

Cover/Signature Page - Abbreviated Template/Abbreviated Template with Curriculum

Institution Submitting Request: *University of Utah*

Proposed Title: *Chemical Engineering Emphasis for Chemistry BA/BS*

Currently Approved Title:

School or Division or Location: *College of Science*

Department(s) or Area(s) Location: *Department of Chemistry*

Recommended Classification of Instructional Programs (CIP) Code¹ (for new programs): *40.0599*

Current Classification of Instructional Programs (CIP) Code (for existing programs): *00.0000*

Proposed Beginning Date (for new programs): *Fall 2015*

Institutional Board of Trustees' Approval Date:

Proposal Type (check all that apply):

Regents' General Consent Calendar Items		
<i>R401-5 OCHE Review and Recommendation; Approval on General Consent Calendar</i>		
SECTION NO.		ITEM
5.1.1	<input type="checkbox"/>	Minor*
5.1.2	<input checked="" type="checkbox"/>	Emphasis*
5.2.1	<input type="checkbox"/>	(CER P) Certificate of Proficiency*
5.2.3	<input type="checkbox"/>	(GCR) Graduate Certificate*
5.4.1	<input type="checkbox"/>	New Administrative Unit
	<input type="checkbox"/>	Administrative Unit Transfer
	<input type="checkbox"/>	Administrative Unit Restructure
	<input type="checkbox"/>	Administrative Unit Consolidation
5.4.2	<input type="checkbox"/>	Conditional Three-Year Approval for New Centers, Institutes, or Bureaus
5.4.3	<input type="checkbox"/>	New Center
	<input type="checkbox"/>	New Institute
	<input type="checkbox"/>	New Bureau
5.5.1	<input type="checkbox"/>	Out-of-Service Area Delivery of Programs
5.5.2	<input type="checkbox"/>	Program Transfer
	<input type="checkbox"/>	Program Restructure
	<input type="checkbox"/>	Program Consolidation
5.5.3	<input type="checkbox"/>	Name Change of Existing Programs
5.5.4	<input type="checkbox"/>	Program Discontinuation
	<input type="checkbox"/>	Program Suspension
5.5.5	<input type="checkbox"/>	Reinstatement of Previously Suspended Program
	<input type="checkbox"/>	Reinstatement of Previously Suspended Administrative Unit

**Requires "Section V: Program Curriculum" of Abbreviated Template*

Chief Academic Officer (or Designee) Signature:

I certify that all required institutional approvals have been obtained prior to submitting this request to the Office of the Commissioner.

Signature

Date: *MM/DD/YEAR*

Printed Name: *Name of CAO or Designee*

¹ CIP codes must be recommended by the submitting institution. For CIP code classifications, please see <http://nces.ed.gov/ipeds/cipcode/Default.aspx?y=55>.

Program Request
University of Utah
Proposed Chemistry Bachelor's Degrees with Chemical Engineering Emphases
10/08/2014

Section I: Request

The Department of Chemistry is requesting to add a Chemical Engineering emphasis to its current eight offerings (Professional, Biology, Geology, Materials Science and Engineering, Mathematics, Physics, and Teaching). The request does not lead to any change in course offerings, but does allow for Chemistry majors to follow a path that gives them the opportunity to gain important complementary instruction in the area of Chemical Engineering.

Section II: Need

There are several reasons that we believe this new emphasis will provide a substantial benefit not only to our students, but to their future employers as well. To begin with, while Chemistry and Chemical Engineering majors share many fundamental core courses, their ultimate focuses are significantly different. Chemists tend to focus on finding reactions of interest, while engineers will tend to focus more on developing conditions and equipment to optimize the processes. There is nonetheless some overlap between these two activities, which leads to a significant number of industrial chemists needing to be taught some engineering, and some chemical engineers needing to be taught some chemistry, once they are employed. Hence, a student who emerges with a bachelor's degree which has significant exposure to both areas should appear far more attractive to a potential employer, and naturally should be capable of greater contributions. Even better would be students who might choose to major in both chemistry and chemical engineering, and by having a chemistry degree with a chemical engineering emphasis, it becomes easier for a student to receive both degrees. Additionally, it is not uncommon for either chemistry or chemical engineering students to decide to switch to the other major. Having our new emphasis available would make it a more efficient change to make, in either direction.

