

## Council Approval

Note: This form is intended to track the progress of a proposal (whether from Academic Affairs or Health Sciences) through the Undergraduate and Graduate Councils.

Proposal: Graduate Certificate in Engineering Entrepreneurship

This proposal needs to go through:

Undergraduate Council	<input type="checkbox"/>
Graduate Council	<input checked="" type="checkbox"/>
Both Approvals	<input type="checkbox"/>
Grad Approval/Undergrad Notification	<input type="checkbox"/>

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This proposal has been approved by:

Chair of Undergraduate Council \_\_\_\_\_ Date: \_\_\_\_\_

Chair of Graduate Council  \_\_\_\_\_ Date: 12/1/16

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Once the appropriate signature(s) have been obtained, please forward this completed form to the Office of the Senior Vice President for Academic Affairs. (NOTE: The SVP-AA is the Chief Academic Officer for the University of Utah and reports to the Board of Regents in this capacity. When necessary, the CAO will get a signature from the SVP-HSC.)

Chief Academic Officer  \_\_\_\_\_ Date: 12-2-16

Once the Chief Academic Officer's signature has been obtained, this approval document will be forwarded to the **Office of the Academic Senate**.

<sup>2</sup> "Proposed Beginning Term" refers to first term after Regent approval that students may declare this program.

**Utah System of Higher Education  
Program Description - Abbreviated Template**

**Section I: The Request**

**University of Utah requests approval to offer the following Graduate Certificate: Certificate in Engineering Entrepreneurship effective Fall 2017. This program was approved by the institutional Board of Trustees on .**

**Section II: Program Proposal/Needs Assessment**

**Program Description/Rationale**

*Present a brief program description. Describe the institutional procedures used to arrive at a decision to offer the program. Briefly indicate why such a program should be initiated. State how the institution and the USHE benefit by offering the proposed program. Provide evidence of student interest and demand that supports potential program enrollment.*

A joint certificate offered by the College of Engineering and the Eccles School of Business at the University of Utah.

The Certificate in Engineering Entrepreneurship offers students the opportunity for hands-on innovation experience, as well as a foundation in business aspects of technology. We believe that this program will aid College of Engineering students, and other students pursuing majors in other scientific disciplines, who desire to work within their companies at a management level and/or have the skills to successfully launch their own products and companies.

The goal is to provide the educational background to thrive in small and large business, convey technical information in business terms, understand the business viability of engineering solutions, and factor in cost/risk analyses in their engineering/science designs.

It is worth noting that a very recent report by SpencerStuart places at 33% the number of CEOs in S&P500 firms that have engineering degrees. Many smaller companies in technical fields have engineers at the helm - the increasing growth of the tech sector in Utah highlights the need for an educational program in Engineering Entrepreneurship. Evidence of students' interest can be deduced from the fact that the course Emerging Technologies and Entrepreneurship (ENGIN 5020/6020) offered this semester has 43 students from all engineering department registered.

**Faculty Consultation**

Faculty in each department within the College of Engineering were notified of the interest in creating a Certificate in Engineering Entrepreneurship at their respective faculty retreats. Faculty were then given the time to make their recommendations, voice any concerns, and ask any questions regarding the goals and administration of the program. Department Chairs, in collaboration with the Dean of Engineering and the Director of Entrepreneurship, were also notified on an individual basis on how this might benefit their students.

The College of Engineering Executive Committee discussed the proposal on January 22nd, 2016., provided input during the coming months, and provided their unanimous support on September 16th, 2016. The proposal was discussed by the **various department faculties at their retreats and received unanimous support on the following dates: August 16, ECE and ChE; August 17, Bio and MSE; August 18, ME, SoC, CvEE. The School of Business voted unanimously January 9th.**

**Labor Market Demand**

*Provide local, state, and/or national labor market data that speak to the need for this program. Occupational demand, wage, and number of annual openings information may be found at sources such as Utah DWS Occupation Information Data Viewer ([jobs.utah.gov/jsp/wi/utalmis/gotoOccinfo.do](http://jobs.utah.gov/jsp/wi/utalmis/gotoOccinfo.do)) and the Occupation Outlook Handbook ([www.bls.gov/oco](http://www.bls.gov/oco)).*

The labor market demand for engineers is currently increasing. Projected employment for Electrical Engineers and related fields is expected to grow considerably. This expected growth in engineering employment, combined with the Utah Statewide increase of general business management positions at approximately 2.5% increase annually, shows evidence in need of not only engineers or product managers, but qualified individuals who can do both. There is also an increasing need to be able to

convey engineering designs and solutions to the business world. This certificate will provide students with those necessary skills.

### **Consistency with Institutional Mission/Impact on Other USHE Institutions**

*Explain how the program is consistent with the institution's Regents-approved mission, roles, and goals. Institutional mission and roles may be found at [higheredutah.org/policies/policyr312/](http://higheredutah.org/policies/policyr312/). Indicate if the program will be delivered outside of designated service area; provide justification. Service areas are defined in [higheredutah.org/policies/policyr315/](http://higheredutah.org/policies/policyr315/).*

In 2016 the USHE Board of Regents unanimously approved a 10-year strategic plan, acknowledging that Utah is at a crossroads in the "midst of developing a strong technology and start up sector." University of Utah Engineering graduates are at the heart of both of these sectors, driving growth, product development, and pushing Utah into the technology sector further than ever before.

By implementing the Certificate in Engineering Entrepreneurship, we are equipping our engineers with the knowledge to successfully navigate the business, legal, and financial aspects of the technology and start up sectors. In doing so, these students will continue to develop the Utah economy by increasing wages, creating jobs, and maintaining low unemployment. As such, this certificate serves to directly aid the goals and objectives laid out in the Board of Regent's 10-year strategic plan.

### **Finances**

*What costs or savings are anticipated in implementing the proposed program? If new funds are required, indicate expected sources of funds. Describe any budgetary impact on other programs or units within the institution.*

We do not anticipate any notable adverse budgetary impact. The Certificate will require either the creation or modification of four courses: the resources currently available to both the College of Engineering and the Eccles School of Business are sufficient to undertake the proposed endeavour.

There will be no financial impact. Though the new courses will cost money to teach, as long as we have 20 students per class, we expect the tuition (both differential and base) to cover the costs of the courses. In fact, we estimate having 40 students in the classes, exceeding the required amount to cover costs.

The advising of the certificate will be done by the existing ECE advisor, costing no extra funds.

### Section III: Curriculum

#### Program Curriculum

List all courses, including new courses, to be offered in the proposed program by prefix, number, title, and credit hours (or credit equivalences). Indicate new courses with an X in the appropriate columns. The total number of credit hours should reflect the number of credits required to receive the award. **For NEW Emphases, skip to emphases tables below.**

For variable credits, please enter the minimum value in the table below for credit hours. To explain variable credit in detail as well as any additional information, use the narrative box below.

Course Number	NEW Course	Course Title	Credit Hours
General Education Courses (list specific courses if recommended for this program on Degree Map)			
<b>General Education Credit Hour Sub-Total</b>			
<b>Required Courses</b>			
ENGIN 6020		Engineering Entrepreneurship	3
ENTP/ENG 6790	X	The Business of Entrepreneurship	3
ENTP/ENG 6791	X	Launching Technology Ventures	3
ENGIN 6xxx	X	Engineering Law and Contracts	3
ENGIN 6xxx	X	Dissertation Writing or approved elective	3
Add Another Required Course			
<b>Required Course Credit Hour Sub-Total</b>			15
<b>Elective Courses</b>			
Add Another Elective Course			
<b>Elective Credit Hour Sub-Total</b>			
<b>Core Curriculum Credit Hour Sub-Total</b>			15

Propose a NEW Emphasis to an existing Regent approved program

**Program Curriculum Narrative**

*Describe any variable credits. You may also include additional curriculum information, as needed.*

The certificate program will be open to all Engineering major students and students from other scientific disciplines. As such, the core courses will be tailored toward their specific majors. This will apply to all the graduate degrees. Requirements for each participating Department will be determined by the managing committee of the Certificate and individual Departments.

