

## **AC 2007-2559: IMPLEMENTING A 3 + 1 ARTICULATION AGREEMENT IN ENGINEERING TECHNOLOGY BETWEEN UNIVERSITIES IN CHINA AND THE UNITED STATES**

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## **Implementing a 3 + 1 Articulation Agreement in Engineering Technology Between Universities in China and the United States**

An Agreement of Cooperation between Shanghai Normal University (SNU) and the University of Dayton (UD) to establish transfer and joint BS programs in Electronic Engineering Technology (EET) and Manufacturing Engineering Technology (MFG) was signed on March 3, 2003<sup>1</sup>. The plan called for development of a “3 + 1 + 1 course” transfer program whereby the first three years of the program are taught in China by Shanghai Normal University faculty, and the last year of the program is taught by University of Dayton faculty in Dayton, OH. This is to be followed by one course to be taught by University of Dayton faculty in China. At the conclusion of the program, students receive baccalaureate degrees from both Shanghai Normal University and the University of Dayton.

The principal agreement was signed by administrators at the respective institutions, while faculty were charged to later develop the details. Since this program was on a “fast-track” to implementation, faculty at Shanghai Normal University and University of Dayton have been simultaneously building relationships, modifying curricula, and mentoring enrolled students. The first cohort of 100 students was recruited and enrolled in the joint degree program at Shanghai Normal University just five months following signing of the agreement. Three cohorts of students are currently pursuing the joint degree program, with the first cohort presently enrolled at University of Dayton and scheduled to graduate in Summer, 2007.

### **About the Institutions**

Shanghai Normal University<sup>2</sup> was founded in 1954. Over the last fifty years, the university has developed from a teachers college into a comprehensive university which offers a large variety of disciplines including philosophy, economics, law, education science, literature, history, natural science, engineering, agriculture and management science. Currently, Shanghai Normal University has over 1840 graduate students, more than 22,000 undergraduates, and 1627 full-time faculty members.

The Mechanical and Electronic Engineering College of Shanghai Normal University has programs in Machine Design, Machine Manufacture & Mechanical Automation, Automobile Service, and Electronic Information & Automation. The College has 1580 full-time students, 68 faculty, and over 7000m<sup>2</sup> (75,000sf) of laboratory space.

The University of Dayton<sup>3</sup> was founded by the Society of Mary (the Marianists) in 1850. It has evolved from a boarding school for boys into a top-tier national, private university and one of the 10 best Catholic universities in the nation. The University of Dayton has 6925 full-time undergraduate students, 2580 graduate students, and 458 full-time faculty.

The University of Dayton School of Engineering has 938 full-time students, 56 full-time faculty, and over 100,000sf of laboratory space. The School has undergraduate programs in Chemical Engineering, Civil and Environmental Engineering, Computer Engineering, Electrical Engineering, Mechanical and Aerospace Engineering, Engineering Technology (Computer,

Electronic, Industrial, Manufacturing, and Mechanical), and graduate engineering programs in Aerospace, Chemical, Civil, Electrical, Materials, and Mechanical Engineering as well as graduate programs in Electro-Optics, Engineering Management, and Management Science.

### **Negotiating Terms of the Agreement**

While developing the program curricula, faculty at both institutions had to develop an understanding of a foreign business culture. The agreement, negotiated by the Senior Vice President and Provost at the University of Dayton and his counterpart at Shanghai Normal University, articulated the format of the program, admission requirements, tuition and fees, and the responsibilities of each institution. It was agreed that an articulation be developed to transfer students in two programs: Electronic Information Engineering at SNU to Electronic Engineering Technology at UD; and Mechanical Design, Manufacture & Automation at SNU to Manufacturing Engineering Technology at UD. The agreement also indicated that “the two parties will negotiate the curriculum offered...”

Early in the curriculum development process, faculty at UD shared course outcomes and syllabi with their counterparts at SNU. A short time later, SNU sent their course outlines, which in some cases, bore a very close resemblance in both content and numbering, to the UD outlines. An initial articulation of courses from SNU to UD for the first three years of the programs was developed. Based only on course outcomes, it appeared as though many of the mathematics, science, and technical courses would be a good match between the institutions. However, since each institution had a different philosophy regarding requirements for general education, it was apparent that there would need to be some serious conversation in this area.

