

CHANGE UNDERGRADUATE PROGRAM FORM

1. General Information

College: <u>Arts and Sciences</u>		Department: <u>Chemistry</u>	
Current Major Name: <u>Chemistry</u>		Proposed Major Name: <u>Chemistry</u>	
Current Degree Title: <u>BS</u>		Proposed Degree Title: <u>BS</u>	
Formal Option(s): <u>(1) Traditional; (2) Biochemistry</u>		Proposed Formal Option(s): <u>(1) Traditional; (2) Biochemistry; (3) Materials Chemistry</u>	
Specialty Field w/in Formal Option: <u>N/A</u>		Proposed Specialty Field w/in Formal Options: <u>N/A</u>	
Date of Contact with Associate Provost for Academic Administration ¹ : <u>6/3/15</u>			
Bulletin (yr & pgs): <u>2014, 134ff</u>		CIP Code ¹ : <u>40.1002</u>	
Today's Date: <u>6/3/15</u>			
Accrediting Agency (if applicable): <u>N/A</u>			
Requested Effective Date: <input checked="" type="checkbox"/> Semester following approval. OR <input type="checkbox"/> Specific Date ² : _____			
Dept. Contact Person: <u>Mark Meier</u>		Phone: <u>257-3837</u>	
Email: <u>meier@uky.edu</u>			

2. General Education Curriculum for this Program:

The new General Education curriculum is comprised of the equivalent of 30 credit hours of course work. There are, however, some courses that exceed 3 credits & this would result in more than 30 credits in some majors.

- There is no foreign language requirement for the new Gen Ed curriculum.
- There is no General Education Electives requirement.

Please list the courses/credit hours currently used to fulfill the University Studies/General Education curriculum:

Unchanged from other options in the BS-CHE program:
Arts and Creativity: Any course from the approved list (3 cr);
Humanities: Any course from the approved list (3 cr);
Social Sciences: Any course from the approved list (3 cr);
Natural/Physical/Mathematical: CHE 105/111 (5 cr);
Composition and Communication: CIS or WRD 110 (3);
Quantitative Foundations: MA 113 (4);
Statistical Inferential Reasoning: Any course from the approved list (3);
Community, Culture, and Citizenship in the USA: Any course from the approved list (3);
Global Dynamics: Any course from the approved list (3);

Please identify below the suggested courses/credit hours to fulfill the General Education curriculum.

General Education Area	Course	Credit Hrs
I. Intellectual Inquiry (one course in each area)		
Arts and Creativity	<u>Any UK options</u>	<u>3 (No change)</u>
Humanities	<u>Any UK option</u>	<u>3 (No change)</u>
Social Sciences	<u>Any UK option</u>	<u>3 (No change)</u>

¹ Prior to filling out this form, you MUST contact the Associate Provost for Academic Administration (APAA). If you do not know the CIP code, the (APAA) can provide you with that during the contact.

² Program changes are typically made effective for the semester following approval. No program will be made effective until all approvals are received.

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	<u>CHE 105/111</u>	<u>5 (No change)</u>
II. Composition and Communication		
Composition and Communication I	CIS or WRD 110	3
Composition and Communication II	CIS or WRD 111	3
III. Quantitative Reasoning (one course in each area)		
Quantitative Foundations ³	<u>MA 113</u>	<u>4 (No change)</u>
Statistical Inferential Reasoning	<u>Any UK option</u>	<u>3 (No change)</u>
IV. Citizenship (one course in each area)		
Community, Culture and Citizenship in the USA	<u>Any UK options</u>	<u>3 (No change)</u>
Global Dynamics	<u>Any UK options</u>	<u>3 (No change)</u>
Total General Education Hours		<u>33</u>

3. Explain whether the proposed changes to the program (as described in sections 4 to 12) involve courses offered by another department/program. Routing Signature Log must include approval by faculty of additional department(s).

The proposed new option requires MSE 201, and MSE 301 can be taken as one of the upper-division courses.

4. Explain how satisfaction of the University Graduation Writing Requirement will be changed.

Current	Proposed
<input type="checkbox"/> Standard University course offering. List: _____	<input type="checkbox"/> Standard University course offering. List: <u>No Change</u>
<input checked="" type="checkbox"/> Specific course – list: <u>CHE 372/472</u>	<input checked="" type="checkbox"/> Specific course) – list: <u>CHE 372/472 (no change)</u>

5. List any changes to college-level requirements that must be satisfied.

Current	Proposed
<input checked="" type="checkbox"/> Standard college requirement. List: _____	<input checked="" type="checkbox"/> Standard college requirement. List: _____
<input type="checkbox"/> Specific required course – list: _____	<input type="checkbox"/> Specific course – list: _____

6. List pre-major or pre-professional course requirements that will change, including credit hours.

Current	Proposed
<u>MA 113 (4 cr)</u>	<u>same</u>
<u>MA 114 (4 cr)</u>	<u>same</u>
<u>CHE 105 (4 cr)</u>	<u>same</u>
<u>CHE 111 (1 cr)</u>	<u>same</u>
<u>CHE 107 (3 cr)</u>	<u>same</u>
<u>CHE 113 (2 cr)</u>	<u>same</u>

³ Note that MA 109 is NOT approved as a Quantitative Foundations course. Students in a major requiring calculus will use a calculus course (MA 113, 123, 137 or 138) while students not requiring calculus should take MA 111, PHI 120 or another approved course.

