

Double-Degree Programs in International Education

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Abstract

Using the Global Engineering Education Exchange (Global E3), American universities can create double diploma undergraduate programs, and two-tiered bachelor/masters degree opportunities through independent, tuition-waived, exchange agreements. Recruitment, scholarship, articulation, and accreditation components of a healthy international exchange program are addressed in this presentation. Multi-national corporations reward students who validate their global engineering education by earning degrees from universities in other cultures, in other languages.

I. Introduction

The number of engineering students at Embry-Riddle Aeronautical University (ERAU) and at the University at Buffalo, The State University of New York (SUNY-B) who are involved in international academic exchanges, incoming and outgoing, has doubled over the last five years. And there are good reasons for this surging interest in studying engineering subjects abroad. First among them is student enthusiasm, enthusiasm resulting from their educational experiences in Europe or Oceania mixed with their American engineering curricula. "Without my masters degree from ENAC in Toulouse, it is unlikely that I would be working with an International Space Station contractor, as I am now," writes Solie Marriott, a 2000/01 graduate of ERAU and ENAC. But, for Solei to clear all of the exchange hurdles successfully, considerable attention had to be paid to preparation, articulation and politics.

If a multiple degree programs are to be successfully coordinated, both institutions must bear an equal share of the exchange burden; refinements to each agreement need to be made on an annual basis and must reflect changes in institutional policies, fluctuations in available resources, and, occasionally, responses to unsatisfactory student treatment or performance. The more flexible the initial protocol the more likely the accreditation and administrative hurdles can be cleared, year after year, as each institution evolves its curricula to meet its own national needs.

ERAU has three principle designs for delivering double diplomas within their exchange programs. Processed through the Global Engineering Education Exchange (Global E3), through bilateral undergraduate agreements, and through combination

undergraduate/graduate individual institution agreements. Most of the agreements include both bachelors and masters level studies, and ERAU incorporates a Pass/Fail grading system for its programs.

II. Global Engineering Education Exchange

The Global E3 consortium of institutions includes thirty USA participants and forty-nine foreign participants. Coordination of all exchanges is managed through the Global E3 offices at the Institute of International Education (IIE) in New York City. This year alone it has placed more than 280 students internationally, and during its seven years since incorporation it has disbursed nearly \$250,000 in scholarships¹. The Global E3 has helped to place Embry-Riddle students safely and appropriately in institutions with superior engineering programs for over six years. Dozens of very well prepared European students have studied at both the Daytona Beach and Prescott Campuses through the Global E3 network in recent years; currently, four students from France, Germany and Spain are studying aerospace engineering at ERAU.

Exchange administrators must take great care with the student selection process for study through the Global E3 system. Language proficiency, strong grade point averages, and program matches are critical prerequisite items. International applicants without transcript evidence of aeronautical or aerospace studies prior to the exchange should not be approved for ERAU, since limited subject knowledge would become a problem in course selection and research involvement. Destinations promising mild winters can assume priority status among many European engineering students.

Applicants from ERAU's engineering programs are similarly screened. Added to the concerns outlined above are: financial resource checks, parental approval secured, visa status cleared, core requirements satisfied, and discipline match assured. Global E3 exchanges often pair a term of study with a four-month internship. The IIE office provides appropriate visas for each exchange arrangement; this is a particularly important dimension of Global E3's involvement, since many American universities have visa-issuing limitations.

III. Double Diploma Agreements

With three of the Global E3 institutions, Ecole Polytechnique Feminine (EPF), Ecole Nationale de l'Aviation (ENAC), and Fachhochschule Munchen (FH Munich) Embry-Riddle has multiple degree agreements. Through these special programs, students from both sides of the Atlantic Ocean can earn parallel diplomas and graduate degrees through a compounded credit formula. Within five years an ERAU double diploma student who spends his junior year in France or Germany, returns to his home campus for one year, interns during that following summer in either Europe or America, completes a final fall term in Europe, can then graduate in April, having earned aerospace engineering bachelors degrees from both institutions. Nine credit hours of the five-year EPF, ENAC, or FH Munich degree can be applied toward an ERAU masters degree in aerospace engineering, should the student wish to pursue it.