**Degree Map**

*Degree maps pertain to undergraduate programs ONLY. Provide a degree map for proposed program. Degree Maps were approved by the State Board of Regents on July 17, 2014 as a degree completion measure. Degree maps or graduation plans are a suggested semester-by-semester class schedule that includes prefix, number, title, and semester hours. For more details see <http://higheredutah.org/pdf/agendas/201407/TAB%20A%202014-7-18.pdf> (Item #3).*

*Please cut-and-paste the degree map or manually enter the degree map in the table below*

September 27, 2016

Gianluca Lazzi  
USTAR Professor and Department Chair  
Department of Electrical and Computer Engineering  
The University of Utah

Dear Professor Lazzi,

It is with great enthusiasm that I write to support the proposal to create a Certificate in Engineering Entrepreneurship. The certificate is an essential and timely addition to the college's academic offerings. The college, as well as the university as a whole, is committed to the idea of translating fundamental research into commercial products that can better the human condition. Presently, students and many faculty members are uncertain how to navigate the challenging pathway to product creation. Thus, this formal program to educate our students on the entrepreneurship process is sorely needed.

As Chair of the Department of Mechanical Engineering, I often have discussions with students about issues such as intellectual property and translating their ideas to actual products. Our required capstone design, two-course sequence for seniors requires student teams to develop a solution to a real-world problem. In a typical year, the department sponsors up to 40 teams of 3 – 5 students on projects that require a physical prototype to be fabricated. Many of these projects result in very interesting product ideas, which leads to student interest in forming a company to further develop the idea. Unfortunately, students do not typically have the background in business, accounting, and IP legal issues that they need to get a new business venture off the ground. The proposed certificate will fill that void and provide students with the basics in these areas.

With the college and department marketing their entrepreneurial successes, it seems logical that we should provide an academic program in that area. From the department's point of view, I believe the visibility the program will generate will have a positive influence on the recruitment of more high achieving students. Establishing this certificate will also allow our students to gain a competitive advantage as they enter the marketplace. Overall, the new certificate will provide strategic value to the university as the new program will augment the university's position as a national leader in entrepreneurship.

I look forward to the opportunity of contributing to the creation and support of this new certificate program and I am confident that it will be successful in attracting new students to the College of Engineering and the Department of Mechanical Engineering.

Best Regards,



Tim Ameel  
Professor and Chair



September 22, 2016

Gianluca Lazzi  
USTAR Professor and Department Chair  
Department of Electrical and Computer Engineering  
The University of Utah  
Salt Lake City, Utah 84112

Re: Letter of Support for Engineering Entrepreneurship Certificates

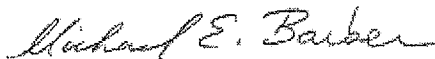
Dear Dr. Lazzi,

On behalf of the Department of Civil and Environmental Engineering (CVEEN), this letter is to confirm our strong support of the undergraduate and graduate certificates in Engineering Entrepreneurship. I believe the proposed curriculums will strengthen our students' abilities to understand what it takes to be success in business whether from the viewpoint of working for existing companies or striking out on their own in a new venture. The working partnership with the School of Business will provide our students with unique learning opportunities that will help prepare them for rewarding careers.

In addition, several of the proposed classes offered as part of the graduate certificate also will help CVEEN strengthen its offerings in our Engineering Management MS degree. We are excited about adding them to our list of elective courses.

Thanks for taking the lead on these outstanding new certificates. I am confident that they will be popular with our students.

Sincerely,



Michael E. Barber, Ph.D., P.E.  
Professor and Chair of Civil and Environmental Engineering



**Richard B. Brown**

Dean of Engineering  
1692 Warnock Engineering Building  
72 S. Central Campus Drive  
Salt Lake City, Utah 84112  
PH: (801) 585-7498 FAX: (801) 581-8692  
brown@utah.edu  
<http://www.coe.utah.edu/~brown>

September 9, 2016

Gianluca Lazzi  
USTAR Professor  
Chair of Electrical and Computer Engineering  
University of Utah  
Salt Lake City, Utah

Dear Prof. Lazzi:

I am pleased to write a letter of enthusiastic support for the proposed Engineering Entrepreneurship Certificates at both the undergraduate and graduate levels. These certificates will be joint between the College of Engineering and the School of Business.

Since coming to the University of Utah, I have been interested in giving the Engineering students an introduction to business concepts. This background will be helpful to our graduates whether they become involved in new ventures or are employed by established companies. Knowing the language and perspective of business will facilitate communication between engineers and their marketing and sales counterparts, will give them confidence to be involved in start-up companies, and will help them make better engineering design decisions. A *report* by executive search consulting firm SpencerStuart claims that 33% of the S&P 500 companies' CEOs have Engineering undergraduate degrees. Many smaller companies, especially those that are technically oriented, also have engineers as their CEOs. These facts argue that our students need some education in business.

While there is an Entrepreneurship certificate available to undergraduate students now, it is not a good fit for Engineering students, as is evident from the fact that, despite their high level of interest in entrepreneurship, none of our students pursue it. The proposed Engineering Entrepreneurship Certificates' requirements are compatible with the curricula in all of the College of Engineering degree programs. To earn a certificate, students will have to plan their course selection with the certificate in mind, and then take a couple of extra courses beyond what can be counted toward their majors as either core requirements or technical electives; this is a reasonable obligation. Two new Business courses will be developed to give students an overview of business concepts. Students will be required to take a "Law for Engineers" course that will introduce them to intellectual property, contracts, and other business law issues. They will take a technical communications course at the undergraduate level, or, for graduate students, the dissertation writing course. Undergraduates will do a senior design project; for it to count toward the Entrepreneurship Certificate, the project will need to include an analysis of commercializability. And finally, students will take a capstone Entrepreneurship course (Eng 5020/6020), in which each small group of students will select an emerging technology and go through the steps of developing a business plan, a funding strategy, pitch deck, marketing plan, etc.

The University of Utah has a strong reputation in commercialization, and the College of Engineering, which has spun out 55 companies in the past decade, is well known for innovation and entrepreneurship. But to date, the academic support for entrepreneurship in the College of Engineering has been weak. This certificate program will change that. In addition to the academic merits of the program, the establishment of this certificate program will have the desirable effect of pulling Engineering and Business into a close and formal collaboration.

I am very optimistic about this certificate. I know that it will be popular with our students. It will be good for recruiting at both the undergraduate and graduate levels. It will help graduates achieve greater success in their careers.

Thank you for your work in leading this effort, Gianluca. I am delighted to support the proposal, and I look forward to working with you and our colleagues in Business to make it a program of which the University will be proud.

Sincerely,

A handwritten signature in dark ink, appearing to read "Richard B. Brown", followed by a long horizontal flourish.

Richard B. Brown  
Dean of Engineering



Department of  
**CHEMICAL ENGINEERING**  
COLLEGE OF ENGINEERING | THE UNIVERSITY OF UTAH

Dr. Gianluca Lazzi  
Chair  
Department of Electrical Engineering  
University of Utah  
Salt Lake City, UT

September 30, 2016

Dear Professor Lazzi:

On behalf of the Department of Chemical Engineering, I would like to express my enthusiastic support for Entrepreneurship Certificate being proposed by the College of Engineering. Innovation and entrepreneurship are becoming a core skill for engineers in general and chemical engineers, in particular. I believe the knowledge and the skills acquired in courses comprising of the certificate both at the undergraduate and the graduate level will help our students, the industry and the country to compete effectively. This is important for job creation and economic growth.

The Department started a freshman course titled Chemical Engineering Design and Innovation about five years ago. This course, based on hands-on learning and innovation has been highly successful. This component of the program will be emphasized throughout the curriculum. The Entrepreneurship Certificate will be a perfect complement to this departmental strategy. We are making graduate students also more cognizant of the need for innovation and entrepreneurship. The formal training offered through the certificate will be looked positively by graduate students as well.

In summary, the proposed certificate will greatly benefit the department by offering important curricular skills for our undergraduate and graduate students.

Best Regards

Milind Deo  
Meldrum Professor and Chair  
Chemical Engineering



September 22, 2016

Gianluca Lazzi  
USTAR Professor and Chair  
Department of Electrical and Computer Engineering  
University of Utah  
Salt Lake City, Utah

Dear Prof. Lazzi,

I am pleased to write this letter in support of the proposed Engineering Entrepreneurship Certificates at both the undergraduate and graduate levels.