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7. List the major's course requirements that will change, including credit hours.

Current	Proposed
<u>Core requirements for Traditional option:</u>	<u>Core requirements for Materials Chemistry option:</u>
<u>CHE 226 (3 cr)</u>	<u>same</u>
<u>CHE 230 (3 cr)</u>	<u>same</u>
<u>CHE 232 (3 cr)</u>	<u>same</u>
<u>CHE 372 (1 cr)</u>	<u>same</u>
<u>CHE 410G (2 cr)</u>	<u>same</u>
<u>CHE 412G (2 cr)</u>	<u>same</u>
<u>CHE 441G (2 cr)</u>	<u>same</u>
<u>CHE 472 (1 cr)</u>	<u>same</u>
<u>CHE 532 (2 cr)</u>	<u>same</u>
<u>CHE 533 (2 cr)</u>	<u>same</u>
<u>CHE 547 (3 cr)</u>	<u>same</u>
<u>Major field options (6 cr)</u>	<u>same</u>
<u>CHE 442 (3 cr)</u>	<u>not required</u>
<u>CHE 522 (4 cr)</u>	<u>not required</u>
<u>CHE 550 or 552 (3 cr)</u>	<u>not required</u>
	<u>MSE 201 (3 cr)</u>
	<u>CHE 516 (3 cr)</u>
	<u>CHE 536 (3 cr)</u>
	<u>CHE 566 (3 cr)</u>
	<u>CHE 567 (2 cr)</u>
	<u>CHE 576 (3 cr)</u>
<u>"Other Coursework Required for the Major" (Traditional option)</u>	<u>"Other Coursework Required for the Major" (Materials Chemistry option)</u>
<u>PHY 231 (4 cr)</u>	<u>same</u>
<u>PHY 232 (4 cr)</u>	<u>same</u>
<u>PHY 241 (1 cr)</u>	<u>same</u>
<u>PHY 242 (1 cr)</u>	<u>same</u>
<u>MA 213 (3 cr)</u>	<u>same</u>
<u>MA 322 (3 cr)</u>	<u>not required</u>

8. Does the pgm require a minor AND does the proposed change affect the required minor? N/A Yes No

If "Yes," indicate current courses and proposed changes below.

Current	Proposed
No minor is required or affected	<u>No minor is required or affected</u>

9. Does the proposed change affect any option(s)? N/A Yes No

If "Yes," indicate current courses and proposed changes below, including credit hours, and also specialties and subspecialties, if any.

Current	Proposed
<u>No changes to existing options - we are adding a new option.</u>	<u>No changes to existing options - we are adding a new option</u>

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10. Does the change affect pgm requirements for number of credit hrs outside the major subject in a related field?

Yes No

If so, indicate current courses and proposed changes below.

Current	<i>Proposed</i>
<u>For the "Traditional" track: 25 credit hours</u>	<u><i>For the "Materials Chemistry" track: 25 credit hours (no change in total hours outside of the major subject area)</i></u>
<u>MA 113 (4 cr)</u>	<u><i>MA 113 (4 cr)</i></u>
<u>MA 114 (4 cr)</u>	<u><i>MA 114 (4 cr)</i></u>
<u>MA 213 (4 cr)</u>	<u><i>MA 213 (4 cr)</i></u>
<u>MA 322 (3 cr)</u>	<u><i>PHY 231 (4 cr)</i></u>
<u>PHY 231 (4 cr)</u>	<u><i>PHY 232 (4 cr)</i></u>
<u>PHY 232 (4 cr)</u>	<u><i>PHY 241 (1 cr)</i></u>
<u>PHY 241 (1 cr)</u>	<u><i>PHY 242 (1 cr)</i></u>
<u>PHY 242 (1 cr)</u>	<u><i>MSE 201 (3 cr)</i></u>

11. Does the change affect pgm requirements for technical or professional support electives?

Yes No

If so, indicate current courses and proposed changes below.

Current	<i>Proposed</i>
<u>None</u>	<u><i>No change</i></u>

12. Does the change affect a minimum number of free credit hours or support electives?

Yes No

If "Yes," indicate current courses and proposed changes below.

Current	<i>Proposed</i>
<u>6 credit hours (Arts and Sciences)</u>	<u><i>No change</i></u>
<u>6 credit hours of major field options</u>	<u><i>No change</i></u>