The proposed chemical engineering emphasis would be very similar to our existing materials science and engineering emphasis. The only difference would be in the elective units, which are compared below:

Proposed Chemical Engineering Emphasis Classes:
CH EN 2800 Fundamentals of Process Engineering (3)
CH EN 3353 Fluid Mechanics (3)
CH EN 3453 Heat Transfer (3)
CH EN 3553 Chemical Reaction Engineering (3)
CH EN 3603 Mass Transfer and Separations (3)
CH EN 3853 Chemical Engineering Thermodynamics (3)

Current Materials Science and Engineering Emphasis Classes. Fifteen or more units selected from the following:

MSE 2010 Intro. to Matls. Sci. Engr. (4)
MSE 5011 Adv. Mtrls. Tech. (2)
MSE 3010 Materials Processing Lab (3)
MSE 5032 Advanced Thermodynamics (3)
MSE 3011 Struct. Anal. of Matls. (4)
MSE 5034 Kinetics of Solid-state Processes (3)
MSE 3210 Electronic Properties of Solids (3)
MSE 5040 Intro. to Modern Biomaterials (4)
MSE 3310 Intro. to Ceramics (3)
MSE 5071 Intro. to NanoBio. Tech. & Matls. (3)
MSE 3410 Intro. to Polymers (3)
MSE 5470 Polymer & Org. Matls. Ener. Appl. I (3)
CHEM 3130 Solid State Chemistry (2)
CHEM 4800 or 4999 Undergraduate Research or Honors Thesis (max. 2 units counted total)

While there are three additional elective units, the chemical engineering emphasis would still have less than our biology emphasis (<http://www.chem.utah.edu/undergraduate/degree-options.php>). The six chemical engineering classes that have been included are those that were very strongly recommended by the Chemical Engineering advisors, Prof. Geoff Silcox and Tracey Farnsworth, in large part since these must be, or must have been, taken by students entering into either the Chemical Engineering Ph.D. or Fuels Engineering Master's program. This highlights another advantage to this offering, namely that a student who receives this bachelor's degree in chemistry, would be well prepared to pursue a graduate program in chemistry, chemical engineering, or fuels engineering. The full proposed program may be seen on the last page.

Section III: Institutional Impact

The new program would not lead to any additional institutional burdens. There could be a slight, and desirable, enrollment increase for some upper division Chemistry and Chemical Engineering classes, which generally have room for additional students. No new courses are involved in the program, and no new facilities, faculty, or staff would be required. There might be a slight increase in advising responsibilities which could easily be handled.

Section IV: Finances

As noted in Section III, there would be no additional expenses generated by this addition. There could be a favorable increase in enrollments for some upper division Chemistry and Chemical Engineering courses.

Section V: Program Curriculum

Chemistry Major, Chemical Engineering Emphasis

<p>Chemistry Core Courses (required of all majors):</p> <p>CHEM 1210, 1220 General Chemistry I, II (4, 4) both SF (or 1211/1221 honors versions)</p> <p>CHEM 1215, 1225 General Chemistry Lab I, II (1, 1) (or 1240/1241 honors versions)</p> <p>CHEM 2310, 2320 Organic Chemistry I, II (4, 4) (or 2311/2321 honors versions)</p> <p>CHEM 2315, 2325 Organic Chemistry Lab I, II (2, 2)</p> <p>CHEM 3000 Quantitative Analysis (4) QI CW</p> <p>CHEM 3060 Quantum Chemistry and Spectroscopy (4) QI</p> <p>CHEM 3100 Inorganic Chemistry (5)</p>
<p>Math and Physics Core (required of all majors):</p> <p>MATH 1210, 1220 Calculus I, II (4, 4) or MATH 1250 AP Calculus I (4) all QR</p> <p>MATH 2210 Calculus III (3) or MATH 1260 AP Calculus II (4) both QR</p> <p>PHYS 2210, 2220 Physics for Scientists and Engineers I, II (4, 4) (or 3210/3220 honors versions)</p> <p>PHYS 2215, 2225 Physics Laboratory for Scientists and Engineers I, II (1, 1)</p>