The Department of Materials Science and Engineering (MSE) have a strong tradition in support of faculty and students in commercialization of their research inventions and discoveries. More than thirty percent of MSE faculty have founded start-up companies based on the technologies developed at the University of Utah. Also, a notable number of MSE students have ventured into entrepreneurship activities after graduation. For example, two MSE graduates David Toledo (BS '10) and Paul Slusser (BS/MS '09) recently appeared on ABC's Shark Tank competition pitching their Power Pot startup based on a novel application of thermoelectric materials and received \$250,000 investment. Therefore, we expect that a good number of MSE students will be interested in receiving an Engineering Entrepreneurship Certificate as a valuable addition to their academic degree.

The proposed Engineering Entrepreneurship Certificates' requirements are compatible with both the undergraduate and graduate MSE curricula, so that students will be able to earn the certificate with minimum extra course work. We are already in the process of reviewing and revising some of the existing MSE courses to be counted for the certificate program, such as adding a design component in the Materials Innovation course.

In summary, I am very optimistic that this certificate will be well received by our students.

Sincerely,

A handwritten signature in cursive script, appearing to read 'Feng Liu'.

Feng Liu, Ph.D.  
Professor, Chair of Materials Science and Engineering  
University of Utah



September 9, 2016

Subject: Letter of Support for Proposed Engineering Entrepreneurship Certificates

To Whom It May Concern:

I am writing to offer my enthusiastic support for the proposed Engineering Entrepreneurship Certificates at both the undergraduate and graduate levels. These certificates will be joint between the College of Engineering and the School of Business.

Entrepreneurial ventures combining engineering expertise with business execution are valuable to the economy and the reputation of the university. We are pleased to collaborate with the College of Engineering to provide students with a robust curriculum that will accelerate entrepreneurial activity among engineering students. The curriculum is novel among programs in the nation in that collaborative efforts between colleges nationally is the exception rather than the norm.

In summary, I strongly support the proposed Engineering Entrepreneurship Certificates. There is a demand for such a program, and the University has an opportunity to expand the reach and impact of its outstanding Engineering and Entrepreneurship programs.

Sincerely,

Taylor Randall, PhD  
Dean



Department of

**BIOENGINEERING | UNIVERSITY OF UTAH**

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September 22, 2016

Dr. Gianluca Lazzi  
USTAR Professor and Chair  
Electrical and Computer Engineering  
University of Utah  
Salt Lake City, UT 84112

Dear Dr. Lazzi:

As Chair of the Department of Bioengineering I support your proposed Engineering Entrepreneurship Certificates at both the Undergraduate and Graduate levels that are jointly sponsored by the Colleges of Business and Engineering.

The statistics for job opportunities for BME are highly encouraging, with the Department of Labor Statistics projecting a growth of 27% in employment in the next ten years. Biomedical engineers find jobs in manufacturing, hospitals labs, education, research and development divisions of companies, government labs, regulatory agencies as well as starting their own businesses. Having an entrepreneurial mindset can give BME professionals an edge and the option to increase their involvement in the process of innovation. The training you have outlined complements our existing curriculum and should produce students who are better equipped to identify, acquire, develop, and transfer technology into new products and services.

Sincerely,

Patrick A. Tresco, PhD  
Professor and Chair  
Department of Bioengineering  
University of Utah  
Office (801)-656-7886

cc: Richard B. Brown, Dean  
College of Engineering





School of Computing  
50 S. Central Campus Drive  
University of Utah  
Salt Lake City, UT 84112-9205

September 29, 2016

Dear Gianluca:

I am writing, as the Director of the School of Computing, to express my support for the proposed Engineering Entrepreneurship Certificate. I think that exposing engineering and computer science students to the topics described in your proposed curriculum will make them very marketable and well positioned to participate in the Utah's technology-driven, small business economy. I think that some of our students will be interested in the program, and we look forward to describing this new curriculum to both our undergraduate and graduate students in computer science. Good luck on this new enterprise.

Yours truly,

Ross T. Whitaker  
Director, School of Computing  
Professor, SCI Institute



September 12, 2016

Gianluca Lazzi  
USTAR Professor  
Chair of Electrical and Computer Engineering  
University of Utah  
Salt Lake City, Utah

Dear Professor Lazzi:

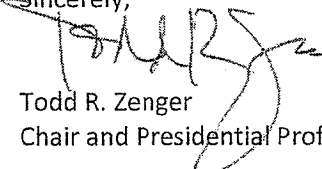
I am writing to express my strong support for the proposed Engineering Entrepreneurship Certificates that will be offered jointly by the School of Engineering and the School of Business through the Department of Entrepreneurship and Strategy.

There is a growing consensus among top business and engineering schools that preparing engineering students for a life of impact requires augmenting their well-honed technical skills with insights from the social sciences and business, including courses in business operations, the management of innovation and intellectual property, and new business formation. These skills amplify the impact of trained engineers, who are increasingly called upon to lead organizations composed of technical and non-technical staff; make crucial decisions associated with the pursuit of innovation or management of technology; and, in entrepreneurial settings, occupy positions in top management as hybrid engineering leaders and executives.

This new Engineering Entrepreneurship Certificate will be distinct from the Entrepreneurship Certificate that the Department of Entrepreneurship and Strategy already offers to University undergraduates. The existing certificate targets freshman and sophomores across campus. Engineering students have no open slots in their schedules for these courses during their freshman and sophomore years, and the existing 1000 and 2000 level courses are not tailored for advanced engineering students with strong technical backgrounds.

We are excited by the prospect of collaborating with our colleagues in the School of Engineering, and excited to collaboratively develop a program that will accelerate the skills of its students as they seek to create real value through entrepreneurial ventures and careers as engineers.

Sincerely,

  
Todd R. Zenger  
Chair and Presidential Professor

Department of Entrepreneurship and Strategy

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(801) 585-9471  
1655 East Campus Center Drive, Room 7126  
Salt Lake City, UT 84112-9349  
Eccles.Utah.edu

January 3, 2017

Richard B. Brown, Ph.D.  
Dean, College of Engineering  
University of Utah  
72 S. Central Campus Drive, 1650 WEB  
Salt Lake City, UT 84112

Dear Dean Brown,

The J. Willard Marriott Library appreciates your request to comment on our ability to support students in an Engineering Entrepreneurship Certificate program.

The Marriott Library has extensive holdings to support study in engineering, business and law, including monographs, databases, and journals. The Library has been supporting graduate students in business and in various engineering disciplines for many years.

The Library regularly acquires scholarly books in engineering, business and other related disciplines. We are also able to purchase specific books upon request, and we encourage faculty and students to work with librarians to build Library collections in any areas that are needed.

The Library currently maintains subscriptions to many scholarly journals that would support this new program, including the *Journal of Management in Engineering*; *R & D Management*; *IEEE Transactions on Engineering Management*; the *Journal of Engineering and Technology Management*; the *Journal of Engineering Entrepreneurship*; *The Journal of Entrepreneurship*; the *Journal of Business Venturing*; *Entrepreneurship: Theory & Practice*; *Journal of Small Business Management*; *Technovation*; and *Management Science*.

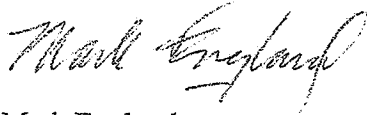
Students in this certificate program will have access many useful databases; including *IEEE Xplore*; *INSPEC*; *Scopus*; *Web of Science*; *Dissertations & Theses: Global*; *Business Source Premier*; *BizMiner*; *Bloomberg*; *Business Monitor International*; *Factiva*; *FedBizOpps*; *IBISWorld*; *MarketResearch.com*; *Mergent Intellect*; *PrivCo*; the *Small Business Reference Center*; *Standard and Poor's NetAdvantage*, and several others.

Professional library staff offer training workshops, online tutorials, and one-on-one consultations

to University of Utah students and faculty. Similarly, we offer class presentations and one-to-one consultations with library specialists who will suggest appropriate search strategies and help students to locate relevant resources for their course-related and independent research projects.

The Marriott Library is looking forward to engagement with the faculty and students in this new program.

Sincerely,

A handwritten signature in cursive script, reading "Mark England". The signature is written in dark ink and is positioned above the printed name.

Mark England  
Head, Collection Management  
J. Willard Marriott Library

# **ADDENDUM**

## **Description of New Courses**

### **ENTP 5790, ENTP 5791**

This new sequence of two courses provided by the School of Business will teach students the following concepts:

- Definition of technology entrepreneurship, Porter's five forces
- Supply, demand, economic profit and types of competition
- Business case
- Fundamentals of accounting
- Fundamentals of corporate finance
- Financing the venture
- Staged financing and dilution
- Team dynamics
- Founders' dilemmas
- Management organization
- Management succession
- Group projects – pitch the venture

More detailed information can be found in the attached syllabi.

