

Entrepreneurship Education for Engineering Students

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ABSTRACT: *Embry-Riddle Aeronautical University (ERAU) leads the world in aviation and aerospace higher education. ERAU engineering programs are of highest quality. Undergraduate aerospace engineering program in the College of Engineering is the largest in the country and has been consistently ranked #1 in the US News and World Report surveys. The undergraduate programs in aerospace, computer, civil, and electrical engineering, as well as engineering physics program, are accredited by the Accreditation Board for Engineering and Technology. This position paper for the Panel Discussion on Business Education for Engineering Students describes the College of Business initiatives to enhance entrepreneurship program and their impact on undergraduate education in ERAU engineering programs. The paper describes background and organization of ERAU, the need for entrepreneurship education, and the plan of action*

1 INTRODUCTION

To compete and succeed in the modern world requires good combination of technological and business skills. From Jobs and Wozniak to Gates and Allen – the technical wizardry alone does not make the product successful. The development of this entrepreneurship awareness contributes to producing graduates better prepared to compete in the modern world. Many universities realized this trend. Georgia Tech Program for Engineering Entrepreneurship provides formal graduate curriculum and also a selection of short courses (http://www.dupree.gatech.edu/fac_research/centers_initiatives/ee.html). University of Pennsylvania has Engineering Entrepreneurship Program focusing on roles of inventors and founders in high tech ventures (<http://www.seas.upenn.edu/ent/>). The courses in Engineering Entrepreneurship provide team-based and problem-based experience with minimum lecture time for diverse group of students representing both business and engineering disciplines. McMaster University offers graduate program emphasising creation of new business through innovative, opportunity-oriented management resulting in a formal course sequence (<http://www.eng.mcmaster.ca/outreach/meng-eei.htm>). University of Surrey School of Engineering offers undergraduate program in Entrepreneurship in Technology to provide skills for students and graduates to succeed and prosper in complex high-technology business environment (<http://portal.surrey.ac.uk/ugstudy/engineering/entrepreneurship/>). Brown's University Division of Engineering has created course sequence using interesting combination of classroom learning with industry participation. Northwestern University offers Engineering Entrepreneurship course with an overview of entrepreneurial process from engineering perspective including such elements as planning, financing, marketing, etc. (<http://www.iems.northwestern.edu/courses/display.asp?ID=13>)

Entrepreneurship is underserved in the aviation and engineering sector and Embry - Riddle Aeronautical University (ERAU) is a good place to house the program. There is an evident need to develop undergraduate entrepreneurship curriculum within the existing program of the College of Business.

ERAU holds a prominent position in aviation/aerospace education and is lacking entrepreneurship instruction. The College of Business recognizes the need for the development of entrepreneurship program within the College and the University. There must be room for entrepreneurial creativity in modern business education.

Introduction of entrepreneurship curriculum within the College of Business will present ERAU engineering students with an additional option of business specialization; it will teach and inspire entrepreneurial thinking. It will identify entrepreneurial individuals, challenge them and help them to realize their ideas and dreams.

2 BACKGROUND

Embry-Riddle Aeronautical University (ERAU) began in 1926 with a simple plan to train airplane pilots. It transformed to full service technical university accredited by Southern Association of Colleges and Schools (SACS) in early 60's. Today, Embry-Riddle leads the world in aviation and aerospace higher education. ERAU engineering programs are of highest quality. Undergraduate aerospace engineering program in the College of Engineering is the largest in the country and has been consistently ranked #1 in the US News and World Report surveys. The undergraduate programs in aerospace, computer, civil, and electrical engineering as well as in engineering physics program, are accredited by the Accreditation Board for Engineering and Technology (ABET).

ERAU is a global institution with the history dating back to the early days of aviation. Organizational structure of the University includes two residential campuses in Daytona Beach, FL and Prescott, AZ provide education in a traditional setting, while an extensive network of Extended Campus centers within the United States and abroad serve civilian and military working adults. The university holds a prominent position in aviation/aerospace education and is recognized by the Federal Aviation Administration (FAA) as the Center of Excellence in Aviation. ERAU along with NASA, the public and private partners are coming together to change the way we look at air travel and share a revolutionary vision of improved personal transportation. Small Aircraft Transportation System (SATS) concept resides with the ERAU Daytona Beach Campus and opening new business venture opportunities for the faculty and students in different areas of expertise.

