

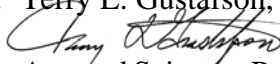


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artsandsciences.osu.edu

June 14, 2011

To: W. Randy Smith, Vice Provost, Office of Academic Affairs
 From: Terry L. Gustafson, Special Assistant to the Executive Dean for Semester Conversion

 Re: Arts and Sciences Program Proposals from the Natural and Mathematical Sciences Division

Arts and Sciences is pleased to submit the following programs from the Natural and Mathematical Sciences Division to the Office of Academic Affairs for conversion from quarters to semesters. The programs have been approved by the faculty members and chair of the originating unit, and reviewed and approved by the divisional advisory panel, a subcommittee of the ASC Committee on Curriculum and Instruction (CCI), and the full CCI. The vote for approval of all programs at the full CCI was unanimous.

Program Name	Academic Plan Code	Conversion Designation	CCI Approval	Last Revision
Chemistry BS	CHEM-BS	Converted	6/10/2011	Prior to 2006
Chemistry BA	CHEM-BA	Converted	6/10/2011	Prior to 2006
Earth Sciences BS	EARTHSC-BS	Re-envisioned	6/10/2011	Prior to 2006
Evolutionary Studies Minor	EVOSTDS-MN	Converted	6/10/2011	Prior to 2006
Molecular Genetics BA	MOLGEN-BA	Deactivated	6/10/2011	Prior to 2006
Plant Cellular and Molecular Biology BA	PCMB-BA	Deactivated	6/10/2011	Prior to 2006

Arts and Sciences General Education (GE) Program: The GE program for untagged B.A. and B.S. degrees in Arts and Sciences was approved by the Council on Academic Affairs on May 26, 2010, after receiving approval from the Arts and Sciences Faculty Senate. All the programs presented here follow the approved GE program.

College of Arts and Sciences Transition Policy: The College of Arts and Sciences is committed to the principles outlined in the university's Pledge to Undergraduate Students. Each unit has a plan on how best to assist its majors and minors through the transition. And the Arts and Sciences Academic Advising Services will advise students on how to transition their GE program. Dual advising is the existing process used in Arts and Sciences and will continue under semesters.

Status: PENDING

PROGRAM REQUEST
Chemistry Bachelor of Arts major

Last Updated: Andereck, Claude David
06/08/2011

Fiscal Unit/Academic Org	Chemistry - D0628
Administering College/Academic Group	Arts And Sciences
Co-administering College/Academic Group	
Semester Conversion Designation	Converted with minimal changes to program goals and/or curricular requirements (e.g., sub-plan/specialization name changes, changes in electives and/or prerequisites, minimal changes in overall structure of program, minimal or no changes in program goals or content)
Current Program/Plan Name	Chemistry
Proposed Program/Plan Name	Chemistry Bachelor of Arts major
Program/Plan Code Abbreviation	CHEM-BA
Current Degree Title	Bachelor of Arts

Credit Hour Explanation

Program credit hour requirements		A) Number of credit hours in current program (Quarter credit hours)	B) Calculated result for 2/3rds of current (Semester credit hours)	C) Number of credit hours required for proposed program (Semester credit hours)	D) Change in credit hours
Total minimum credit hours required for completion of program		44	29.3	35	5.7
Required credit hours offered by the unit	Minimum	34	22.7	29	6.3
	Maximum	44	29.3	35	5.7
Required credit hours offered outside of the unit	Minimum	0	0.0	0	0.0
	Maximum	10	6.7	6	0.7
Required prerequisite credit hours not included above	Minimum	45	30.0	30	0.0
	Maximum	45	30.0	30	0.0

Explain any change in credit hours if the difference is more than 4 semester credit hours between the values listed in columns B and C for any row in the above table

Significant changes to our program relate to our laboratory courses and some of our lecture courses.

Many of our laboratory courses (for example, analytical, inorganic and physical chemistry courses) were one-quarter long offerings, and these quarter offerings are now expanded to one-semester courses (analytical: 2210; physical: 4410; inorganic: 4550). Our organic laboratory courses were two-quarter sequences (254–255), but previously, required a pre-requisite one-quarter long lecture course (251). With semesters, we cannot require this pre-requisite lecture course, and our semester organic lab offerings (2540–2550) must be offered concurrent with lecture (2510–2520 or 2610–2620 or 2910H–2920H). Thus, these lab offerings had to be adjusted in terms of our current two 3-hour (or 4-hour) lab meetings per week to only be one 3-hour (or 4-hour) lab meeting per week.