<p>F. Chemistry, Chemical Engineering Emphasis</p> <p><i>Core courses, plus:</i></p> <p>MATH 2250 Differential Equations and Linear Algebra (4) (or 2270 and 2280)</p> <p>CHEM 3070 Thermodynamics and Chemical Kinetics (4) QI</p>
<p><i>Complete two of the following lab courses:</i></p> <p>CHEM 3200 Advanced Radiochemistry with Lab I (3)</p> <p>CHEM 5700 Advanced Analytical Chemistry Lab (2) CW</p> <p>CHEM 5710 Advanced Organic Chemistry Lab (2)</p> <p>CHEM 5720 Advanced Physical Chemistry Lab (2)</p> <p>CHEM 5730 Advanced Inorganic Chemistry Lab (2)</p> <p>CHEM 5750 Advanced Chemical Biology Lab (2)</p>
<p><i>Chemical Engineering Emphasis Classes:</i></p> <p>CH EN 2800 Fundamentals of Process Engineering (3)</p> <p>CH EN 3353 Fluid Mechanics (3)</p> <p>CH EN 3453 Heat Transfer (3)</p> <p>CH EN 3553 Chemical Reaction Engineering (3)</p> <p>CH EN 3603 Mass Transfer and Separations (3)</p> <p>CH EN 3853 Chemical Engineering Thermodynamics (3)</p>
<p>University Requirements: 122 Hours (at least 40 upper division), DV, IR, WRTG, GEN ED</p>

Suggested Course Sequence

Year 1 Fall	Year 2 Fall	Year 3 Fall	Year 4 Fall
CHEM 1210, 1215	CHEM 2310, 2315	CHEM 3100	CHEM 3000

MATH 1210	MATH 2210	CHEM 3060	CH EN 3353
	PHYS 2210, 2215	MATH 2250	CH EN 3853
Year 1 Spring	Year 2 Spring	Year 3 Spring	Year 4 Spring
CHEM 1220, 1225	CHEM 2320, 2325	CHEM 3070	CHEM 57xx (two)
MATH 1220	PHYS 2220, 2225	CH EN 3453	CH EN 3553
	CH EN 2800		CH EN 3603

Section VI: Miscellaneous

The proposed chemical engineering emphasis leads to a coherent area of focus, which may readily be appreciated by the fact that so many professional chemists and chemical engineers must gain additional training in the other area once employed. Chemistry and Chemical Engineering programs are already offered as separate entities, and thus those in either area clearly appreciate the differences between them, and would recognize what a Chemical Engineering emphasis for a Chemistry bachelor's degree would entail. As noted above, the number of units required for this new emphasis would be comparable to some of our current offerings.



October 27, 2014

Ann Darling
Chair of the Undergraduate Council
Sterling Sill Center
195 South Central Campus Drive
Salt Lake City, UT 84112

Dear Ms. Darling:

I join Distinguished Professor and Chair of Chemistry Cynthia J. Burrows and Professor and Chair of Chemical Engineering Milind D. Deo in my strong support of the *Chemical Engineering Emphasis for Chemistry Majors* in the Department of Chemistry.

As you know, before I was appointed Dean of Science this year, I was chair of the Department of Chemistry for seven years. Dr. Burrows is entirely correct in her assessment that a Chemical Engineering Emphasis would "prepare our students especially well for either academic or industrial careers." Furthermore, Dr. Deo rightly describes the "resurgence in chemical plant construction" in the United States, a trend which will no doubt create a high demand for graduates with a strong foundation in the principles and practice of chemistry and chemical engineering.

There is strong precedent and high need for this emphasis. The Department of Chemistry's biochemistry emphasis has been popular and successful in improving graduating students' biochemistry credentials; as Dr. Deo notes, "[chemical] engineering students often seek a minor in chemistry," meaning that the student demand for a Chemical Engineering emphasis from the Chemistry side is well-attested by enrollment data. As the enclosed proposal further notes, establishing this emphasis would incur no "additional institutional burdens" or "additional expenses" for the Department, College, or University.

In summary, the proposed *Chemical Engineering Emphasis for Chemistry Majors* is supported by faculty and students in Chemistry and Chemical engineering; if implemented, it can significantly improve students' skillsets and employment prospects, and it will result in no new administrative or financial commitments. Considering the very strong benefits and minimal costs, I have no hesitation offering my and the College of Science's strongest endorsement for this proposal.

Sincerely,

Henry S. White
Dean, College of Science, and
Distinguished Professor of Chemistry

Enclosure

October 13, 2014

Henry S. White, Dean
College of Science
University of Utah
CAMPUS

Dear Henry,

I am writing to provide my very enthusiastic support to the proposal to make a Chemical Engineering emphasis available to students working toward a bachelor's degree in Chemistry, as an alternative to our existing eight emphases (professional, biological, business, geology, materials science and engineering, mathematics, physics, and teaching). The close connection between chemistry and chemical engineering would prepare our students especially well for either academic or industrial careers, much as students with our biology emphasis emerge with strong credentials in biochemistry, and this should render them especially attractive candidates in the job market.