3 ENTREPRENEURSHIP PROGRAM DEVELOPMENT

ERAU College of Business Daytona Beach Campus has successful, traditional business program with aviation application. The College of Business recognizes the need for the development of entrepreneurship program within the College and the University. There must be room for entrepreneurial creativity in modern education. Though ERAU holds a prominent position in aviation and aerospace engineering education, it is lacking adequate entrepreneurship instruction. According to a recent ERAU alumni survey, a large number of students started their own businesses. Alumni database contains over 400 former students who are classified as "entrepreneurs". The examples: Aero Alliance Insurance Services, Inc. Alpharetta, GA, Aerodyne Inc. Huntsville, AL; Air-Sur, Ormond Beach, FL; Gold Aviation Services, Fort Lauderdale, FL; PhilAir Flight Center, Daytona Beach, FL, etc.

There is a very strong demand for entrepreneurship instruction and entrepreneurship activities on campus. Embry-Riddle has many student clubs directly involving the College of Business (e.g. The Society for the Advancement of Management SAM). Last Summer ERAU Entrepreneurship Club (CEO Chapter) was organized. The club sponsors yearly business plan competition on the undergraduate level and participates in the national annual CEO conferences to compete and to be recognized locally and nationally. ERAU students participated in several national competitions (National CEO competition, The Global Entrepreneurship Awards, The Venture Bowl, etc.)

The plan to expand the entrepreneurship instruction calls for creation of a new Area of Concentration, which will include four required entrepreneurship courses (*Entrepreneurship, New Venture Creation, Business Planning in Air Transportation, Strategic Management of Technology and Innovation*) plus one elective from the list of the specified business electives courses.

Considering the unique character of ERAU, there is initiative that opens more options for entrepreneurial inclined engineering students. The current general education guidelines for engineering students offer courses in micro- or macroeconomics. The new initiative related to economic education for engineers considers engineering economics as required course for all engineering programs. The College of Business plan is to add entrepreneurship specialization within the Minor in Business. *Small Business Management* course and *Business Planning in Air Transportation* will be introduced within existing specified electives in the Minor in Business. Aerospace, computer, civil and electrical engineering as well

as aviation students take the Minor in Business. *Small Business Management* and *Business Planning in Air Transportation* courses will give students support, guidance and assistance, in creativity and development of a new products, new business ideas and base in business planning development.

ERAU College of Business Areas of Concentration:

- International Air Transportation Management
- Airport Management
- Airline Management
- Aviation Marketing Management
- Flight Operation
- General Management
- Entrepreneurship (*proposed*):
 - Entrepreneurship
 - New Venture Creation
 - Business Planning in Air Transportation
 - Strategic Management of Technology and Innovation
 - Specified business elective

ERAU College of Business Minor in Business Administration

Specified Electives (Specialization in Entrepreneurship *proposed*):

- Life-Cycle Analysis for Systems and Programs in Aviation/Aerospace
- Small Business Management
- Business Planning in Air Transportation

There are many students on campus that have business ideas in the area of aviation, such as: start-up airlines, Fixed Base Operation, and an aircraft detailing business. This new specified elective course will enrich and enhance the existing degree program and will provide additional opportunities for business inclined engineering students. The proposed entrepreneurship initiatives provide the engineering students with instruction, which helps them to learn basic business skills and to be prepared for competition in modern business world.

4 ENTREPRENEURSHIP DIRECTION

Short run solution: *Small Business Management* course within Minors in Business was offered in the Spring 2004 for both business and engineering students. The course used an interdisciplinary team of faculty representing four aspects of the field to approach important economic, financial and business aspects of a private enterprise. This course will build entrepreneurial skills among students.

In the long run: the College of Business will be working on developing undergraduate entrepreneurship program introducing the new Area of Concentration in Entrepreneurship (*Entrepreneurship, New Venture Creation, Business Planning in Air Transportation, Strategic Management of Technology and Innovation*, and one course from the list of specified business electives).

Business Planning in Air Transportation will be offered as well within the Minors in Business, together with *Small Business Management* and already existing *Life-Cycle Analysis for Systems and Programs in Aviation/Aerospace*.

Eventually, the entrepreneurship curriculum would be integrated within the College of Business graduate and distance learning programs. ERAU has an accredited distance learning program and any course or curriculum changes made to the programs on residential campus will also be made to the distance-learning curriculum. As entrepreneurship program within the College of Business continue to grow, we expect to add new faculty and staff in the future.

5 CONCLUSIONS

The modern technology requires versatile professionals knowing not only the technical aspects of the products they engineer, but also necessary managerial, financial and marketing aspects of the product. There is strong need for entrepreneurial education as an interdisciplinary venture between the College of Business and the other Colleges on campus. The proposed plan may be a guideline for development of

economic and entrepreneurial thinking for not only for business students but also for students from all engineering programs.

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