

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: Undergraduate Certificate in Engineering Entrepreneurship

This proposal needs to go through:

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

This proposal has been approved by:

Chair of Undergraduate Council



Date: 1.30.17

Chair of Graduate Council

Date: _____

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-IISC.)*

Chief Academic Officer



Date: 3-6-17

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

Utah System of Higher Education
New Academic Program Proposal
Cover/Signature Page - Abbreviated Template

Institution Submitting Request: University of Utah
Proposed Program Title: Certificate in Engineering Entrepreneurship
Sponsoring School, College, or Division: College of Engineering, David Eccles School of Business
Sponsoring Academic Department(s) or Unit(s): Department of Electrical and Computer Engineering
Classification of Instructional Program Code¹: 14.0101
Min/Max Credit Hours Required of Full Program: 20 / 20
Proposed Beginning Term²: Fall 2017
Institutional Board of Trustees' Approval Date:

Program Type:

<input checked="checked" type="checkbox"/>	Certificate of Proficiency	<input type="checkbox"/> Entry-level CTE CP	<input type="checkbox"/> Mid-level CP
<input type="checkbox"/>	Certificate of Completion		
<input type="checkbox"/>	Minor		
<input type="checkbox"/>	Graduate Certificate		
<input type="checkbox"/>	K-12 Endorsement Program		
<input type="checkbox"/>	NEW Emphasis for Regent-Approved Program <i>Credit Hours for NEW Emphasis Only:</i> / <i>Current Major CIP:</i> 6 - Digit CIP <i>Current Program Title:</i> <i>Current Program BOR Approval Date:</i>		
<input type="checkbox"/>	Out of Service Area Delivery Program		

Chief Academic Officer (or Designee) Signature:

I, the Chief Academic Officer or Designee, certify that all required institutional approvals have been obtained prior to submitting this request to the Office of the Commissioner.

_____ Date:

☐ I understand that checking this box constitutes my legal signature.

¹ For CIP code classifications, please see <http://nces.ed.gov/ipeds/data/cipcodes/>

² "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 Certificate of Proficiency: 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 deducted from the fact that the course Emerging Technologies and Entrepreneurship (ENGIN 5020/6020) offered Fall 2016 had 43 students from all engineering departments 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.

Support letters from leadership can be found in **File #3** of the proposal.

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/ui/utalmis/gotoOccinfo.do) and the Occupation Outlook Handbook (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/. Indicate if the program will be delivered outside of designated service area; provide justification. Service areas are defined in 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)			
General Education Credit Hour Sub-Total			
Required Courses			
ENGIN 5020		Engineering Entrepreneurship	3
ENGIN 5790	X	The Business of Entrepreneurship	3
ENGIN 5791	X	Launching Technology Ventures	3
ENGIN 5xxx	X	Engineering Law and Contracts	3
Dept. Course		Technical Communications for Engineers	3
Dept. Course		Senior Thesis I	2
Dept. Course		Senior Thesis II	3
Add Another Required Course			
Required Course Credit Hour Sub-Total			20
Elective Courses			
Add Another Elective Course			
Elective Credit Hour Sub-Total			
Core Curriculum Credit Hour Sub-Total			20

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. As such, the core courses will be tailored toward their specific majors. For example, a Mechanical Engineering student will not be required to complete the ECE thesis option, but will be able to complete the thesis/capstone option offered by the Mechanical Engineering major. This will apply to all our various Engineering majors. Requirements for each participating Department will be determined by the managing committee of the Certificate and individual Departments.

Assessment Procedures

For all proposed courses, we will use the same learning outcome and assessment procedure that we are using for all other ECE courses: the procedure adheres to the strict requirements specified by ABET to assess learning outcomes. Each year ABET reviews courses and procedures for the department, highlights any issues and requests actions by the following year. The procedure is specified in our ABET report and our ABET evaluators have praised all aspects of our program assessment by renewing our accreditation for the next 6 years (the maximum allowed).

It is therefore planned that the same assessment structures, procedures, and reviews will take place for the Undergraduate Certificate in Engineering Entrepreneurship. Assessment will be conducted by the executive committee of the certificate program.

While reviewing our assessment procedures, the ABET review board made the following observation about the completeness of our process, which involve the instructors, undergraduate committee, and the entire faculty.