### **Elective Classes**

The certificate requires a minimum of 20 credits to completion. There is no requirement to tie this certificate to a particular engineering major, other than the completion of a senior project/thesis, which all engineering majors already require. This will be completed in the scope of the departments' respective senior project class.

Every engineering student will be able to complete this certificate independently of their major requirements.

### **Engineering Entrepreneurship Committee**

Richard B. Brown: Dean of Engineering

Gianluca Lazzi: Program Director, Director of Engineering Entrepreneurship

Todd Zenger: Chair, Entrepreneurship

Taylor Randall: Dean, David Eccles School of Business

The committee was formed by the leadership of the College of Engineering, the Department of Electrical and Computer Engineering and the Department of Entrepreneurship and Strategy, and the School of Business at the University of Utah.

A signed Memorandum of Understanding with all signatories has been included with this addendum.

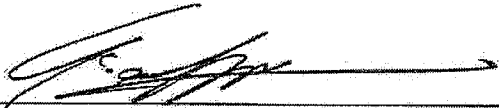
October 13, 2016

## Engineering Entrepreneurship Memorandum of Understanding

The College of Engineering and the David Eccles School of Business intend to collaborate on an Engineering Entrepreneurship Program, leading to a certificate offered to both undergraduate and graduate students with majors in engineering. The lead Departments in the two Colleges are the Department of Electrical and Computer Engineering and the Department of Entrepreneurship. In order to govern this shared Certificate, the two Colleges and lead Departments agree to the following:

1. A faculty governance committee will meet annually to review admission policies, applications, enrollments, teaching quality, and future staffing for the emphasis. This committee will consist of four faculty members, two from the College of Engineering selected by the Dean of Engineering and two from the Department of Entrepreneurship of the Eccles School of Business, selected by the Department Chair.
2. The Dean of Engineering appoints the Director of the Engineering Entrepreneurship Program, who is a member of the faculty governance committee. The founding director of the program is Dr. Gianluca Lazzi.
3. Changes to the program of study leading to the emphasis in each major will not be made unilaterally. Changes to the emphasis must be approved by majority vote of the faculty governance committee.
4. In the event that the faculty governance committee splits 2-2 on any issue, the Director of the Engineering Entrepreneurship Program should make a decision on said issue. Members of the committee can always appeal to the Deans of the two colleges to resolve any outstanding disputes.
5. The Colleges and Departments agree that courses in the emphasis will be staffed by tenure-line or career-line faculty, although exceptions to this can be agreed to by the faculty governance committee.
6. After an initial period of two years, where the Colleges and Departments commit to teach the courses required for the Engineering Entrepreneurship Certificate at least once per year with a minimum enrollment of 7 students, beginning the third year (AY 2019-2020) it is expected that there would be at least 20 students in each course in order to assure that they would be taught. Nonetheless, the faculty governance committee can recommend to the Colleges and Departments that these courses be taught, although ultimately, should there be less than 20 students enrolled, the decision will rest with the Chairs and Deans.
7. Engineering differential tuition will be charged for the courses. The differential tuition will be given to the departments in the College of Engineering or the Eccles School of Business from which the instructor comes.

8. The David Eccles School of Business and its Department of Entrepreneurship will offer two courses accessible to both senior undergraduate and graduate students (currently "The Business of Entrepreneurship" and "Launching Technology Ventures"). The College of Engineering and faculty in its Departments will offer the remaining courses (currently "Emerging Technologies and Entrepreneurship", "IP law", technical writing, and senior design courses which vary among engineering Departments). The faculty governance committee can make recommendations and propose altering titles and content of the courses as needed.
9. The two courses taught by the Entrepreneurship Department will be listed or cross-listed in Engineering in order to facilitate their being taken by College of Engineering undergraduate and graduate students.
10. In addition to the differential tuition, the College of Engineering will transfer to the Department of Entrepreneurship the funds related to student credit hours in the University's budget model for the business courses when they are taught by Department of Entrepreneurship tenure-line or career-line faculty.



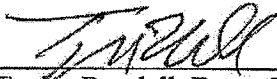
Gianluca Lazzi, Chair, Department of Electrical and Computer Engineering



Todd Zenger, Chair, Department of Entrepreneurship



Richard Brown, Dean, College of Engineering



Taylor Randall, Dean, David Eccles School of Business

**ENG XXXX: Engineering Entrepreneurship**  
**[Day(s)] [Class Start Time] — [Class End Time]**  
**[Building] [Room]**

Robert Wuebker | robert.wuebker@eccles.utah.edu | Wechat: @巴子

## **Course Materials**

Preparatory materials for each session (reading assignments, videos, web sites, journal articles, and the occasional case study or book chapter) are posted to Instructure Canvas.

## **What This Course Offers**

A wealth of research that studies the formation and growth of new businesses discloses a curious fact. At least half of you will be designated occupationally as an entrepreneur over the course of your career. Another strand of research that studies the operations and performance of established firms discloses another curious fact. The nature of work in technology-driven firms and how that work is executed within organizations is changing dramatically. Companies now explicitly seek to hire individuals with something they call “entrepreneurial capability”. While the specific capabilities in demand can sometimes seem murky, there is a growing realization that these capabilities are in demand and are valuable, and represent part of the “new standard” for entry-level technical (and non-technical) positions everywhere you look.

This course asserts (and then demonstrates, through in-class dialogue and a series of assignments) that one of the core “meta-skills” you have developed as engineering students—*finding and solving problems*—represents a critical (if not singular) component of this “entrepreneurial capability” required for starting a company and increasingly crucial for success in a larger organization.

The goal of this course is to show—using entrepreneurship as an experimental laboratory and petri dish—that you can apply the skills you already have to add value across all aspects of a company’s operation. This includes areas that are often considered to be “off limits” to engineering such as organizational design and human resources, valuation and technology licensing, market research and analysis, or sales.

Using entrepreneurial settings as our laboratory and area of inquiry achieves two concurrent aims.

- **First, I want to inoculate you against any fear you have of starting your own company.** Providing you with data on firm formation showing that many of the most successful startups and innovative companies had (and have) engineers at the helm is not the same as you discovering that marketing and sales is not mysterious—it is math. It yields to your skill set, and no amount of “speed dating events to match the Biz Guy and the Technical Guy” or impassioned speeches from a buzzword-heavy epic talker wearing Axe Body Spray is going to change this brute fact about the world. Trust yourself and your judgement.



- **Second, I want to help you get real about the arc of your career inside an established organization, and get you prepared for it.** Having base technical capacity is important. And so is learning to work in a team. Your parents were right—you need to do your homework so you are prepared and have some discipline, and you need to know how to share your toys with the other kids in the sandbox. But—knowing marginally more addition and subtraction than Axe Body Spray Guy and knowing how to share your toys is the ticket to entry. People do not pay you to be nice and do math. What you have to do inside an organization is create value. The more value you create, the more you make (up to a point—that is why individuals who know how to create often go out on their own to start their own firm).

Creating value is difficult. Complicated problems are tough. For most people this gives them sadness. Do not have sadness. Smile and lean in. You already have the base toolkit, and background with creative problem solving in some specific applications. What we want to do in this class is turn that up a notch. Most areas in business will yield to your specific skill set. Demonstrating how true this is—and how motivating, useful, and valuable knowing that truth can be—is the point of this course.

Let's get started.

## What This Course Requires and How You Will Be Evaluated

You are required to attend this course, complete the assignments, and participate (contribute to) the dialogue we have about each week's topic.

Course Component	% Total Grade
In-Class Contribution	20%
Assignments	70%
Final Write-Up	10%

### Learning Through Dialogue

We learn through dialogue in this course. The assignments are the fuel for this dialogue. The assignments can be tackled in many different ways. Sometimes there will be individual assignments. Other times I will assign you to a team. There are several perspectives and models that you can solve to find, frame, or solve a problem. Many of these problems can be re-framed in creative ways that will surprise us all. Discussing what you did and why you did it that way gives us access to the insights of others.