13. Summary of changes in required credit hours:

	Current	<i>Proposed</i>
a. Credit Hours of Premajor or Preprofessional Courses:	<u>For the Traditional option: 18</u>	<u><i>For the proposed Materials Chemistry option: 18</i></u>
b. Credit Hours of Major's Requirements:	<u>35 (Maj. Core reqs)</u>	<u><i>43 (Maj. Core reqs)</i></u>
c. Credit Hours for Required Minor:	<u>N/A</u>	<u><i>N/A</i></u>
d. Credit Hours Needed for a Specific Option:	<u>26</u>	<u><i>30</i></u>
e. Credit Hours Outside of Major Subject in Related Field:	<u>24</u>	<u><i>24</i></u>
f. Credit Hours in Technical or Professional Support Electives:	<u>0</u>	<u><i>0</i></u>
g. Minimum Credit Hours of Free/Supportive Electives:	<u>12</u>	<u><i>12</i></u>
h. Total Credit Hours Required by Level:		
	100: <u>18</u>	<u><i>18</i></u>
	200: <u>17</u>	<u><i>20</i></u>
	300: <u>11</u>	<u><i>8 (CHE 230,231,232 count as 300-level)</i></u>
	400-500: <u>24</u>	<u><i>28</i></u>

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i. Total Credit Hours Required for Graduation:	<u>123</u>	<u>128</u>
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14. Rationale for Change(s) – if rationale involves accreditation requirements, please include specific references to that.

This new track within the BS CHE degree program offers students a topical focus in the coursework. Among students there is significant interest in learning about the 'real world' relevance of the subjects they cover in their classes, and this new degree option provides that context for students who are not interested in the Biological Chemistry option. If students elect to take one biochemistry course as a major field option, the course plan would meet all of the requirements for certification by the American Chemical Society, evidence that the course plan includes appropriate depth and breadth.

15. List below the typical semester by semester program for the major. If multiple options are available, attach a separate sheet for each option.

YEAR 1 – FALL: (e.g. "BIO 103; 3 credits")	<u>CHE 105 (4 cr)</u> <u>CHE 111 (1 cr)</u> <u>MA 113 (4 cr)</u>	YEAR 1 – SPRING:	<u>CHE 107 (3 cr)</u> <u>CHE 113 (2 cr)</u> <u>MA 114 (4 cr)</u>
YEAR 2 - FALL :	<u>CHE 230 (3 cr)</u> <u>CHE 231 (1 cr)</u> <u>MA 213 (4 cr)</u> <u>PHY 231 (4 cr)</u> <u>PHY 241 (1 cr)</u>	YEAR 2 – SPRING:	<u>CHE 226 (3 cr)</u> <u>CHE 232 (3 cr)</u> <u>PHY 232 (4 cr)</u> <u>PHY 242 (1 cr)</u>
YEAR 3 - FALL:	<u>MSE 201 (3 cr)</u> <u>CHE 372 (1 cr)</u> <u>CHE 547 (3 cr)</u> <u>CHE 532 (2 cr)</u> <u>CHE 576 (3 cr)</u>	YEAR 3 - SPRING:	<u>CHE 410G (3 cr)</u> <u>CHE 533 (2 cr)</u> <u>CHE 441G (1 cr)</u> <u>CHE 516 (3 cr)</u>
YEAR 4 - FALL:	<u>CHE 412G (2 cr)</u> <u>CHE 372 (1 cr)</u> <u>CHE 536 (3 cr)</u>	YEAR 4 - SPRING:	<u>CHE 566 (3 cr)</u> <u>CHE 567 (2 cr)</u> <u>CHE 472 (1 cr)</u>

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Signature Routing Log

General Information:

Current Degree Title and Major Name: BS Chemistry

Proposal Contact Person Name: Mark Meier Phone: 257-3837 Email: meier@uky.edu

INSTRUCTIONS:

Identify the groups or individuals reviewing the proposal; note the date of approval; offer a contact person for each entry; and obtain signature of person authorized to report approval.

Internal College Approvals and Course Cross-listing Approvals:

Reviewing Group	Date Approved	Contact Person (name/phone/email)	Signature
CHE Faculty	5/11/15	Steve Yates / 257-7082 / yates@uky.edu	
		/ /	
		/ /	
		/ /	
		/ /	

External-to-College Approvals:

Council	Date Approved	Signature	Approval of Revision ⁴
Undergraduate Council	///3/8/16	Joanie Ett-Mims	
Graduate Council			
Health Care Colleges Council			
Senate Council Approval		University Senate Approval	

Comments:

⁴ Councils use this space to indicate approval of revisions made subsequent to that council's approval, if deemed necessary by the revising council.

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CHE Faculty	5/11/15	Steve Yates / 257-7082 / yates@uky.edu	
CHE Chair	5/11/15	Mark Meier /	
EPC Chair	10/6/15	Stephen Testa.	
Assoc. Dean	10/6/15	Anna Bosch!	<i>Anna Bosch</i>
		/ /	

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Undergraduate Council	3/8/16	Joanie Ett-Mims	
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Senate Council Approval		University Senate Approval	

Comments:

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A Proposal to Establish a Materials Chemistry Option Within the BS-CHE Degree Program

The Department of Chemistry would like to propose the creation of a “Materials Chemistry” option within the BS-CHE degree program. This option, a parallel to the existing Biochemistry option, would offer undergraduate students the opportunity to focus some their upper-division coursework on the topic of materials chemistry. We believe this will appeal to students who are interested in a degree program in chemistry that is more focused and topical than the BS-CHE (traditional) degree track, but are not interested in the life-science focused BS-CHE Biochemistry option.

What is Materials Chemistry?