The assigned credit hours are consistent with the time spent in class, including the re-envisioned lecture, recitation and/or laboratory components. For example, Chemistry 2210 has 3 hours of lecture, 1 hour of recitation and one 4-hour lab per week – hence, 5 credit hours. The quarter version (221) had 3 hours of lecture and two 4-hour labs per week – and was 5 credit hours.

For the BA major, the third quarter of the organic chemistry sequence (Chemistry 253, 4 credit hours) was an elective, but with semester conversion, both semesters of the organic chemistry sequence (2510–2520 or 2610–2620 or 2910H–2920H; each 4 credit hours) are now required of the BA major. Our physical chemistry series for the BA major was a two-quarter sequence (520–521, 3 credit hours each) and has been converted to a two-semester sequence (4200–4210, 3 credit hours each).

Together, these changes have added to the total credit hours required for graduation under semesters.

Program Learning Goals

Note: these are required for all undergraduate degree programs and majors now, and will be required for all graduate and professional degree programs in 2012. Nonetheless, all programs are encouraged to complete these now.

Program Learning Goals

- 1. Students solve state-of-the-art chemistry problems, working both individually and in groups, and these problems will exemplify current disciplinary and interdisciplinary principles as well as modern pedagogical practice.
- 2. Students develop effective skills in oral and written communication of scientific knowledge.
- 3. Students plan experimental procedures, carry out chemical procedures, use laboratory equipment, analyze data and prepare laboratory reports that reinforce current chemical practices.
- 4. Students follow safe practices in the laboratory and demonstrate scientifically ethical practices.
- 5. Students retrieve information from the chemical literature, and become proficient in online database searching.
- 6. Students use modern computer software for graphing, manipulation of symbolic mathematical expressions, and quantum chemical calculations.

Assessment

Assessment plan includes student learning goals, how those goals are evaluated, and how the information collected is used to improve student learning. An assessment plan is required for undergraduate majors and degrees. Graduate and professional degree programs are encouraged to complete this now, but will not be required to do so until 2012.

Is this a degree program (undergraduate, graduate, or professional) or major proposal? Yes

Does the degree program or major have an assessment plan on file with the university Office of Academic Affairs? Yes

Summarize how the program's current quarter-based assessment practices will be modified, if necessary, to fit the semester calendar.

No modifications are planned or required to fit the semester calendar.

Program Specializations/Sub-Plans

If you do not specify a program specialization/sub-plan it will be assumed you are submitting this program for all program specializations/sub-plans.

Pre-Major

Does this Program have a Pre-Major? No

Attachments

- Chemistry BA cover letter.doc: NMS Division of Arts and Sciences cover letter
(Letter from the College to OAA. Owner: Andereck, Claude David)
- CCI Subcommittee Chair Letter--ChemistryBA CCI.doc: CCI Subcommittee Chair Letter
(Other Supporting Documentation. Owner: Vankeerbergen, Bernadette Chantal)
- Chemistry_BA_major_v5.pdf: Revised Chemistry BA proposal
(Program Proposal. Owner: Hadad, Christopher Martin)
- Chemistry_BA_major_v5_comments.pdf: Comments on program revision
(Other Supporting Documentation. Owner: Hadad, Christopher Martin)

Comments

Status: PENDING

PROGRAM REQUEST
Chemistry Bachelor of Arts major

Last Updated: Andereck,Claude David
06/08/2011

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Hadad,Christopher Martin	03/30/2011 06:53 PM	Submitted for Approval
Approved	Hadad,Christopher Martin	03/30/2011 06:53 PM	Unit Approval
Revision Requested	Andereck,Claude David	03/31/2011 12:12 PM	College Approval
Submitted	Hadad,Christopher Martin	03/31/2011 11:25 PM	Submitted for Approval
Approved	Hadad,Christopher Martin	03/31/2011 11:27 PM	Unit Approval
Revision Requested	Andereck,Claude David	04/05/2011 01:17 PM	College Approval
Submitted	Hadad,Christopher Martin	04/11/2011 02:22 PM	Submitted for Approval
Approved	Hadad,Christopher Martin	04/11/2011 02:23 PM	Unit Approval
Revision Requested	Andereck,Claude David	04/14/2011 10:32 AM	College Approval
Submitted	Hadad,Christopher Martin	04/16/2011 03:02 PM	Submitted for Approval
Approved	Hadad,Christopher Martin	04/16/2011 03:03 PM	Unit Approval
Approved	Andereck,Claude David	04/19/2011 11:40 AM	College Approval
Revision Requested	Vankeerbergen,Bernadette Chantal	04/29/2011 03:32 PM	ASCCAO Approval
Submitted	Hadad,Christopher Martin	06/07/2011 05:14 PM	Submitted for Approval
Approved	Hadad,Christopher Martin	06/07/2011 05:15 PM	Unit Approval
Approved	Andereck,Claude David	06/08/2011 08:03 AM	College Approval
Pending Approval	Nolen,Dawn Jenkins,Mary Ellen Bigler Meyers,Catherine Anne Vankeerbergen,Bernadette Chantal Hanlin,Deborah Kay	06/08/2011 08:03 AM	ASCCAO Approval