Students from these three European institutions can earn both bachelors and masters degrees at ERAU by studying for two full academic years in Florida, the first during their fourth European year, and the final year after they have completed the French/German Diploma. The curricula among the partner institutions have been carefully articulated to reduce content redundancy as much as possible.

Maintaining a reasonable balance between incoming and outgoing double diploma students requires significant recruiting efforts among American students, given the scarcity of multi-lingual engineering undergraduates. Hankuk Aviation University (HAU) in Seoul, South Korea would also like to sign a double diploma protocol agreement, but the pool of ERAU engineering students fluent in Korean and interested in pursuing an HAU degree, is tiny.

EPF, the most active double diploma partner, has restructured its aeronautical engineering coursework to better compliment the ERAU program. Located in Seaux, a suburb of Paris, EPF has both hosted more ERAU students and sent more of its students through the double diploma program than both ENAC (Toulouse) and FH Munich combined. While ten ERAU students have studied at EPF as of this writing, only three have followed through with the double diploma option. Of seventeen EPF students in the program, six have earned all three degrees; to achieve that, students must complete a minimum of 33 undergraduate and 27 graduate engineering credits taken at ERAU, on top of the five-year French Engineering Diploma. A flow chart of the ERAU-EPF Double Diploma program is displayed in Figure 1.

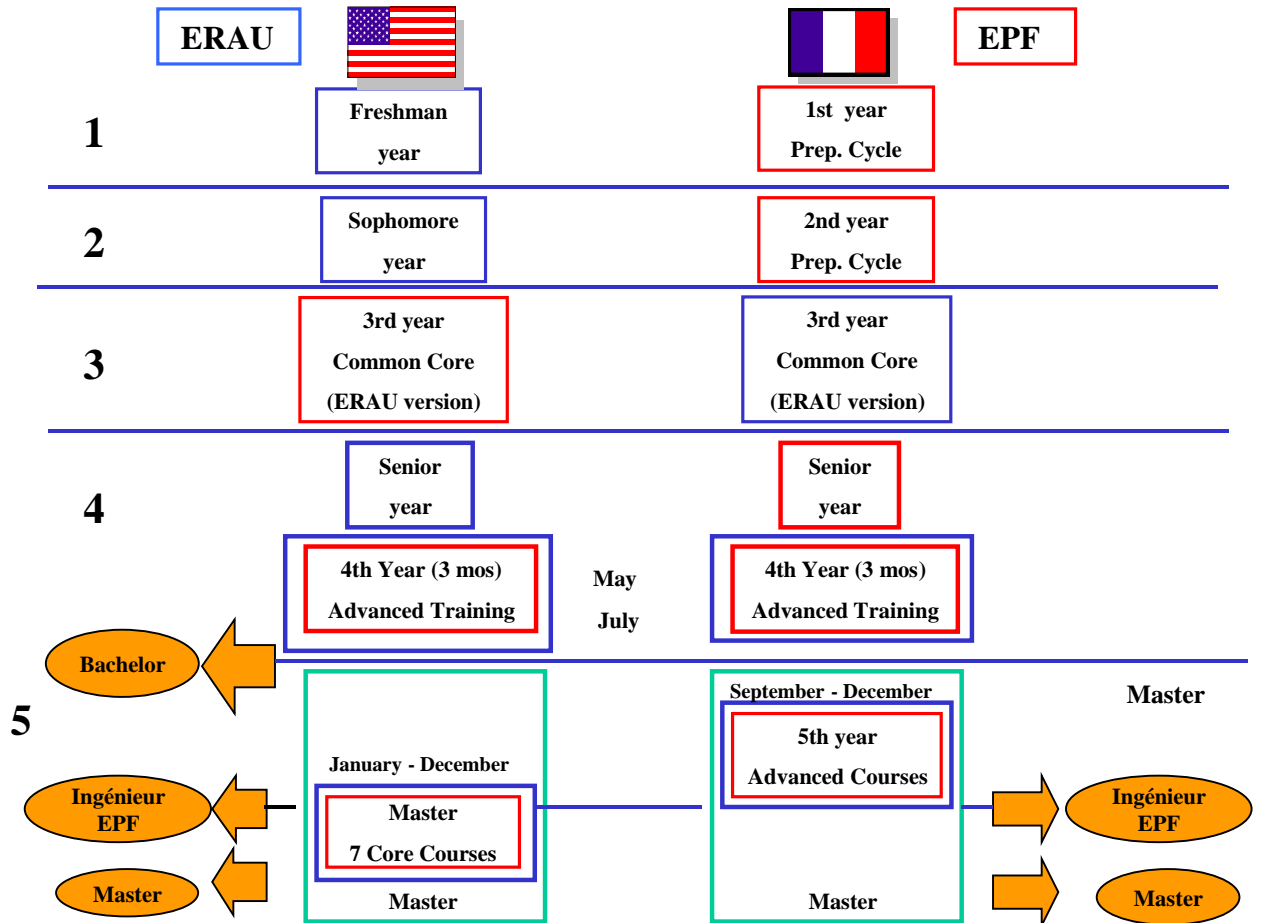
Accreditation concerns are addressed through course-by-course comparisons between the double degree participants. Professors from each institution cross the Atlantic to examine the curricula, laboratories and design projects. EPF engineering and computer science (informatique) department chairs spent a week at ERAU during the development of the double diploma agreement. Last year a similar visit was paid to EPF by Embry-Riddle computer science and aerospace engineering program coordinators. American course credit hours are matched with the French subject area lecture hours, and group projects are co-designed by faculty from both institutions. Student performances in these mixed design groups have been exceptionally strong.