There isn't a simple definition for this highly interdisciplinary field. Materials chemistry encompasses aspects of all of the traditional disciplines within chemistry and interfaces with other fields, including physics, biochemistry, and engineering. Fundamentally, materials chemistry is an application-driven discipline and as such it has great appeal to students who want to understand the relevance of their coursework and to faculty who are struggling for funding in a climate where relevance to real-world problems is increasingly important to funding agencies. The International Union of Pure and Applied Chemistry (IUPAC) formed a committee that was charged with defining this field, and as a result:

“Materials chemistry comprises the application of chemistry to the design, synthesis, characterization, processing, understanding, and utilization of materials, particularly those with useful, or potentially useful, physical properties.”¹

Essentially, materials chemistry involves the understanding and application of useful properties that emerge from the structure and reactivity of chemical compounds and their blends.

Within the Department, there is a significant core of individuals with research interests and expertise in the design, synthesis, characterization, processing, understanding, and utilization of materials. These faculty members can be informally grouped into four areas, based on their training, grant activity, and publications:

Organic Materials: Anthony, Graham, Kim, Meier, Odom, Risko, Selegue, Watson

Electronic Materials: Anthony, Graham, Kim, Odom, Risko, Watson

Polymeric Materials: DeRouchey, Odom, Watson

Inorganic Materials: Guiton, Kim, Selegue

This collection of faculty members is more than sufficient to establish and maintain a materials chemistry undergraduate degree program, and in fact several of these individuals have already taught courses that would fall under the heading of “materials chemistry.” The most recent examples are *Inorganic Materials Chemistry*, taught by Beth Guiton and *Polymer Chemistry* taught by Jason DeRouchey. Both classes have had strong enrollments from CHE and ENGR

¹ Day, P., Interrante, L., West, A. *Chemistry International* 2009, 31(3). The International Union of Pure and Applied Chemistry, http://www.iupac.org/publications/ci/2009/3103/1_day.html

undergraduates, as well as from graduate students. There is reason to believe that there is sufficient interest among students to ensure that a set of materials chemistry courses would have enrollments that are high enough to sustain the program.

Proposed Course Plan

Courses that would make up the core of a Materials Chemistry option include:

1. MSE 201: *Materials Science I*
2. CHE 516: *Inorganic Materials Chemistry*
3. CHE 536: *Organic Materials: Electronic and Photonic Properties*
4. CHE 566: *Organic Materials: Characterization and Devices*
5. CHE 567: *Organic Materials: Fab Lab*
6. CHE 576: *Polymer Chemistry*

Students can substitute MSE 301 (Materials Science II) for one of the CHE materials lecture courses listed above. The description of MSE 201 (Materials Science) is: *Microscopic and macroscopic structure as related to the properties of materials with engineering applications. Prereq or concur: MA 114 and freshman chemistry.* The description of MSE 301 is: *Introduction to processing of ceramic, polymer and composite materials; relating the structure and bonding in these materials to their properties; considerations in choosing appropriate materials for engineering applications. Prereq: MSE 201, or consent of instructor.* Evident from the description, this 3-credit course offers students an introduction to the processing of materials, something that is not covered in the CHE-materials courses and offers students some exposure to ceramics and composites. These courses are nicely complementary to the materials chemistry courses described below.

CHE 536: ORGANIC MATERIALS: ELECTRONIC AND PHOTONIC PROPERTIES. (3) A course on the emerging field of organic electronics. The course will cover the electronic and optical properties of organic molecules and polymers, and describe the evolution of these properties in the solid state and at interfaces. Material characteristics will be related to devices where organic materials show promising performance, including display, lighting, transistor, energy conversion and storage, and non-linear optics technologies. Prerequisites: CHE 232 and PHY 213 or 232, or permission of the instructor.

Available instructors: John Anthony, Chad Risko

CHE 566: ORGANIC MATERIALS: CHARACTERIZATION AND DEVICES. (3) A course on the use of carbon-based materials in electronic or photonic devices, covering basic methods for the formation of thin films of organic compounds, techniques to extract data relevant to device performance, and methods to form and measure devices such as transistors and light-emitting diodes. The class will cover polymer and small molecule systems, along with more complex device structures necessary to create all-organic circuitry. Prerequisites: CHE 232 and PHY 213 or PHY 232, or permission of the instructor.

Available Instructors: John Anthony, Chad Risko, Kenneth Graham.

CHE 567: ORGANIC MATERIALS: FABRICATION LAB. (2) A laboratory course focused on the fabrication and characterization of organic and organic – inorganic hybrid electronic devices. Although a stand-alone course, the laboratory will cover practical aspects related to topics covered in CHE 536 and 566, including processing methods and characterization of optical and electronic properties of organic materials and thin films. Prerequisites: CHE 536 or CHE 566, and PHY 213 or 232, or permission of the instructor.

Available Instructors: John Anthony, Kenneth Graham.

CHE 576: POLYMER CHEMISTRY. (3) A lecture course in the chemistry of polymers. Topics include a discussion of polymerization mechanisms, structural and physical characterization of polymers. Prereq: CHE 226 and CHE 230, or permission of the instructor.

Available instructors: Jason DeRouchey, Susan Odom, Mark Watson.

Individual proposals for these new courses have been submitted.