I will not be using levels of “rightness” (getting a correct answer or you feeling as if you successfully “won” some imagined debate about the correctness of your approach) as the primary mechanism to evaluate assignments. Being right about something is life's consolation prize. Yes, there are things in life with correct answers. *Getting those things nailed is the lower bar in the course.* It means you paid attention and followed instructions—a meat robot. Good luck with that as a winning life strategy. What I want to see is you grappling with something more interesting than that.

Here's what you need to understand, aspirational engineer person who wants to make interesting stuff. If you want to make things that matter—building stuff in the world rather than using stuff other people built or following their instructions—you need to develop a reputation for successfully directing ever more complicated collections of resources under increasingly ambiguous conditions to pursue increasingly more crucial outcomes. Obviously, this applies at a startup. But if you are going to work for an established firm you are not off the hook. Here is why. Organizations exist because they are efficient—they exist because it is less expensive to organize using a hierarchy than a market (and where it is not, they don't—see Exhibit A, “Outsourcing”). This means that if there is something that can be done “right” or “wrong” in an organization it will be documented, turned into a process, and converted to code or assigned to someone who will do more of it for half of your salary. Think you are safe if you are working on things that require some judgment and have no clear answer? Think again. You can design systems that are “right enough”—see Exhibit B, “Financial Services”).

Your career—if you are going to have one—will be dealing all day, super-effectively, with all the issues that do not fall into the above categories. Human beings are going to get all the tasks that remain—problems that are uncertain, ill structured, complicated, currently not known, or *ex ante* unknowable. I am here to help you get used to that.

My hope is that dialogue-based inquiry—rather than rote transmission of dusty slides or ancient cases—will help us learn more about this process, and the activities will help us figure out what the process actually *feels* like. During this class we will collectively shuck off our need to be right and look good, focusing instead on refining our capacity to experiment, reflect, ask good questions, and actually listen to the answers. I expect to be amazed and surprised by you, because each semester I am.

Said another way, while this class will rely on in-depth analysis of assignments, the point of these assignments is to prime us for knowledge generation in the classroom. *They are merely the point of departure.* If you do not prepare, your capacity to contribute will suffer, as well as your ability to follow the dialogue and learn from it.

<b>Pro Tip:</b> Taking up oxygen in the classroom does not count as attendance.
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### Assignments

Assignment start and due dates are noted in the syllabus, are submitted to me via Canvas, and all of the material you need to discuss the assignment are brought to the appropriate class session. If you have an issue with either assignment start or due dates, it is your responsibility to negotiate with me to resolve this (in advance, not *ex post*).

### Individual Write-Up (Final Exam)

I will request an individual write-up on a topic of my choosing (you can call this a Final Exam if you like). Your grade will be based in part upon the quality of your response, and in part upon my *feels*, which are complicated, precious, and nuanced.

<b>Pro Tip:</b> The optimal way to prepare for the final exam is to pay attention in class, take notes, and to take 5-10 minutes pre and post-class to consider what you have learned, and what new questions have emerged for you.
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### A brief note on late work

I do not accept late work.

## **Administrative Issues**

### Office hours

Please feel free to stop by—I am often in my office, except for the times that I am not in my office. If you would like to schedule a specific time to meet, you can do so through Canvas. Please specify an e-mail address where you can be reached, and where I can send a calendar event for our appointment.

### Academic integrity and other University policies

I rigorously enforce School and University policy on academic integrity, discrimination, accommodation for the disabled, and so forth. Please see the School or University web site for specific information about these policies.

Students are expected to pursue the highest standards of academic honesty in all assignments. This includes, but is not limited to, refraining from cheating, plagiarizing, research misconduct, misrepresenting one's work and/or inappropriately collaborating. Plagiarism specifically refers to the use of another's work, ideas and words as your own. It is also extended to include the re-use of a paper originally intended for a different class. All class work is expected to be original, unless there is appropriate acknowledgement of sources. Students that are found engaging in the above activities will receive a failing grade, may fail the course, and will most certainly earn my disdain. Details of the David Eccles School of Business and the University of Utah policies on academic honesty may be reviewed in the University Code.

The University expects regular attendance at all class meetings. You are responsible for satisfying the entire range of academic objectives, requirements and prerequisites as I have defined them. If you miss the first two class meetings you may be required to withdraw from the course. If you are absent from class to participate in officially sanctioned University activities (e.g. band, debate, student government, intercollegiate athletics), religious obligations, or with instructor's approval, you will be permitted to make up both assignments and examinations. The involved students must deliver written documentation of absence to their instructors, preferably before the absence but in no event later than one week after the absence. Students are responsible for class material during an absence and should make individual arrangements to get notes or updates.

The University of Utah's Accommodation Policy allows students to request a modification of class requirements if those requirements conflict with the students' sincerely held core beliefs. The responsibility is on the student to request the modification, and I have full decision-making power to deny or grant the request. Although this syllabus has been carefully developed, it is always possible that some of the writings, lectures, films or presentations in this course may include material offensive to some students. Please review the syllabus carefully to see if this course is one that you are committed to taking. If you have a concern, please discuss it with me at the earliest opportunity.

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations.

### Grade Scale

Grades reflect the judgment of the instructor and, as such, the weights that I assign to each task as well as the scales detailed below serve only as guidelines in my calculation of your final grade. As a result, your final grade may vary from these guidelines. They will, however, hew quite closely to the grade descriptions articulated by the School of Business (reproduced below the grade table).

Grade	100 Point Scale	4 Point Scale
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A	93	4.0
A-	91	3.7
B+	88	3.3
B	83	3.0
B-	80	2.7
C+	78	2.3
C	73	2.0
C-	70	1.7
D+	67	1.3
D	63	1.0
D-	60	.67
E	60 or worse	0

**A: Excellent Performance/Superior Achievement**

An 'A' level involves understanding the content and learning objectives thoroughly, completely and accurately, and demonstrating that understanding in a number of ways. Such a student will have done exceptionally well on assignments, exams and class projects, and will have participated extensively in class discussion. An A student will also have demonstrated a strong interest in the learning process by contributing to a constructive class environment and to the learning success of his or her fellow students.

**B: Good Performance/Substantial Achievement**

A 'B' level involves demonstrating a relatively high level of mastery of the content and learning objectives of the course. A B student will have done very well on assignments, exams and class projects, and will have participated constructively in class discussion. A B student will have demonstrated a positive attitude toward the learning process and made a positive contribution to the learning environment of the class.

**C: Standard Performance and Achievement**

A 'C' level involves demonstrating a reasonable level of mastery of the content and learning objectives of the course. A C student will have completed assignments and demonstrated a reasonable grasp of requisite knowledge on exams and class projects. A C student will have demonstrated a reasonable level of commitment to the learning process and made a positive contribution to the learning environment of the class.

**D: Substandard Performance/Marginal Achievement**

A 'D' level involves demonstrating some level of mastery of the content and learning objectives of the course, but less than that desired to serve as a basis for future endeavor. A D student will not have completed all assignments in a satisfactory manner, nor demonstrated more than a partial grasp of requisite knowledge on exams and class projects. A D student will have demonstrated only some commitment to the learning process and made only a marginal contribution to the learning environment of the class.

**E: Unsatisfactory Performance and Achievement**

An 'E' level reflects a failure to demonstrate any significant mastery of the content and learning objectives of the course. An E student will not have completed all assignments in a satisfactory manner, nor demonstrated any significant grasp of the requisite knowledge on exams and class projects. An E student will have failed to demonstrate any significant level of commitment to the learning process, nor made any positive contribution to the learning environment of the class.