ABET champions programs that offer international opportunities – through internships and through parallel academic programs. Two degrees within the same discipline, managed responsibly by institutions with strong programs, can result in greater breadth of knowledge, especially with regard to the cultural applications of the subject matter. A seventy-percent formula for course content commonality is used to explain parity to those who review the homework, exams, projects, etc. of the French double diploma students earning Embry-Riddle degrees. Finally, the fifth year of the French and German bachelor degrees have been granted nine graduate hours within the masters part of the agreement. American students who complete the French or German fifth year receive the same graduate credit equivalency.

The double diploma commitment is a significant one for sophomores, who must resign themselves to the daunting language requirement and the expenses and effort of a five year challenge.

DOUBLE DEGREE PROGRAM

(Figure 1)



Graduates in aerospace engineering who design and communicate smoothly within European cultures and languages offer industry an internationally savvy employee. The double diploma graduate captures a level of technical competence evidenced by a bone fide, five-year European credential. Further study, at either ENAC or FH Munich, through the tuition exchange arrangement, can produce a French or German masters degree. Two ERAU students have followed that path. An engineering program/discipline matrix of the ERAU/ENAC Double Degree Agreement is outlined in Figure 2. Students in other programs (business, human factors, professional pilot) have French degree earning opportunities also.

Double Degree Agreement (Figure 2)
between
Embry-Riddle Aeronautical University (ERAU)
and
Ecole Nationale de L'Aviation Civile (ENAC)

List of ENAC programs accessible to qualified ERAU students under the provisions of article 3.1 (Single Degree Program) of the Double Degree Agreement:

- **ENAC Engineering Degree (IENAC):** 3 year-curriculum, ERAU students admitted directly into the 2nd year of the program (4th year under the US counting system) ;
- **ENAC Master's program:** 1 year-program, including a 4- month industrial internship
 - Master in Satellite-based Communications, Navigation, Surveillance (MSCNS, in English)

List of ERAU programs accessible to qualified ENAC students under the provisions of article 3.2 (Single Degree Program) of the Double Degree Agreement:

- Master of Aerospace Engineering
- MS in Aerospace Engineering
- MBA in Aviation
- Master of Software Engineering

List of international integrated studies between ERAU and ENAC leading to ERAU's Bachelor's degree.