In an effort to increase the transfer efficiency of courses, and to reduce the number of credits that would need to be completed at UD, SNU faculty agreed to modify their programs to better match the first three years of the UD programs. While it was believed that the SNU curriculum had been effectively changed to better align with the UD curriculum, the final transcripts told a somewhat different story. When the final transcripts were received, it seems that some of the courses that were indicated in the program were not actually taken.

During the first Summer at the University of Dayton, SNU students remained in their cohort to complete six credits of English Composition, three credits of Communications, and one credit of University Orientation. In the succeeding year, Chinese students were integrated into existing courses in the EET and MFG programs, enrolling in 16 – 18 credits in the Fall and Winter semesters. The original Agreement of Cooperation stated that students would return to China for their remaining UD course. However, upon reviewing final SNU transcripts, it was determined that students in the first cohort were still missing some University-required General Education courses, and will be required to complete these additional requirements prior to receiving their degree from the University of Dayton. UD faculty rearranged the last year of the curriculum to accommodate the missing classes and best serve the needs of the students. The final curriculum for the first cohort is shown in Table 1.

SNU administration initially applied for approval from the Ministry of Education for this transfer program. In order to gain approval the Ministry asked for additional contact between students enrolled in the program and US faculty. An agreement was reached whereby faculty from the University of Dayton would periodically travel to Shanghai and “guest lecture” in established SNU courses. In 2006, three faculty in general education and engineering technology traveled to SNU to deliver classes during the UD spring break. Since the time was short, this method of interacting with SNU students was very disruptive to UD faculty. However, since the Spring semester at SNU extends some six weeks beyond the end of the UD semester, this seemed like an opportune time for faculty to travel to Shanghai. In Spring of 2007, UD faculty will spend four weeks delivering course content to upcoming SNU cohorts.

While faculty thoroughly reviewed course outlines and materials from Shanghai Normal University courses, there was still some degree of faith that students would have the backgrounds necessary to succeed in an academically rigorous engineering technology program.

Students were found to have good academic preparation, especially where there was significant reliance on mathematics and basic sciences. However, their ability to perform design based on accepted practices, and their skills in solving more open-ended problems, appeared to present more of a challenge. Students were required to demonstrate an adequate level of proficiency in the English language, as demonstrated by the Test of English as a Foreign Language (TOEFL) scores to be admitted to the University of Dayton. While their conversation skills are good, students still have difficulty with English communication of technical materials, differences in systems of units, and testing methods. In spite of these challenges, students have quickly acclimated to college life and culture at a Western institution.

### **Lessons Learned**

Differences in culture and communicating though e-mail, halfway across the world, seemed to exacerbate the negotiation process. It was apparent that faculty at both institutions were trying to develop a partnership that was in the best interest of the students. However, while faculty attempted to learn about each other’s business culture it was apparent that many of the issues that arose during the negotiation process were due to differences in culture and communications.

In the US, contracts are generally clearly detailed, with all contingencies spelled out, whereas the Chinese prefer less detail and feel that all issues are still subject to negotiation<sup>4</sup>. This was apparent when the signed agreement was delivered to UD faculty with an understanding that the “two parties will negotiate the curriculum...” The curriculum negotiations took a full three years of development, and were still being worked out after the students were already most of the way through their program.

It is important to develop a strong relationship prior to entering into negotiations. The Chinese refer to “Guanxi,” or the “connection” that is developed between parties<sup>5</sup>. Taking the time to build a relationship between the parties may be time consuming, but necessary in developing a lasting relationship.

Negotiating curriculum across cultures and time zones has been continuous, even as student cohorts are progressing in the programs. This has posed a challenge to ensure a balance between requirements imposed by each institution and accrediting bodies, the reputation of the respective programs, and the best interests and academic preparation of the students. Nonetheless, much has been learned during the development and implementation of this agreement.

Aside from the issues encountered thus far, faculty at both institutions are committed to the success of the program. Program development continues for future cohorts, interaction between students in China and faculty at University of Dayton is increasing, and administrators at both institutions have committed additional resources to assure the continued development and ongoing success of the program.