Relationship to other programs on campus

We met Prof. Douglass Kalika (Chair, Chemical and Materials Engineering) to gauge his level of interest in this proposal. Prof. Kalika was quite enthusiastic about the proposed program, noting that he thought it would be good for students in Chemistry, good for students in CME and MSE, and an opportunity for the Departments to work together. At his suggestion, we sat down with Prof. John Balk (DUS in Material Science and Engineering) to go through the motivations behind the proposal, to examine the details of the proposed new courses, and to look for areas of common interest and potential areas of conflict. At the end of the meeting, Prof. Balk said that he thought the whole program looked 'great' and didn't see any problems or conflicts between the proposed BS-CHE Materials Chemistry option and the undergraduate degree program in Materials Engineering. There is not significant overlap between courses taught in MSE and the proposed new courses in CHE. In a few cases, similar topics are mentioned in the course descriptions, but in Prof. Balk's view this reflects the fundamental nature of those topics (e.g. "diffraction") and it's perfectly acceptable for such topics to be reviewed in each class. The only area of concern voiced by Prof. Balk involved the prerequisites listed for these classes, as students in the MSE program do not take a great deal of chemistry and could be locked out of these courses if we were strict on the prerequisites. He asked for the degree of flexibility that is offered by "...or permission of the instructor." In practice, MSE students who have taken Inorganic Materials and Polymer Chemistry have done well, so we have incorporated this statement into the course descriptions. The MSE program has agreed that we can require one of their classes (MSE 201) and they recommend another (MSE 301). The undergraduate program committee in MSE has vetted this proposal and has concurred with Prof. Balk's opinions.

The Course Plan

We propose the courses listed below to be required for a BS-CHE (Materials Chemistry Option).

Math (12 credits)

MA 113, 114, 213 (Calculus 1, 2, and 3)

Physics (10 credits)

Lectures: PHY 231, 232 (General Univ. Physics)
Labs: PHY 241, 242

General Chemistry (10 credits)

Lectures: CHE 105, 107
Labs: CHE 111, 113

Organic Chemistry (11 credits)

Lectures: CHE 230, 232, 532
Labs: CHE 231, CHE 533

Analytical Chemistry (3 credits)

CHE 226

Physical Chemistry (5 credits)

Lectures: CHE 547
Labs: CHE 441

Inorganic Chemistry (4 credits)

Lecture: CHE 410
Lab: CHE 412

Others (5 credits):

CHE 372, 472
MSE 201 (*Materials Science I*)

Major Field Options (6 credits):

Chosen from CHE 395, any 500-level CHE courses not required for the degree

Materials Chemistry (14 credits)

Lectures: (take 4 of the following 5):

MSE 301 (*Materials Science II*, 3 credits)

CHE 516 (*Inorganic Materials Chemistry*, 3 credits)

CHE 536 (*Organic Materials: Characterization and Devices*, 3 credits)

CHE 566 (*Organic Materials: Electronic and Photonic Properties*, 3 credits)

CHE 576 (*Polymer Chemistry*, 3 credits)

Labs: CHE 567 (*Fab Lab*, 2 credits)

The 4-Year Undergraduate Curriculum.

UK Core, A&S Requirements: 48 credits

Composed of: UK Core (24 credits)²
GCCR³
A&S Language (12 credits)
A&S SS, HUM (6 credits)⁴
A&S Free Electives (6 credits)

Premajor Requirements: 18 credits

Composed of: MA 113 (4 credits)
MA 114 (4 credits)
CHE 105 (4 credits)
CHE 111 (1 credit)
CHE 107 (3 credits)
CHE 113 (2 credits)

Major Requirements: 39 credits

Composed of: CHE 226 (3 credits)
CHE 230 (3 credits)
CHE 231 (1 credit)
CHE 232 (3 credits)
CHE 372 (1 credit)³
CHE 410G (2 credits)
CHE 412G (2 credits)
CHE 441G (2 credits)
CHE 472 (1 credit)³
CHE 516 (3 credits)
CHE 532 (2 credits)
CHE 533 (2 credits)
CHE 536 (3 credits)^{*}
CHE 547 (3 credits)
CHE 566 (3 credits)^{*}
CHE 567 (2 credits)^{*}
CHE 576 (3 credits)^{*}

^{*} New courses to be proposed as part of the program

Other Major Hours: 16 credits

MSE 201 (3 credits)
MA 213 (4 credits)
PHY 231 (4 credits)
PHY 232 (4 credits)
PHY 241 (1 credit)
PHY 242 (1 credit)

CHE Major Field Options: 6 credits

CHE 395 recommended

Total for the degree: 128 credits

Total in A&S: 92 credits (*a minimum of 90 is required*)

Total acceptable to A&S: 128 (*a minimum of 120 is required*)

Total at 300-Level: 44 (*a minimum of 24 is required for BS, and CHE 230, 231, and 232 count*)

Total in Sciences: 78 (*a minimum of 60 is required for BS*)

Total in Pre-major: 18 (*a minimum of 6 is required for BS*)

Total in CHE above Pre-major: 45 (*a minimum of 39 is required*)