ERAU's Bachelor	Required credits	Concentration/ Electives/ Minor Courses available at ENAC
Aviation Computer Sc.	120	Most Jr and Sr courses and more (30 cr)
Aerospace Engineering	134	Most Jr and Sr courses (36 cr)
Avionics Eng. Tech.	128	Most technical courses in Jr and Sr years (33cr)

V. Managing International Exchange Agreements

In 1994, the year in which Global E3 was established, the Rand Corporation evaluated the state of engineering education and announced that “cross-cultural competence was considered by members of both the academic and corporate communities to be the most important new attribute for future effective performance in a global marketplace. However, it is what U.S. citizens are most lacking.”² During the 1996/97 academic year over 86,000 American students from 993 institutions earned credit through study abroad programs. “The bad news is that 457,984 international students studied within the U.S.A. during this same period.”³ While only a small fraction of these students were enrolled in engineering programs, the imbalances among engineering students are comparable and deserve serious attention by American academic administrators.

What steps are usually necessary to transition engineering students from high school conversational French, German, or Spanish to survival level proficiency in two years? Most ERAU students who intend to study in an institution that instructs in a language other than English, spend a seven-week summer term during their sophomore year in the target country to begin the language fluency challenge. Then, six weeks before the academic exchange is to begin (junior year) the students start their studies in the host country through one of Embry-Riddle’s Summer Abroad Programs.

When the first year abroad of a double diploma program is about to begin, exchange students register through their own ERAU engineering faculty before leaving the USA. Regular e-mail contact is maintained with the exchange coordinator and with the faculty advisor throughout the academic year. Occasionally, substitute courses or omitted class materials must be provided electronically by ERAU faculty to ensure that each exchange student earns a minimum of 12 credit hours per term.

Until transcripts are received from the host institution (sometimes delayed by as long as eight months), grades of “N” (indefinite incomplete) are recorded. In this way, financial aid awards and academic status reports are not adversely affected. World Education Services’ International Grade Conversions are used to determine passing or failing grades when the international transcript arrives, and “P” or “F” is entered into the students’ records. International grading practices are dynamic within countries and even within a single institution, but this conversion booklet balances the variables in a most equitable assessment formula⁴. Embry-Riddle adopted a pass/fail grading system for all international exchanges five years ago to reduce grade point average (GPA) anxieties among interested exchange applicants with high GPA’s. This single administrative policy has had a dramatic effect on student participation and morale in study abroad programs.

Scholarships are critical components of a successful engineering exchange program. The Ernest L. Arbuckle Scholarship Fund was set up exclusively at ERAU for engineering students in the exchange program, and currently awards \$500 each year to the two outgoing double degree seeking students with the highest grade point averages. Six and a half million dollars have been pledged by the Freeman Foundation (IIE, New York) to help engineering students study in Asia, one student per university. These scholarships, \$3,000 for summer programs, \$5,000 for single semesters, and \$7,000 for full academic years, can be awarded to

any applicant who has not lived for more than a month in any Asian country. These Freeman Scholarships are new, and should be investigated by all U.S. colleges and universities with engineering programs⁵.

Scholarship requests far exceed the number of awards available. More economic support needs to be solicited from our corporate beneficiaries to enable the brightest Embry-Riddle engineering students to realize the personal and professional rewards of complementary international degrees, so important in this millennium.

As the global aviation/aerospace industry continues to become increasingly interdependent, there will be a growing demand for broadly educated aerospace engineers to cooperate closely with their overseas and orbiting counterparts. In addition to a mastery of traditional engineering subjects, the aerospace engineer will need to have foreign language ability, cross-cultural skills, and international experience. Embry-Riddle Aeronautical University is responding to this growing demand by industry to partner with engineering institutions and organizations worldwide to provide students with academic exchanges and international internships in creative and affordable programs.

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