**Table 1. Senior Year Curriculum for the First Cohort of Students.**

Shanghai Normal University 2006-07 Course Schedule		Cohort 1		1/17/2007		
Electronic Engineering Technology (EET)			Manufacturing Engineering Technology (MFG)			
<b>Summer 2006</b>			<b>Summer 2006</b>			
CMM-110	Decision Making	1	⇔	CMM-110	Decision Making	1
CMM-111/112	Public Speaking	1	⇔	CMM-111/112	Public Speaking	1
CMM-113	Interviewing	1	⇔	CMM-113	Interviewing	1
ENG-101	College Composition I	3	⇔	ENG-101	College Composition I	3
ENG-102	College Composition II	3	⇔	ENG-102	College Composition II	3
SET-300	ET Transfer Seminar	1	⇔	SET-300	ET Transfer Seminar	1
<b>Summer 2006 Total 10</b>			<b>Summer 2006 Total 10</b>			
<b>Fall 2006</b>			<b>Fall 2006</b>			
ECT-358	Microprocessors II	3				
ECT-358L	Microprocessors II Lab	1				
ECT-408	Data Acquisition & Measurements	2	⇔	ECT-408	Data Acquisition & Measurements	2
ECT-465	<i>Substitute for ECT-462</i>	3				
ECT-Tech EI	<i>MFG-400 Automotive Tech</i>	3				
				IET-308	Production Management	3
				IET-317	Industrial Economic Analysis	3
IET-323	Project Management	3	⇔	IET-323	Project Management	3
				MFG-432	Material & Processes-Plastics & Composites	3
				MFG-Tech EI	<i>MFG-400 Automotive Tech</i>	3
SET-499	Senior Seminar	1	⇔	SET-499	Senior Seminar	1
<b>Fall 2006 Total 16</b>			<b>Fall 2006 Total 18</b>			
<b>Winter 2007</b>			<b>Winter 2007</b>			
ECT 306	Electronic Devices II	3				
ECT-306L	Electronic Devices II Lab	1				
				IET-318	Statistical Process Control	3
				MFG-208L	Geometric Dimensioning & Tolerancing	1
MFG 426	Automated Manufacturing & CIM	3	⇔	MFG-426	Automated Manufacturing & CIM	3
MFG 431	Controls for Industrial Automation	3				
ECT-490	Senior Project	2	⇔	MFG-490	Senior Project	2
Ethics	<i>PHL-316 Engineering Ethics</i>	3	⇔	Ethics	<i>PHL-316 Engineering Ethics</i>	3
Arts Study	<i>MUS-205 Music, Instruments, &amp; Technology or MUS-303 Introduction to Music of the World</i>	3	⇔	Arts Study	<i>MUS-205 Music, Instruments, &amp; Technology or MUS-303 Introduction to Music of the World</i>	3
				PHY-201	PHY-206 General Physics I	3
<b>Winter 2007 Total 18</b>			<b>Winter 2007 Total 18</b>			
<b>Summer 2007 (at SNU)</b>			<b>Summer 2007 (at SNU)</b>			
PHL-103	Introduction to Philosophy (Distance Learning)	3	⇔	PHL-103	Introduction to Philosophy (Distance Learning)	3
PHL/REL	<i>SOC-326 Law and Society (In China)</i>	3	⇔	PHL/REL	<i>SOC-326 Law and Society (In China)</i>	3
<b>Summer 2007 Total 6</b>			<b>Summer 2007 Total 6</b>			
	Credits offered by CAS (SU)	15			Credits offered by CAS (SU)	15
	Credits offered by CAS (FAWI)	6			Credits offered by CAS (FAWI)	9
	Credits offered by ET (SU)	1			Credits offered by ET (SU)	1
	Credits offered by ET (FAWI)	28			Credits offered by ET (FAWI)	27
	Remaining credits at SNU	0			Remaining credits at SNU	0
<b>Grand Total 50</b>			<b>Grand Total 52</b>			
	CAS Credits common to both academic programs:	21				
	ET Credits common to both academic programs:	12				

## References

1. *Agreement for Cooperation between Shanghai Normal University (PRC) and the University of Dayton (USA)*. Signed March 26, 2003.
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5. Wikipedia <<http://en.wikipedia.org/wiki/Guanxi>>. [Retrieved 01/05/2007]