Engineering Entrepreneurship Program (EEP) (9 hours)

Program Structure (a 9-hour certificate that is currently under review)

The Engineering Entrepreneurship Program (EEP) provides three classes to teach students how to launch a technical entrepreneurial venture (see eep.eng.ua.edu). It is for students interested in applying their technical skills to create their own ventures and become their own bosses. It's only three classes to accommodate the crowded and busy schedules of engineering students. An application to approve this program as a 9-hour certificate is currently pending. Our three classes teach Styslinger College of Engineering (SCOE) and other STEM students to (i) evaluate the probable success of a venture (GES320), (ii) the skills to design and create a technical prototype for efficient manufacture (GES 321), and (iii) launch a technical venture (GES 421). There is also a summer study abroad program in Taiwan that will give students international experience in entrepreneurship. Below is the outline of the courses, how these count as engineering electives, the study abroad program, and the proposed certificate format.

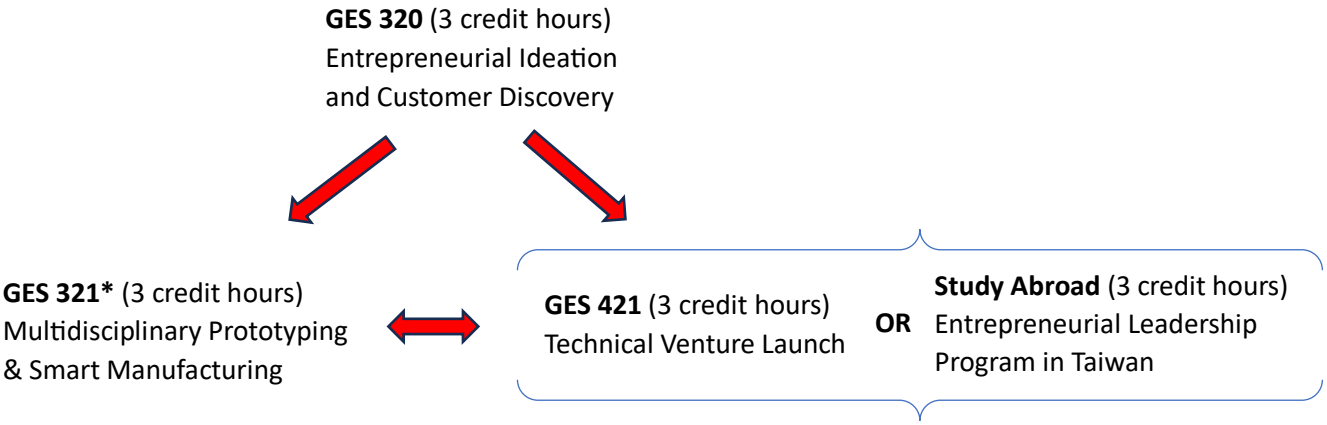

FIGURE 1. Curricular Structure of the 9-credit-hour Engineering Entrepreneurship Program Certificate

* This course is taught in The Cube (the College of Engineering maker space) as it uses many of the facilities in this space. GES 320 is the prerequisite for GES321 and GES421 or the study abroad option. Once GES320 is completed students may take GES321, GES421 (or the study abroad option) in any order.

Class Descriptions:

GES 320 Engineering Entrepreneurial Ideation and Customer Discovery (3 credit hours)

Entrepreneurial Ideation and Customer Discovery uses the Evidence-Based Entrepreneurship Approach of the NSF I-Corps Program. The course covers ideation, teaming, customer discovery and the use of the Business Model Canvas to create and optimize a Minimum Viable Product (MVP). Teams will focus on the creation of an actual venture, and explore additional concepts such as the cognitive biases that prevent accurate customer discovery, and how and when to execute venture pivots. This course helps students optimize their original idea with active customer discovery and analysis of a value proposition in the Business Model Canvas. This course will prepare them for future courses on protype creation, and business venture launch.

