslararası ortak programlar, müfredat, akreditasyon.

Özet: Bu makalede, Amerika Birleşik Devletlerindeki Sam Houston State Üniversitesi (SHSU) ve Türkiye'deki Firat Üniversitesinin (FU) Yazılım Mühendisliği ve Adli Bilişim Mühendisliği alanlarında geliştirdikleri ortak lisans derecesi program süreçleri tanımlanmaktadır. Yapılan anlaşmayı başarı bir sonuca getirebilmek için ele alınması gereken yönetim, müfredat, akreditasyon ve mali konuları araştırılmaktadır.

1. Introduction

Following an iTiCSE workshop in Ankara, Turkey (Cooper et al., 2010), the department chair of Computer Science at Sam Houston State University was invited to present a paper "Towards Standards in Digital Forensics Education" to the Faculty of Technology at Firat University. As a result, informal conversations took place regarding potential research, exchange and curricular collaborations between the two universities.

These discussions resulted in a formal statement of cooperative intent between the two universities signed in summer 2011 and a yearlong process to develop two collaborative degree programs, one in Software Engineering, and another in Digital Forensics Engineering. The department chair of Computer Science at Sam Houston State University and the department chair of Software Engineering of College of Technology at Firat University were designated as the primary contact personnel and detailed work began on aligning the curricula between the two programs began in earnest.

This paper addresses the major challenges in preparing curricula that meets the academic and accreditation requirements of both universities, together with a discussion of the admission, financial

and administrative issues that accompany such a collaborative venture.

2. Curriculum

Both Firat University and Sam Houston State University structure their academic offering in similar ways. Both institutions operate under a legal framework that requires a general education component, academic major components that address ACM Curricula Guidelines (Shackelford, et al., 2006), and support courses that provide necessary foundations in mathematics and science. In addition, the existing degree programs in Computer Science and Software Engineering are subject to external accreditation standards through ABET/CAC (ABET/CAC, 2013) and MUDEK (MÜDEK, 2013).

1.1. General Education

- The general education requirements at Sam Houston State University are governed by State of Texas legislation and Institutional policy and must include:
 - English (6 hours)
 - Mathematics (3 hours)
 - Natural Sciences (8 hours)
 - Humanities and Visual Arts (9 hours)

- Social and Behavioral Sciences (15 hours)
- Kinesiology (1 hour)
- General education at Firat University requires:
 - Turkish Language (4 hours)
 - Humanities (6 hours)
 - Science (8 hours)
 - Mathematics (8 hours)
 - English (8 hours)
- While the respective curriculum committees were flexible in interpreting certain parts of the general education requirements, (for example Turkish Language and Turkish History were interpreted at Sam Houston State University as part of the Humanities requirements) certain courses are specifically mandated including US History (6 hours) and US Political Science (6 hours). In order to make the Political Science course requirement relevant to an international clientele, the second course concerns International Relations.
- Initially this was viewed as a problematic addition to the overall degree program hours. However, as the negotiation advanced it became apparent that there were significant educational advantages to providing students with an historical and political acculturation to both countries.

1.2. Foundation Courses

Providing foundation courses for the collaborative program proved relative simple. Under ABET/CAC guidelines the computer science undergraduate program at SHSU requires 17 hours of mathematics; Calculus I, Calculus II, Discrete Mathematics and six hours of upper division mathematics. The Software Engineering program at Firat University requires Mathematics I, Mathematics II, Discrete Structures I, Discrete Structures II, Probability and Statistics, for a total of 18 hours. In addition, both representatives felt the addition of Numerical Methods would strengthen the degree program.

The computer science program at SHSU currently requires an additional eight hours of Natural Science. However, the increased Mathematics requirements were considered a reasonable tradeoff.

1.3. Major Requirements

The major requirements for the Software Engineering needed to meet both ABET/CAC and MUDEK guidelines, and in particular provide coursework that would justify the inclusion of the word 'Engineering' in the title (In Turkey the word 'Engineer' is a title that carries a level of respect that has no direct counterpart in the United States).

The Core Computer Science courses follow a fairly standard pattern:

- Introduction to Computer Science (4 hours)
- Algorithms and Programming (8 hours)
- Principles of Software Engineering (7 hours)
- Programming Languages (7 hours)
- Architecture (7 hours)
- Data Structures (3 hours)
- Computer Architecture (3 hours)
- Database Management Systems (3 hours)
- Data Mining (3 hours)
- Operating Systems (3 hours)
- Human Computer Interaction (3 hours)
- Networks (6 hours)
- Graphics (3 hours)
- Simulation (3 hours)
- Ethics (3 hours)

In addition students can select 6 hours from:

- Information Systems Design and Management
- Switching Theory
- Language Translators
- Web Technologies
- Cryptography
- Digital Signal Processing

Students complete their degree through the design, development, implementation, debugging and demonstration of a Software Engineering project.