**Session [X]—[Day] [Month]**  
**Course Introduction**

<b>Objective</b>	Confirm thesis, learning objectives, and expectations for this course.
<b>Preparation</b>	<ul style="list-style-type: none"> <li>• Arthur—The Inevitability of Uncertainty</li> <li>• Stewart—The Management Myth</li> </ul>
<b>Guest(s)</b>	TBA [High Profile Engineering Founder]
<b>Assignment</b>	About You (A Primer)

**Session [X]—[Day] [Month]**  
**Value Creation—Problem Finding and Solving**

<b>Objective</b>	Individuals (and businesses) create X dollars of value and capture Y% of X. It is important to know that X and Y are independent variables, and to understand the implications of that fact.
<b>Preparation</b>	<ul style="list-style-type: none"> <li>• Graham—How to Make Wealth</li> <li>• Wuebker—Don't Be Someone's Revenue Stream</li> <li>• Zenger—Build a Theory Then A Strategy</li> <li>• Zenger—What is the Theory of Your Firm</li> </ul>
<b>Guest(s)</b>	Todd Zenger, University of Utah
<b>Assignment</b>	Finding Problems, Re-Framing Problems

**Session [X]—[Day] [Month]**  
**The Math of Problem-Finding**

<b>Objective</b>	Constructing and screening hypotheses: is this a valuable problem? Is this a valuable enough problem, and to whom?
<b>Preparation</b>	<ul style="list-style-type: none"> <li>• Dixon—Software is Eating the World</li> <li>• Weissmann—The No Stack Startup</li> </ul>
<b>Guest(s)</b>	Bubba Page, Dave Oldham, Steve Glickling, Outro
<b>Assignment</b>	Outro—How Much Is Your Personal Network Worth?

**Session [X]—[Day] [Month]**  
**The Math of Market Selection**

<b>Objective</b>	Billion dollar ideas are secrets. Getting people to believe your secret is one challenge. Operationalizing where to start is another. The former is the domain of social ontology. The latter yields to math.
<b>Preparation</b>	<ul style="list-style-type: none"> <li>• Bhidé—How Entrepreneurs Craft Strategies That Work</li> <li>• Moore—<i>Crossing the Chasm</i> (Ch. 3, Excerpts)</li> <li>• Theil—On Secrets</li> </ul>
<b>Guest(s)</b>	Brent Thomson, Blip Billboards
<b>Assignment</b>	Blip Billboards—AdWords for Billboards

**Session [X]—[Day] [Month]**

### Experimental Design I: A/B Testing (and Beyond)

<b>Objective</b>	A/B testing is the fulcrum from which to begin to think about data-driven and systematic testing approaches to digital and physical products (and services). We will start with simple tests, and branch out to more sophisticated approaches.
<b>Preparation</b>	<ul style="list-style-type: none"> <li>• Graham—Do Things That Don't Scale</li> <li>• Firmhouse—Experimental Design Primer</li> <li>• Wired—The Technology That Changed Web Development</li> </ul>
<b>Guest(s)</b>	Gary Jense, Omaze
<b>Assignment</b>	A/B Test Analysis

### Session [X]—[Day] [Month]

### Experimental Design II: Design Sprints and “Minimum Viability”

<b>Objective</b>	Every generation gets the entrepreneurship religion it deserves. Business plans, customer development, agile methods, scrum, the “lean startup”, design thinking, and sprints have one thing in common: each believes it represents the One Weird Trick to startup success. Let's think a little more carefully about this.
<b>Preparation</b>	<ul style="list-style-type: none"> <li>• Blank—How The Lean Startup Changes Everything</li> <li>• Brown—Design Thinking</li> <li>• Google Ventures—Design Sprints Methods</li> </ul>
<b>Guest(s)</b>	Travis Corrigan, Beachbody.com
<b>Assignment</b>	Design Sprint Exercise

### Session [X]—[Day] [Month]

### Experimental Design III: Expert Inquiry

<b>Objective</b>	In the previous session we have established if (and how) to build first to get to a robust theory of value, and if (and when) to ignore experts. In this session we consider another option—when (and how) to talk to experts, and if you do how to get the most out of that.
<b>Preparation</b>	<ul style="list-style-type: none"> <li>• Hseih—Three Approaches to Content Analysis</li> <li>• NYU—Conducting Semi-Structured Interviews</li> </ul>
<b>Guest(s)</b>	Adam Slovik, Angel Investor, Technology Entrepreneur
<b>Assignment</b>	Expert Panels—Sample Selection and Virtual Text Analysis

### Session [X]—[Day] [Month]

### The Firm As Experiment: Analyzing Operations I

<b>Objective</b>	In the previous two sessions we have made the case that the approach to proving out a theory depends on the parameters of the problem. Sometimes it is useful to test incrementally. Other times it is useful to build a prototype. Other times better to talk to experts. Under certain
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	conditions, an operating business is the appropriate experiment.
<b>Preparation</b>	<ul style="list-style-type: none"> <li>• Guardian—How Uber Conquered London</li> <li>• Niu—Apple and Tim Cook’s Operational Brilliance</li> <li>• Wilson—Web and Mobile Revenue Models</li> </ul>
<b>Guest(s)</b>	Davis Wang, Mobike
<b>Assignment</b>	Mobike—Unit Economics w/Company As Experiment

**Session [X]—[Day] [Month]**  
**The Firm As Experiment: Analyzing Operations I**

<b>Objective</b>	The problem with getting to a valid operational model often has less to do with experimental design and more to do with you—your capacity to organize and collaborate, your ability to overcome your own systematic cognitive biases and need to be right.
<b>Preparation</b>	<ul style="list-style-type: none"> <li>• Argyris—Teaching Smart People How to Learn</li> <li>• Grove—High Output Management (Chapter 1)</li> <li>• Wuebker—What Experiments are Running You</li> </ul>
<b>Guest(s)</b>	Adam Kaslikowski, Pink Iron
<b>Assignment</b>	Pink Iron—N+1

**Session [X]—[Day] [Month]**  
**The Math of Collaboration**

<b>Objective</b>	Google ran a massive experiment on human cognitive, demographic, and personal attributes on individual and group performance. What did they discover? None of what we thought mattered actually did. What can we learn from applying analytical techniques to team and individual performance? How can we do it?
<b>Preparation</b>	<ul style="list-style-type: none"> <li>• Duhigg—Better, Smarter, Faster (Ch. 4)</li> <li>• Gawande—Personal Best</li> <li>• Hackman—Group Behavior and Performance</li> </ul>
<b>Guest(s)</b>	TBA
<b>Assignment</b>	Google People Analytics—Team Design

**Session [X]—[Day] [Month]**  
**The Math of Motivation**

<b>Objective</b>	You might think a venture capitalist thinks that companies fail because they run out of money. And you would be wrong. Venture capitalists know that companies fail because teams do not learn fast enough—they conduct the wrong experiments poorly, and fail to collaborate. That is why venture capitalists care so much about contract design and incentive alignment.
<b>Preparation</b>	<ul style="list-style-type: none"> <li>• Feld—Term Sheet Primer</li> <li>• Sahlman—What Venture Capitalists Do</li> </ul>

	<ul style="list-style-type: none"> <li>• Triantis—Venture Capital Contract Design</li> </ul>
<b>Guest(s)</b>	Ben Dahl, Pelion Partners
<b>Assignment</b>	Salary Design + Capitalization Table

**Session [X]—[Day] [Month]**  
**Marketing Is Math I—Campaign Analytics**

<b>Objective</b>	We discuss three important and interrelated aspects of marketing that happen to be incredibly math-heavy—(1) designing, running, and evaluating the effectiveness of advertising campaigns and (2) estimating the demand curve, often through experiments like A/B testing or hierarchical Bayesian analysis, which inform (3) the ultimate metric—the cost of acquiring a customer.
<b>Preparation</b>	<ul style="list-style-type: none"> <li>• [Bond Will Provide Preparation Material]</li> </ul>
<b>Guest(s)</b>	Brian Bond, Eventboard
<b>Assignment</b>	Campaign Design

**Session [X]—[Day] [Month]**  
**Marketing Is Math II—Pricing (Willingness-to-Pay)**

<b>Objective</b>	We discuss three important and interrelated aspects of marketing that happen to be incredibly math-heavy—(1) designing, running, and evaluating the effectiveness of advertising campaigns and (2) estimating the demand curve, often through experiments like A/B testing or hierarchical Bayesian analysis, which inform (3) the ultimate metric—the cost of acquiring a customer.
<b>Preparation</b>	<ul style="list-style-type: none"> <li>• Pragmatic Marketing—Introduction To Conjoint Analysis</li> <li>• Qualtrics—Conjoint Analysis Theory</li> <li>• Sawtooth—Conducting Conjoint Analysis</li> </ul>
<b>Guest(s)</b>	Jason Snyder, University of Utah Nina Hampl, University of Vienna
<b>Assignment</b>	Conjoint Analysis