This proposal has received very strong support from the Chemistry Undergraduate Education Committee and from our Faculty at large. An additional supporting letter has been provided by Professor Milind Deo, Chair of the Chemical Engineering Department.

We are asking for your approval and a letter of support for this new Chemical Engineering emphasis so that the proposal can be forwarded to the administration and Board of Regents.

Sincerely,



Cynthia J. Burrows
Distinguished Professor and Chair
Thatcher Presidential Endowed Chair of Biological Chemistry

Professor Henry White
Dean, College of Science
University of Utah
Salt Lake City, UT

Dear Henry:

I am writing to strongly endorse the proposed Chemical Engineering Emphasis for Chemistry Majors in the Department of Chemistry. We have discussed the need for a stronger collaboration between Chemistry and Chemical Engineering at the University of Utah. Stronger research and academic interactions between the two departments will be of great mutual benefit. From a practical standpoint, it is very important for chemical engineering students to have a strong background in chemistry to be effective as chemical engineers. This is particularly true today as the United States is seeing resurgence in chemical plant construction after several decades of relatively flat activity. Similarly, providing a strong background in basics of chemical engineering would better equip chemistry graduates with a competitive advantage in the job market.

Chemical engineering students often seek a minor in chemistry. We also have an Applied Science Emphasis (not formally approved) with major course content in chemistry. The proposed emphasis will mirror some of these initiatives from the chemistry side. I do believe this undergraduate initiative will bring the two programs closer and enhance collaborations at the graduate level and in research.

I support the proposed Chemical Engineering Emphasis for students graduating with a major in chemistry for the reasons outlined. Please contact me if you have any questions or need additional details from the Chemical Engineering Department.

Best Regards



Milind D. Deo
Professor and Chair, Chemical Engineering



THE UNIVERSITY OF UTAH

College of Science

November 5, 2014

Prof. Ann L. Darling
Chair, Undergraduate Council
Office of Undergraduate Studies
University of Utah
CAMPUS

Dear Ann:

After considering the recommendations of Professors Richard Ernst and Cynthia Burrows, I would like to add my support to the request that Chemistry majors be allowed to have up to two emphases listed on their graduation transcripts, should they have completed the appropriate requirements. As my colleagues have noted, this option will benefit both the students and the University, without adding any financial obligations.

Sincerely yours,

Henry S. White
Dean, College of Science, and
Distinguished Professor of Chemistry



Prof. Ann L. Darling
Chair, Undergraduate Council
University of Utah

Dear Professor Darling,

Due to some student inquiries I have received over the last year, I am writing to request your support for our Department's desire to allow our undergraduate majors to complete their degrees with two emphases. Students who pursued such an option would receive a stronger education in chemistry, which would appear on their graduation transcripts and would alert potential employers and professional schools to their extra accomplishments and abilities. The extra training should also help the students in their subsequent careers. In addition, the University would benefit by having increased enrollments in the additional classes, which are typically upper division classes having room to accommodate more students. I have limited this request to allow for a second emphasis only, as additional ones might appear to be overkill, but if there were reason to do otherwise, I think that would be fine also.

This proposal received strong support from our Undergraduate Education Committee, and I hope that this can be implemented in the near future, to benefit both our students and University.

Sincerely yours,

Richard D. Ernst
Professor and Chair, Chemistry
Undergraduate Education Committee

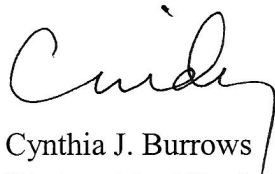
November 3, 2014

Prof. Ann L. Darling
Chair, Undergraduate Council
University of Utah

Dear Ann,

I have read and considered the request from my colleague, Rick Ernst, the Chair of our Department's Undergraduate Education Committee, concerning the possibility of allowing at least two emphases for our undergraduate majors. I believe that the approval of this option would be beneficial to both our students and the University. As there would be no need to offer any classes beyond which are already offered, this would not be a burden on the University's resources, but instead can be expected to provide at least a small degree of additional tuition income, as well as providing some educational and career advantages to the students involved. I am therefore in full support of this proposal, and request approval by the Undergraduate Council.

Sincerely,



Cynthia J. Burrows
Distinguished Professor and Chair
Thatcher Presidential Endowed Chair of Biological Chemistry