² The UK Core Intellectual Inquiry requirements for Natural/ Physical/Mathematical and Quantitative Foundations are satisfied by CHE 105/111 and MA 113

³ The Graduation Communication and Composition Requirement is satisfied by CHE 372/472

⁴ The A&S requirement for Natural Sciences and for Lab is satisfied by CHE 107/113

Courses Required from Other Departments

The majority of the required courses come from CHE, but our BS-CHE program does require courses in math and in physics. The Physics requirement (PHY 231, 232, 241, and 242) is the same for all of tracks in the BS-CHE program, including this proposed Materials Chemistry track. The Department of Physics and Astronomy finds this acceptable, and an email from Sumit Das, Chair of Physics and Astronomy, is attached. The BS-CHE program also requires a set of courses in mathematics (MA 113 and MA 114). The "traditional" track in the BS-CHE program also requires MA 213. The Department of Mathematics as agreed that it is acceptable for us to require MA 113, MA 114, and MA 213 for the BS-CHE Materials Chemistry track (email from Russell Brown, Chair of the Department of Mathematics, is attached. Prof. Brown also raises the possibility of the BS-CHE program accepting the MA 137 – MA 138 sequence in lieu of MA 113 – 114. We currently accept MA 137 – MA 138 by petition for students who wish to change majors into CHE, and we will consider making a formal change to the BS-CHE programs in the near future. It is clear that MA 137 – 138 make the most sense for students in the BS-CHE Biological Chemistry track.

Resources

The Department of Chemistry currently has faculty with the expertise to teach all of the courses in the proposed program. There is no question that the Department is seeing significant enrollment growth, particularly at the upper division, and we intend to continue to hire faculty at all levels as opportunities arise. Given that we need to open additional sections of upper-division courses, this proposal does not significant change the need for additional faculty.

The proposed laboratory course will require some new pieces of equipment and these will be purchased from Departmental funds. A number of our current instruments will be used, and many of the new pieces of equipment are not inordinately expensive (e.g. a spin coater costs as little as \$1700). We recognize that TA credentials can be an issue if a graduate student enrolls in this course, but this will only be a concern if the enrollment grows to where a TA is needed to assist the instructor. In that circumstance, we will work with the instructor and the available personnel to ensure that people with appropriate credentials are supervising and grading the students.

Summary

We believe that this new option within the BS-CHE degree program will be of benefit to many students who are interested in a new topical focus in the CHE degree program. The new courses will also benefit graduate students in a number of groups from at least two different Colleges (the College of Arts and Sciences and the College of Engineering).

Attachments:

1. Communications from Sumit Das (Chair of PHY), Russell Brown (Chair of MA), and Douglass Kalika (Chair of MSE).
2. Comparison of BS-CHE Traditional, Biochemistry, and Materials Chemistry options
3. 4-Year Curricular Map

1. Communications from Sumit Das (Chair of PHY), Russell Brown (Chair of MA), Douglass Kalika (Chair of MSE).

From: Sumit Das <chair@pa.uky.edu>
Subject: Re: Proposed change to the BS-CHE program.
Date: June 16, 2015 at 11:37:23 PM EDT
To: "Meier, Mark" <mark.meier@uky.edu>, "DAS, SUMIT R" <sumit.das@uky.edu>
Cc: "Yates, Steven W" <yates@uky.edu>

Hi Mark

It is okay with me if the Chemistry department requires PHY 231, 232, 241, and 242 as part of the BS-CHE materials chemistry track, as we currently do for the BS-CHE traditional and BS-CHE biological chemistry tracks.

Thanks

Sumit

From: "R. Brown" <russell.brown@uky.edu>
Subject: Re: Proposed change to the BS-CHE program
Date: June 17, 2015 at 8:17:24 AM EDT
To: "Meier, Mark" <mark.meier@uky.edu>
Cc: "Yates, Steven W" <yates@uky.edu>

Mark,

We would be happy to have you require MA 113, MA 114 and MA 213, Calculus I-III for the new track in materials chemistry for the Bachelor of Science with a Chemistry major.

I also suggest that you accept MA 137/138, Calculus I and II with Life Science Applications as alternatives to MA 113/114.

Russell Brown



July 1, 2015

TO: Prof. Mark Meier, Chair
Department of Chemistry

FROM: D.S. Kalika, Chair
Department of Chemical and Materials Engineering

RE: Proposed undergraduate option in Materials Chemistry

On behalf of the faculty in the Department of Chemical and Materials Engineering, I am pleased to support establishment of the proposed undergraduate option in Materials Chemistry. The option is an excellent addition to the undergraduate program in chemistry and will further expand educational opportunities in materials science at the University of Kentucky.

The CME department is fully supportive of the inclusion of MSE 201 as a required course for the option, as well as offering MSE 301 as an elective.

Sincerely,

Doug Kalika

Douglass S. Kalika, Chair
Chemical & Materials Engineering



College of Arts & Sciences
Educational Policy Committee
202 Patterson Office Tower
Lexington, KY 40506-0027

859 257-6689
fax: 859 257-2635

www.as.uky.edu/education-policy-committee

November 6, 2015

Dear Undergraduate Council,

On behalf of the faculty of the College of Arts and Sciences, the Education Policy Committee discussed and approved the Chemistry Undergraduate program change proposal 9:0:0 on Tuesday, October 6, 2015.