**Session [X]—[Day] [Month]**  
**Sales Math: Cost of Customer Acquisition (and Retention)**

<b>Objective</b>	We discuss three important and interrelated aspects of marketing that happen to be incredibly math-heavy—(1) designing, running, and evaluating the effectiveness of advertising campaigns and (2) estimating the demand curve, often through experiments like A/B testing or hierarchical Bayesian analysis, which inform (3) the ultimate metric—the cost of acquiring (and keeping) a customer.
<b>Preparation</b>	<ul style="list-style-type: none"> <li>• Kissmetrics—Cost of Customer Acquisition</li> <li>• Quora—How to Calculate Customer Acquisition Cost</li> <li>• Sailthru—Customer Lifetime Value</li> </ul>

<b>Guest(s)</b>	Darren Lee, Proofpoint Brian Bond, Eventboard
<b>Assignment</b>	Customer Acquisition Worksheet (Ancestry.com Case)

**Session [X]—[Day] [Month]**  
**The Math of Partnership Contracts**

<b>Objective</b>	New firms often need partnerships to survive or thrive. Established firms often use partnerships to accelerate the development of a product or create new (or additional) value. We will examine a series of contracts and “back out the math” using value creation and value capture as our frame of reference: where is the value being created? Who is bringing what to the party? What are they getting, when, and under what conditions? ** Addition: Acquisition Math
<b>Preparation</b>	<ul style="list-style-type: none"> <li>[Hadley will provide preparation material]</li> </ul>
<b>Guest(s)</b>	Ben Hadley—Cooley, LLC
<b>Assignment</b>	Deal Or No Deal

**Session [X]—[Day] [Month]**  
**Financing Growth I: Venture Math**

<b>Objective</b>	Let’s assume your company requires outside financing for growth—credit cards are not enough, grants are not appropriate, and banks have nothing to collateralize. This is the realm of angel investors and venture capital. To provide you with capital, you offer a certain percentage of your company to the venture capitalists in exchange for cash. But how much of the company, and for how much cash? How are the numbers calculated? How do specific deal terms influence ownership and control down the road?
<b>Preparation</b>	<ul style="list-style-type: none"> <li>Feld/Mendelson—Venture Deals</li> <li>Wilmerding—Venture Terms</li> </ul>
<b>Guest(s)</b>	Ken Krull—Mercato
<b>Assignment</b>	Valuation Exercise

**Session [X]—[Day] [Month]**  
**Financing Growth II: New Project Math**

<b>Objective</b>	Let’s assume you are working inside a large company and have an idea for a new business—a new line of business, or a new product in your division. That would not be unusual at all. What is unusual is learning early on in your career how the capital allocation and business evaluation process works—which makes these decisions mysterious to many, if not most, employees.
<b>Preparation</b>	<ul style="list-style-type: none"> <li>Govindarajan and Trimble—Building Breakthrough Businesses In Established Organizations</li> </ul>
<b>Guest(s)</b>	Fabien Berger—Swisscom

	Gladys Gu—Philips Lighting
<b>Assignment</b>	The Internal Business Case

**Session [X]—[Day] [Month]**  
**Financing Growth III: Exit Math**

<b>Objective</b>	The final stage of the entrepreneurial life cycle—tapping the capital markets for growth—is the Initial Public Offering (IPO). What happens during the going-public process, and how does the IPO get priced? We will find out—because you will price one and sell your book to your peers.
<b>Preparation</b>	<ul style="list-style-type: none"> <li>• HBR—Too Soon To IPO?</li> <li>• IPO Prospectus—The Goldman Sachs Group</li> <li>• Seeking Alpha—The Untold Story of the Baidu IPO</li> </ul>
<b>Guest(s)</b>	Lance Zhu—Minwen Capital
<b>Assignment</b>	IPO Pricing (UPS, Netscape, Blackstone)

# **Engineering Entrepreneurship**

## **Curriculum Concepts**

### **[Course #1]—Business Plan Development**

- Context: Teach business fundamentals and underlying economic logic associated with the creation of a business built around a new product or service through a semester-long business planning exercise tuned specifically for Engineering students.
- Value Proposition: Engendering a problem-finding and problem-solving perspective, students will need to work through key issues and challenges in marketing, financing, and supply chain associated with creating a business around an idea that they envision and evolve.

#### Details

- In-class time will largely be allocated to peer-review and discussion with minimal lecturing by faculty.
- Specific technical business areas (marketing, finance, supply chain/sourcing, etc.) will be delivered through on-line, modular video tutorials (i.e. just-in-time “deep learning”) and necessary for in-class discussion.
- Artifact(s): Students will emerge with VC-ready set of artifacts:
  - Business Plan | Examples: 20+ page plan
  - Pitch deck 10 slides w/20+ slide appendix
  - Executive summary 2 pages
  - Poster (ideally for temporary display in Engineering school to grow interest)
- Grading: Delphi Panel + Internal Classroom Voting + Lassonde Showcase

**Material in red needs further (careful) review/editing**

This course covers the process of identifying and quantifying market opportunities, then conceptualizing, planning, and starting a new, technology-based enterprise. Students develop detailed business plans for a startup. It is intended for students who want to start their own business, further develop an existing business, be a member of a management team in a new enterprise, or better understand the entrepreneur and the entrepreneurial process.

In this course we not only study entrepreneurs, we become entrepreneurs. Students will, over the course of the semester, learn the process of how to create an innovation-based new venture. As a framework for this, we use the business planning process and students develop the essential parts of a business plan and investor pitch as a useful vehicle to achieve this goal. Students will work in teams to launch companies, working through issues of market analysis, technology viability assessment, competitive positioning, team-building, product life-cycle planning, marketing strategy, sales channel analysis, and a strong emphasis on the entrepreneur as a salesperson. We will map the practical steps of organizational and legal issues associated with forming a brand-new company, and we will address the strategic considerations for creating companies that can quickly define and dominate a new category or disruptive technology.

This is a hands-on course that teaches a rigorous framework as well as providing valuable experience to students so that they, upon completion, can be more successful in starting a new venture. This has been evidenced by the hundreds of successful entrepreneurs courses modeled on this approach have produced, who have gone on to form dozens of companies (see Launched at Lassonde for more detail).

## Section 1: Entrepreneurship Essentials

### Session 1 Introduction / Team Formation / Course Overview

- Class Logistics
- Team Formation (Google Analytics Insights; Speed Dating Exercise)
- Management Reports: what it means to hold yourself and your peers accountable
- Mini-Case
- Workshop—Finding, Framing, Solving Problems

### Session 2 Financial Overview

- Net present value
- Discounted cash flows
- Discount rates
- Application: CAPM model

### Session 3 Accounting Overview

- Backing into free-cash flows
- Income Report
- Cash-Flows Statement
- Balance Sheet

### Session 4 Financial Forecasting and Valuations

- Impact of finance decisions on the Pro-Forma
- Arriving at valuations
- Value creation recap

## Section 2: Opportunities

### Session 5 Legal Matters: Ownership, Hold-up, and Legal entities

- Intellectual Property
- Corporations and Partnerships
- Initial Founder's Agreements (team contracts)
- 
- 
- +0.Functional Excel Pro-Forma Financials due

### Session 6 Product Definition and Competition

- Minimum Viable Product
- Industry analysis – Porter
- Customer needs as “Jobs to be done” –Christensen
- HBS Market Research Note
- Competition – building a competitive matrix
- Dropbox Case

### Session 7 Product Definition and Competition

- Traditional market research
- Evolution to agile market research
- Rent the Runway Case (?)
- Market Landscape / Evaluation Due

### Session 8 Sales and Marketing

Crossing the chasm – Geoffrey Moore

- Sales cycle: from early to late adopters

The Art of the Start – Guy Kawasaki

- TBD
- Market research proposal + w/min 10 sample points
- Angelist case(?)
- Iphone applications case(?)

### Session 9 Customer and Business Model

Eric Ries author of The Lean Startup:

“What is customer development”

“The three Drivers of Growth for your business model”

## Business Model Taxonomy: Seizing the White Space: Business Model Innovation by Mark Johnson

Extract the entire taxonomy and be prepared to defend your choices on each dimension, and what market testing you did to arrive at each decision.

### Section 3: Putting it together

#### Session 9 Management, Operations, and Investor perspectives

- Adam Slovik—Precision Execution (Building A Unicorn) (guest speaker)  
Fitness anywhere case(?)