Prerequisites:

Any one of the following classes with minimum grade of C-: CHE 254, AEM 249, CE 262, CS 200, ECE 225, ME 215, MTE 271, or permission of instructor

GES 321 Multidisciplinary Prototyping and Smart Manufacturing (3 credit hours)

Multidisciplinary Prototyping and Smart Manufacturing addresses the skills and procedures for prototyping, and the design principles to optimize manufacturing and processing required for a successful venture. Part one of the class includes lectures and assignments on (i) design for manufacturing, (ii) design for maintenance and repair, and (iii) design for failure. Part two includes introductory projects on relevant skills including, but not limited to (i) additive manufacturing, (ii) subtractive manufacturing, (iii) electronic control, (iv) applied artificial intelligence, and (v) material properties and optimization. Part three is dedicated to the production of a specific product/prototype with relevant instructor mentoring and review.

Prerequisites:

GES 320 minimum grade of C-

GES 421 Engineering Venture Launch (3 credit hours)

Venture Launch picks up where Entrepreneurial Ideation and Customer Discovery ends. Students who have taken GES 320, or those with sufficient experience using customer discovery and a minimum viable product to refine a product/service idea should take this course. It examines how to fund, launch and scale a value-generating venture (profit or non-profit) using a refined product/service idea. The course will examine the relevant legal and regulatory issue in the launch process, and how to raise capital. Both the traditional equity capital approach and a practical bootstrap approach will be explored by students for venture funding. How to scale the business using the recently available on-line business services will also be explored.

Prerequisites:

GES 320 minimum grade of C-

Taiwan Study Abroad Program

This is a 3-credit hour program at Chung Yuan Christian University entitled "International Innovation/Entrepreneur Leadership Experience Program" typically offered during the month of July. The program includes lectures, projects, workshops, two academic field trips, two cultural field trips and a final presentation within an innovation competition. The academic field trips visit technical startups, and are augmented by visits to research and innovation labs at CYCU. Students work in groups with students from around the world to formulate an entrepreneurial venture using lean start-up principles. The program is taught in English.

Prerequisites:
GES 320 minimum grade of C-

Note on program enrollment for other STEM students

The addition of "… permission of instructor," to the course prerequisites above, is designed to allow other STEM majors, and secondary engineering majors to enroll in the EEP courses. The prerequisites above reflect the desire to take the first one or two major-specific courses that give a student an introduction to their major. This introduction prepares students to create a venture related to their particular field. While the standard prerequisites for most COE majors are listed above, this early major-specific class can vary significantly for other STEM majors and some secondary COE majors. For example, the CE 262 prerequisite for GES 320 Examples is for the B.S. major in Civil Engineering. However, some COE students enrolled in the Construction Engineering major in the Civil Engineering department might take CE 366 before CE 262. CE 366 is "Introduction to Construction Engineering," and represents the introduction to this major. Therefore, these students could be granted permission to enroll in GES 320 without previously completing CE 262, it they did complete CE 366.

Similarly, students from STEM majors can enroll in GES 320 after completing the first or second major-specific course in those majors. We interpret STEM broadly as majors including, but not limited to Math, Chemistry & Biochemistry, Physics & Astronomy, Biological Sciences, Psychology, Sociology, Kinesiology, Education, Geological Sciences, Sports Medicine, and Nursing. The initial major-specific courses in these majors can vary, so the instructor approval requirement is the most effective way to allow students to take these courses.

What EEP Courses count as COE Electives

The table below enumerates how the EEP courses count as electives for the various majors in the Styslinger College of Engineering. **Until these elective assignments become standardized, and are acknowledged in the list of accepted electives in the course catalogue, and the departmental course flowchart, they may require the filing of a petition to obtain credit.**

Engineering Department	Details of how the three required courses in this certificate count toward electives in the various majors in the Styslinger College of Engineering	# of Electives
Civil, Construction & Environmental Engineering	The number of EEP courses that count toward CCEE Electives is equal to the number of General Electives allowed for that particular CCEE degree program: Civil Engineering (3), Architectural Engineering (1), Environmental Engineering (3), and Construction Engineering (1).	3
Chemical & Biological Engineering	Up to two of the EEP courses count as Career Electives	2
Electrical & Computer Engineering	The EEP courses count as a Technical Electives (two 300/400 electives and one 400 level elective) for both the Electrical and Computer Engineering Degrees.	3
Metallurgical & Materials Engineering	Up to two of the EEP courses count as MTE Electives	2
Aerospace Engineering & Mechanics	Up to two of the EEP courses count for Professional Electives	2
Mechanical Engineering	GES320 counts as an ME Elective, and GES321 & GES341 as Technical Electives	3
Computer Science	All 3 EEP courses can be used for Free Electives	3