ABET Accreditation Report (2015)

"The assessment of student outcomes in courses is accomplished in most cases by having instructors complete the form shown in Fig. 4.A.1, below. Instructors choose a task in their course and decide on a score that is "satisfactory." The number of students performing the task and the number getting a satisfactory score are recorded. By graphing the numbers over time, trends in student performance may be identified. The graphs are presented in Section 4.A.4, below. Instructors also comment on possible problems and solutions with regard to the outcome" (p. 34).

"The assessment of student outcomes occurs every year in each course ... The evaluation of the assessment data is done at the end of spring semester, in preparation for the faculty retreat in the fall. Proposals that entail large-scale changes are usually presented at the retreat, while smaller changes are presented at faculty meetings throughout the year. The Undergraduate Committee performs the evaluation of student outcome assessment data. Each member of the committee evaluates three or four outcomes and writes a summary. The reviewing committee member makes recommendations about each of their assigned student outcomes. The recommendations are distributed to other committee members by email. The committee then meets and discusses each student outcome. Progress on old action items is reviewed and new action items are suggested, if necessary" (p.36).

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

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

	Required Core Classes				IP/Law	Communications	Senior Thesis
BIOEN	ENGIN 5020	ENGIN 5790	ENGIN 5791	CVE EN 5850/ME EN 5000		BIOEN 4200+4201+4202 (5)	BIOEN 3801+4801 (6)
CHE	ENGIN 5020	ENGIN 5790	ENGIN 5791	CVE EN 5850/ME EN 5000		CHEN 3253 (1)	CH EN 4903+4905 (7)
EE	ENGIN 5020	ENGIN 5790	ENGIN 5791	CVE EN 5850/ME EN 5000		ECE 3030 (3)	ECE 4900+4910 (5)
CE	ENGIN 5020	ENGIN 5790	ENGIN 5791	CVE EN 5850/ME EN 5000		ECE 3030 (3)	CS 3992+4710 (5)
MSE	ENGIN 5020	ENGIN 5790	ENGIN 5791	CVE EN 5850/ME EN 5000		MSE 5090 (3)	MSE 5098+5099 (4)
ME	ENGIN 5020	ENGIN 5790	ENGIN 5791	CVE EN 5850/ME EN 5000		ME EN 3400 (3)	ME EN 4000+4010 (6)
SOC	ENGIN 5020	ENGIN 5790	ENGIN 5791	CVE EN 5850/ME EN 5000		WRTG 3012/3014/3015 (3)	CS 4940+4970 (6)
CVEE	ENGIN 5020	ENGIN 5790	ENGIN 5791	CVE EN 5850/ME EN 5000		CVE EN 3100 (3)	CVE EN 4910 (3)

DESCRIPTION OF NEW COURSES

ENGIN 5020 – Emerging Technologies and Entrepreneurship

- 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 for 5790/5791.

ENGIN 5790 – The Business of Entrepreneurship

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.

- Value creation, problem finding and solving
- The math of problem finding
- The math of market selection
- A/B testing
- Design sprints and minimum viability
- Expert inquiry and experimental design
- Analyzing operations
- Campaign analytics
- Pricing and willingness to pay
- Customer acquisition
- Partnership contracts

ENGIN 5791 – Launching Technology Ventures

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. Topics include:

- Financial overview
- Accounting overview
- Financial forecasting and valuations
- Legal matters, ownership, hold-up, and legal entities
- Product definition and competition
- Sales and marketing
- Customer and business models
- Management, operations, and investor perspectives
- Investors and VC
- Start-up simulations

Additional information and sample syllabi can be found in file #4 Syllabi in the proposal folder.

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 black ink, appearing to read "Richard B. Brown", followed by a long horizontal flourish line.

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 black ink, 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

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:

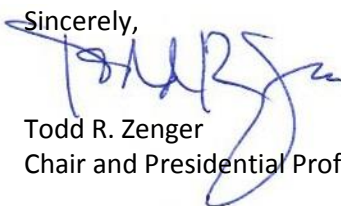
I am writing to express my strong support for the proposed Engineering Entrepreneurship Certificates that will be offered jointly by the School of Engineering and the School of Business through the Department of Entrepreneurship and Strategy.

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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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,

Mark England

Mark England
Head, Collection Management
J. Willard Marriott Library

March 21, 2017

To Whom It May Concern:

The University of Utah's J. Willard Marriott Library is pleased to support the request of the University of Utah's College of Engineering and the David Eccles School of Business for the creation of a Certificate in Engineering Entrepreneurship. The Library is well positioned to support this program without adding additional resources

Sincerely,

Alberta D. Comer

Alberta D. Comer
Dean and University Librarian