Grove—High Output Management

#### Session 10 Investors and VC

- Funding New Ventures: Valuation, Financing, and Capitalization Tables HBS
- Six Myths About Venture Capitalists HBR
- Venture Valuation
- Ben Dahl—Why Should I Finance Your Company? (guest speaker)
- Term Sheets
- Cap-Tables
- Complete Financial model due

#### *Midterm 2*

#### Session 11 The Start-Up Simulation & Presentation Workshop

- In class simulation and debrief
- How to pitch effectively
- The art of reduction / refinement

#### Presentations

- Final feasibility study due
- In class, 2-minute pitch—no slides—with 5 min Q&A

#### Final Exam

- Each student will be required to fully evaluate and provide feedback on 2 other feasibility studies. Grades will be assigned on the basis of team reports and individual feedback



**ENGINEERING 5020/6020**  
**Emerging Technologies and Entrepreneurship**  
Gianluca Lazzi

**Course Overview**

Regardless as to whether you intend to start a company or not, “emerging technologies and entrepreneurship” provides skillsets that everyone can benefit from, no matter what you will be doing in your life. Warren Buffet says “Only when the tide goes out do you discover who has been swimming naked;” this highlights that unpreparedness, lack of knowledge, lack of confidence are your worst enemies when it comes to determine your next steps as an entrepreneur and your skills are likely to prove essential in tough times, not good times. Gaining an understanding of operations, strategy, finance, business plans, and valuation will be invaluable for you and your career; the goal is to ensure that you learn to discover and seize opportunities, and learn how to approach them and operate so that you have the best chance to make the most out of them. Having great ideas is just the first part of the job: execution is just as important and can be the difference between failure and success or a job poorly done or well done. The difference that execution can make? Watch this video: <https://www.youtube.com/watch?v=UIGI3laGAo>.

In this course, we will cover the fundamental concepts at the heart of technology entrepreneurship, including fundamentals of how to form a team; management challenges; business plans; business canvases; strategy; financial statements; risk management; and venture financing. Students will form teams that will work toward launching a tech business venture and they will pitch their venture to the class at the end of the semester. Business cases will be used throughout the course and discussed both in class and in discussion boards. Students interested in learning more about technology entrepreneurship are encouraged to also consider including in their curriculum subsequent courses in the Engineering Entrepreneurship sequence, such as Business for Engineers I and Business for Engineers II (course names may change).

**About the Instructor**

Gianluca Lazzi is a USTAR Professor and Chair of the Department of Electrical and Computer Engineering at the University of Utah. He holds an MBA from IE Business School, Madrid, Spain (specialized in Corporate Finance); a PhD in Electrical Engineering from the University of Utah, Salt Lake City, Utah; and a Dr.Ing. in Electronics from the University of Rome “La Sapienza,” Rome, Italy. Gianluca’s research work has been sponsored by several US federal agencies, including the National Institute of Health (NIH), the National Science Foundation (NSF), and the Department of Energy (DOE). He has made contributions to the fields of bioelectromagnetics, liquid metal electronics, antennas, wireless electromagnetics and neurostimulation. He has dedicated much of his career to the development and engineering of an artificial retina to restore partial vision to the blind: in this project, he has been a co-investigator of a \$ 70 M, Department of Energy (DOE)-sponsored, center which involved three universities, five national laboratories, and one company (Second Sight Medical Products, Inc). He has collaborated over the years with the company Second Sight Medical Products, Inc, and followed their path from early venture to public company. He recently founded Bend LLC with the backing of private equity, which is focused on the development and commercialization of stretchable electronic systems for consumer electronics and advanced athletic apparel. He is a Fellow of the IEEE, Fellow of AIMBE, and former Editor-in-Chief of IEEE Antennas and Wireless Propagation Letters. He has received several awards, including the IEEE Wheeler Award, a R&D100 Award, a URSI Young Scientist Award, the BEMS “Curtis Carl Johnson Award,” a NSF CAREER Award, a Whitaker Young Investigator Award, and a NCSU Outstanding Teacher Award. Gianluca’s research work has been featured in publications such as Forbes, the Economist, MSNBC, MIT Technology Review, and several others.

**Tentative Class Schedule (Note that class schedule and content may change during the semester)**

<b>Date</b>	<b>Tentative Topic</b>
<b>Aug. 25</b>	Introduction to the course, goals, and expectations. Introduction to the learning strategy behind the course: regular lectures, Harvard Business cases, presentations by student groups and guests. Class introductions, discussion of team formation and approach to the "venture challenge." What is technology entrepreneurship? And who are entrepreneurs? Our first case to think through together (Kellogg's) and introduction to strategy and Porter's five forces.
<b>Sept. 1</b>	Porter's five and understanding the industry we are in. The prisoner's dilemma. Fundamentals of supply, demand, economic profit, and types of competition (e.g, perfect competition, monopoly).
<b>Sept. 8</b>	Introduction to business plans; Canvas and lean canvas
<b>Sept. 15</b>	In class discussion of a business case (Atari and Nintendo); Guest speaker
<b>Sept. 22</b>	Groups present their venture idea, framing their idea with basic concepts learned up to this point. What problem am I solving and is there a problem? What is the unique selling proposition and how is my product different? Who is my customer? What is my "unfair advantage"? What is my channel?
<b>Sept. 29</b>	Fundamentals of accounting; introduction to the accounting equation; cash and accrual accounting; journal entries.
<b>Oct. 6</b>	Fundamentals of corporate finance; financial statements; basic analysis of financial statements; concepts of leverage, company returns, profit, cost of capital.
<b>Oct. 20</b>	Financing our venture; what are the sources of capital? How much cash is needed and for what? How do we structure a deal? Financing Tradeoffs.
<b>Oct. 27</b>	Staged financing; dilution; financing structure; returns to investors and entrepreneurs; Guest Speaker.
<b>Nov. 3</b>	Guest Speakers; updates on groups' "venture challenge"
<b>Nov. 10</b>	Team dynamics: in class exercise on understanding what works and what does not work in team dynamics. What challenges is each team experiencing? How could these be solved? This will be a class debate on team dynamics and an opportunity to revisit concepts covered up to this point.
<b>Nov. 17</b>	Founders' dilemmas; equity splits; management organization; management succession strategies; in class case study
<b>Dec. 1</b>	Final presentations and reports
<b>Dec. 8</b>	Final presentations and reports

**Course Objective**

In this course, students will obtain:

1. Understanding of entrepreneurship fundamentals
2. Understanding of financial statement fundamentals and venture financing
3. Understanding of fundamentals of strategy
4. Ability to prepare a business plan and pitch the venture

**Course Material**

Course material will consist of readings, powerpoint presentations, and other documents either available on the web or provided by the instructor. Case studies will have to be purchased individually from Harvard Business School publishing (most cost approximately \$ 8 and we may be working on 4-5 cases throughout the semester).

**Policies***Group Venture Challenge, Group Projects, and Individual Homework:*

There will be one Group Venture Challenge, Group Reports for case analysis, and individual homework, which may consist of participation in the discussion board set-up for the class. Attendance to the class is mandatory and absences must be approved in advance by the instructor.

*Academic Integrity:*

THE VENTURE IDEA MUST BE SOLELY OF THE GROUP AND THE PRESENTATION OF THE VENTURE MUST NOT BE BASED ON VENTURE PROPOSALS FOUND ON THE WEB OR OTHER RESOURCES. Students are expected to exhibit integrity in their conduct and are subject to the University of Utah Code of Student Rights and Responsibilities (<http://www.regulations.utah.edu/academics/6-400.html>). Plagiarism of any form, for any assignment, will not be tolerated. If a student finds material that stimulates further understanding of the cases or the homework, the student should always clarify the source of the material in presentation, postings, or homework.

*Americans with Disabilities Act (ADA) Statement*

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations. All information in this course can be made available in alternative format with prior notification to the Center for Disability Services. ([www.hr.utah.edu/oeo/ada/guide/faculty/](http://www.hr.utah.edu/oeo/ada/guide/faculty/))

*Wellness Statement*

Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences, etc., can interfere with a student's ability to succeed and thrive at the University of Utah. For helpful resources contact the Center for Student Wellness - [www.wellness.utah.edu](http://www.wellness.utah.edu); 801-581-7776.

**Assignments and Grading Policy**

Problem Sets or Group Cases: 35 %

Individual Participation (Class and Board Discussion): 25 %

Final Venture Pitch: 40 %. Grades for the final venture pitch will be based on both grades assigned by the instructor and grades assigned by the rest of the class.