Sincerely,

A handwritten signature in cursive script that reads "Stephen Testa".

Stephen Testa
Chair, Education Policy Committee

Harmon, Camille

From: Meier, Mark
Sent: Friday, November 06, 2015 10:36 AM
To: Harmon, Camille
Cc: Cammers, Arthur
Subject: Re: Chemistry Program Change
Attachments: Chem UG Program Change.pdf

Importance: High

Hi Camille. The Chemistry faculty voted and approved this program change during a faculty meeting on May 11, 2015. If you need a formal memo, please let me know.

Mark

On Nov 6, 2015, at 9:48 AM, Harmon, Camille <camille.harmon@uky.edu> wrote:

Good Morning Mark,

The Chemistry program change was approved at the 10/6/15 EPC meeting. Due to a few of the chemistry courses still lingering at the college level the program change has not been forwarded. The remaining courses have been added to the consent list for our upcoming meeting on 11/10/15. Before I forward the program change I will need a memo from you stating that the Chemistry faculty voted and approved this program change.

Thank you,

Camille Harmon

Dean's Office Administrative Assistant
College of Arts and Sciences
University of Kentucky
202 Patterson Office Tower
859-257-3966

<Chem UG Program Change.pdf>

March 1, 2016



College of Arts and Sciences

Joanie Ett-Mims
Undergraduate Education
230 McVey Hall
University of Kentucky
Lexington, KY 40506

Department of Chemistry
Chemistry-Physics Building
Lexington, KY 40506-0055

859 257-7080

fax 859 323-1069

chem.as.uky.edu

Dear Ms. Ett-Mims,

I am pleased to offer a bit of clarification on our proposal to establish a Materials Chemistry option within the CHE-BS degree program. As the Council has observed, the proposed option requires 128 credit hours, which is the same as the minimum number of credit hours required for our established BS-Biochemistry option. The 123-credit hour BS-Traditional option meets the requirements for Certification by the American Chemical Society and covers a broad range of chemical topics. The addition of courses required for a focus in Biochemistry required a few additional courses, but we have tried to keep the number of credit hours as low as possible.

The new option was substantially tailored after the Biochemistry option. The similar structures of these programs will facilitate development and implementation of an effective assessment plan for the Materials Chemistry option.

I would be happy to answer any question that the Council may have.

Sincerely,

A handwritten signature in black ink, appearing to read 'Mark Meier', with a stylized flourish at the end.

Mark Meier
Professor and Chair

see
blue.

2. Comparison of BS-CHE (Traditional), BS-CHE (Biochemistry), and BS-CHE (Materials Chemistry)

Common to All BS-CHE Options:

Premajor Requirements

MA 113 (Calc. I, 4 cr)
 MA 114 (Calc. II, 4 cr)
 CHE 105 (Gen. Coll. Chem I, 4 cr)
 CHE 111 (Lab. Gen. Chem. I, 1 cr)
 CHE 107 (Gen. Coll. Chem. II, 3 cr)
 CHE 113 (Lab. Gen. Chem. II, 2 cr)

Other Course Work

MA 213 (Calc. III, 4 cr)
 PHY 231 (Gen. Univ. Phys., 4 cr)
 PHY 232 (Gen. Univ. Phys., 4 cr)
 PHY 241 (Gen. Univ. Phys. Lab, 1 cr)
 PHY 242 (Gen. Univ. Phys. Lab., 1 cr)

Major Requirements

CHE 226 (Analyt. Chem. 3 cr)
 CHE 230 (Org. Chem I, 3 cr)
 CHE 231 (Org. Chem. Lab I, 1 cr)
 CHE 232 (Org. Chem II, 3 cr)
 CHE 372 (Commun. in Chem I, 1 cr)
 CHE 410G (Inorg. Chem. 2 credits)
 CHE 412G (Inorg. Chem. Lab, 2 cr)
 CHE 441G (Phys. Chem. Lab, 2 cr)
 CHE 472 (Commun. in Chem. II, 1 cr)

Specific to each BS-CHE Option:

Traditional

MA 322 (Matrix Alg. and Appl. 3 cr)
 CHE 442 (Thermo/Kinetics 3 cr)
 CHE 522 (Instr. Analysis, 4 cr)
 CHE 532 (2 credits)
 CHE 533 (2 credits)
 CHE 547 (Prin. Phys. Chem. 3 cr)
 CHE 550 or 552 (Biol. Chem. 3 cr)
 Major Field Options (6 cr)

26 additional credits

Biochemistry

BIO 150 (Prin. Bio. I, 3 cr)¹
 BIO 151 (Prin. Bio. Lab. 2 cr)¹
 BIO 152 (Prin. Bio. II, 3 cr)¹
 BIO 153 (Prin. Bio. Lab II, 2 cr)¹
 BIO 304 or BIO 308 or BIO 315 (3-4 cr)
 CHE 440G (Intro. Phys. Chem., 4 cr)
 CHE 522 (Instr. Analysis or CHE 532/533 (4 cr)
 CHE 550 (Biol. Chem. 1, 3 cr)
 CHE 552 (Biol. Chem. 2, 3 cr)
 CHE 554 (Biochem. Lab., 2 cr)
 Major Field Options (4 cr)