While the emphasis on computer science may appear significantly greater than usually experienced in an American university two points should be made. First, 'hours' are not entirely synonymous between Turkey and the United States as there is more emphasis on working outside the class-designated times. Second, the US model differs radically from that of many European countries where general education is not often a part of a degree program and 'majors' constitute the entirety (96 hours) of a three-year degree program. The model we present here is draws a mid-point between the European and US systems.

1.4. Digital Forensics Engineering

The Digital Forensics Engineering degree program follows the same general model as the Software Engineering program with the primary difference being a set of courses to provide targeted instruction in the forensic process, the legal environment in which professional forensics operates. In particular the following courses are included in the curriculum:

- Introduction to Digital Forensics and Information Assurance
- Hardware Forensics
- Network Security
- Malware
- Digital Forensics Tools
- Information Security

- Cyber Law
- Cyber Warfare

1.5. Modes of Instruction

The language of instruction at both Firat University and SHSU is English. Turkish and US universities have very different higher education traditions and, as a result, students in the collaborative program will have specific opportunities to acclimate to the differences including:

- Summer courses taught by SHSU faculty in Turkey, the first of which is scheduled for June 2013.
- Online courses taught by SHSU faculty.
- Blended courses involving both face-to-face and online components taught jointly by Turkish and US instructors.
- Collaborative student interactions in research with teams drawing from both countries.
- Inter-institutional mentoring

2. Administration

As part of an initial Agreement of Inter-Institutional Cooperation, the two universities agreed to the development of joint activities by means of academic visits, exchanges of students and faculty, collaborative research and the development of the two undergraduate degree programs.

The Software Engineering degree program has been approved through Firat University and YÖK, the Turkish Council of Higher Education, and 30 students already enrolled at the Department of Software Engineering in the academic year of 2012-2013 (YÖK, 2013). The degree program was also approved by the Texas Higher Education Coordinating Board (THECB).

The degree program is constituted as a 2+2 program, with the first two years being taught in Turkey and the final 2 years being taught in the United States.

2.1. Admissions Standards

For Turkish students, admission into the program is determined by Firat University in accordance with the Council for Higher Education requirements for entry in to an engineering program. The LYS (LYS, 2013) examination is a national examination that determines both the level of the university and the placement into specific degree programs. For non-Turkish students, a number of alternative examinations could potentially be utilized including SAT (1000), ACT (21), ABITUR (4), GCE A 'Levels' (2 relevant subjects), or the French Baccalaureate.

Transfer to the United States and the last two years of the program require successful completion of the

first two years, together with demonstrated English Language proficiency (IELTS, 5.5, or TOEFL IBT 79).

The universities are looking to establish a cohort of no more than 30 students per year initially to complete the program and will raise admission standards to maintain limits on enrollment.

2.2. Academic Regulations

Students are subject to the academic regulations of both institutions and dismissal from one institution for academic or other reasons constitutes termination from both the degree program and from both institutions. Where discrepancies in regulation exist between the two universities, those discrepancies are resolved through a comprehensive resolution involving the institutional representatives.

3. Funding

Access to higher education in Turkey is based on scores obtained by prospective students in the YGS and LYS national examinations. The score determines access to specific tertiary education institutions, and to specific degree programs within that institution on a quota basis. The Senate Board at Firat University determine the level of tuition and fees during the first two years, together with access to scholarships and grants to support student admission.

Sam Houston State University, under the authority of the THECB determines the level of tuition and fees for all students, including international students.

3.1. International Tuition

The relatively high cost of education in the US, and in particular for international requires that the universities be proactive in obtaining scholarships and grants to manage the costs. Competitive, performance-based scholarships in excess of \$1000 per year result in the State of Texas waiving the international tuition costs. In addition, both institutions are actively engaged in obtaining grant funding from business and industry partners to further offset student costs.

3.2. Visas

Entries into the US for students planning to study are rarely problematic for Turkish citizens. However the visa process is complex and can be expensive. Both institutions are committed to provide support for the acquisition of visas.

4. For The Future

Sam Houston State University and Firat University are excited about the prospect of bringing these collaborative programs to students. We believe that the collaboration can draw on the strengths and

traditions of institutions, their faculty members and a high quality student intake.

The structure of the degree program is one that meets the requirements of both institutions, is eminently worthy of accreditation once we have five years of graduates and can track their professional progress, and will serve the needs of a community of software engineering professionals with an academic preparation stronger than many US graduates.

The first year of the program begun in September 2012, with those students coming to the US in June 2015 for acclimation to the US culture and beginning their final two years in fall 2015.

Both Firat University and SHSU are looking to expand their collaborative efforts to other universities in Turkey, in the United States and across the globe. There is a growing and vibrant Turkish community in the United States and in Houston in particular. We anticipate that, at some point in the future, we will be able to draw on that community for a number of resources; financial support, internship opportunities within the Turkish business community, and potentially a source of incoming students for the degree programs.

As exciting as the joint degree program is, the inter-institutional agreement offers significant additional benefits in the development of collaborative research, faculty exchanges and a more general broadening of academic horizons both in Turkey and in the United States.

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