33-34 additional credits

Materials Chemistry²

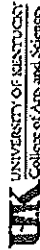
MSE 201 (Materials Science I, 3 cr)
 CHE 516 (Inorganic Materials, 3 cr)
 CHE 532 (Spectr. Iden. Org. Compds, 2 cr)
 CHE 533 (Qual. Org. Analysis, 2 cr)
 CHE 536 (Org. Mat. Elect. Photon. Prop. 3 cr)
 CHE 547 (Prin. Phys. Chem. 3 cr)
 CHE 566 (Org. Mat. Charact. Devices, 3 cr)
 CHE 567 (Fab. Lab. 2 credits)
 CHE 576 (Polym. Chem. 3 credits)
 Major Field Options (6 credit hours)

30 additional credits

¹ Classified as Pre-Major

² MSE 301 (Materials Science II) can replace CHE 516, 536, 566, 567, or 576

2. 4-YEAR CURRICULAR MAP
BACHELOR OF SCIENCE IN CHEMISTRY-
Materials Chemistry Option



Year 1		
Fall UK Core CCC UK Core OF MAT113: Calculus I UK Core NPM (CHE 105: General Chemistry I) UK Core NPM (CHE 111: General Chemistry I Lab) UK Core SIR (STA 210: Intro to Statistical Reasoning)	Credits 3 4 4 1 3	
Semester Total: 15		
Spring UK Core CCC A&S NS (CHE 107: General Chemistry II) A&S Lab (CHE 113: General Chemistry II Lab) MA 114: Calculus II UK Core ACR		Credits 3 3 3 2 4 3
Semester Total: 15		
Year 2		
Fall MA 213: Calculus III CHE 230: Organic Chemistry I PHY 231: General Univ. Physics I PHY 241: General Univ. Physics Lab I CHE 231: Organic Chemistry Lab I UK Core SSC	Credits 4 3 4 1 3 1 16	
Semester Total: 16		
Spring Foreign language 101 CHE 226: Analytical Chemistry UK Core HUM CHE 232: Organic Chemistry II PHY 232: General Univ. Physics II PHY 242: General Univ. Physics II Lab II	Credits 4 2 3 3 3 4 1 18	
Semester Total: 18		
Year 3		
Fall MSE 201: Materials Science A&S HUM CHE 547: Principles of Physical Chemistry I Foreign Language 102 CHE 532: Spec. Identification of Organic Compds CHE 576: Polymer Chemistry	Credits 3 3 3 4 2 3 3	
Semester Total: 18		
Spring Foreign Language 201 CHE 410G: Inorganic Chemistry CHE 553: Qual. Organic Analysis Lab CHE 441G: Physical Chemistry Lab CHE 516 Inorganic Materials A&S Free Elective	Credits 4 2 2 2 3 3 3	
Semester Total: 16		
Year 4		
Fall Major field option UK Core CCC A&S SS CHE 412G: Inorganic Chemistry Lab CHE 572: Communication in Chemistry CHE 536: Electronic and Photonic Properties	Credits 3 3 3 2 1 3 15	
Semester Total: 15		
Spring Major field option CHE 566: Characterization and Devices UK Core GDY CHE 567: Organic Materials Fab Lab CHE 472: Communication in Chemistry A&S Free Elective	Credits 3 3 3 2 1 3 15	
Semester Total: 15		

TOTAL CREDITS: 128

Admission students do not have to enroll in CHE 104. If they have any of the following: 1) An ACT English score of 32 or higher; 2) An SAT Verbal score of 700 or higher; 3) or a score of 4 or 5 on the English Language AP exam. In these situations, the student should register CHE 104 with electives. If CHE 104 must be taken, it can be taken any time in the 1st year of study at UK.

Students who have other student visas of a language in high school can complete the A&S Foreign Language requirement with 3 college semesters of a different language. Also note that if you take a foreign language placement exam, you may be exempt from 1 or more of the foreign languages & their lab courses. If more than one semester is bypassed, include the bypassed language courses with electives. Any language sequence may be taken.

Major Field Options (6 credits) must be chosen from the following: up to 6 hours of CHE 305, any 500-level CHE course except those already required for the major.

Major Field Options that do not count toward any other requirement - must be taken: UK 107, MA 193, and MA 194. Count as free electives because they are not social general requirements.

6 CCI and CC 2 are Composition and Communications
 QF is Quantitative Foundations
 NPM is Intellectual Inquiry: Natural/Physical/Mathematical
 3 HUM is Intellectual Inquiry: Humanities
 3 ACR is Intellectual Inquiry: Arts and Creativity
 3 SSC is Intellectual Inquiry: Social Sciences
 3 SIR is Statistical Inference/Reasoning
 3 CCC is Community, Culture, and Citizenship
 3 GDY is Global Dynamics

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3 A&S NS is Arts and Sciences: Natural Science
 3 A&S SS is Arts and Sciences: Social Studies
 22 A&S Language Requirement
 6 A&S Free Electives

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Materials Chemistry Courses