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To: Larry Krissek, Chair, Committee on Curriculum and Instruction(CCI)
From: James Fredal, Chair, CCI Sciences Subcommittee
Re: Chemistry BA Degree Semester Conversion Proposal
Date: April 26, 2011

Larry:

The Sciences subcommittee of the CCI met on Monday, April 25 to review the BA degree program in Chemistry and approved the proposal unanimously contingent upon the following changes and corrections.

The PACER chart indicates a marked rise in total credit hours to degree. This rise is explained, but the explanation was unsatisfactory and needs clarification since it appears that some courses, and lab courses in particular, are undergoing a marked increase in contact hours from quarters to semesters. Part of the problem seems to be the straight conversion of individual courses (rather than sequences) from quarters to semesters with the same number of credit hours. The suggestion was made that if the second advanced science elective were dropped, some of the increase in total hours would be eliminated.

Several recommendations duplicate those for the BS proposal: many of the courses are not listed with their quarter equivalent on the course list; the semester advising sheet is not clear about the total core hours, elective hours, and prerequisite hours; the four-year plans should be moved to the bottom of the document; and the transition plan should spell out more clearly the plans for bridge courses.

As with the BS, we felt these corrections and requests were insufficient reason to send the document back, so we forward it with a recommendation for approval and with the understanding that these matters will be addressed before it leaves the CCI.

Thanks very much,

Jim Fredal

cc: Bernadette Vankeerbergen

College of Arts and Sciences

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April 19, 2011

Larry Krissek
Chair, Arts and Sciences CCI

Dear Larry:

It is a pleasure to forward to you the proposal for the Bachelor of Arts in Chemistry under semesters. The program has been converted with minimal revision. There have been changes to the laboratory courses, the most important being to allow students to take the organic chemistry laboratories concurrently with the lectures. A second important change has been to offer a version of organic chemistry for majors, in addition to the standard and honors versions—this had already occurred for the introductory sequence.

Beyond my own review of the documents, the proposal has been discussed by colleagues from other NMS units at a meeting on April 5, 2011. Feedback from these discussions has been incorporated in the proposal.

If you have any questions, I would be happy to address them.

Sincerely,



David Andereck
Professor of Physics
Associate Dean of Natural and Mathematical Sciences, College of Arts and Sciences



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June 7, 2011

To: University Semester Conversion Committees

Re: Conversion of Undergraduate Major (B.A. and B.S.) and Minor Programs in Chemistry

The Department of Chemistry currently offers a Bachelor of Arts (BA) and a Bachelor of Science (BS) degree as part of our majors program, along with a minor in Chemistry. Our currently offered majors programs prepare students for a variety of careers, with the BA degree being less intensive in required chemistry courses, thereby offering opportunities for undergraduate students to expand their schedules with interdisciplinary courses. Historically, our BA degree has been the most popular with students who are intending to pursue pre-professional programs (pre-medicine, pre-dental, pre-veterinary, pre-pharmacy, pre-optometry, pre-law, etc) or for chemistry-related employment, including sales and marketing. The BS degree requires more chemistry and mathematics courses and is better preparation for a student going off to graduate school in a chemically related discipline (chemistry, biochemistry, pharmacy, etc) or for employment in chemistry (pharmaceutical or materials chemistry). While there is some variation from year to year, there are about 450 chemistry majors across all ranks in 2011, and approximately 50% of them are intending on the BA degree while 50% are working towards the BS degree.

The American Chemical Society (ACS: www.acs.org) provides guidelines for the educational preparation for degrees in Chemistry, and the department is currently certified to comply with those guidelines. For some institutions, there are significant guidelines as to contact hours by instructors and so on; however, for a large university like Ohio State, the most important aspects of the guidelines are a minimum amount of hours (400) in the chemistry laboratory across the entire program (but excluding first-year general chemistry), a minimum exposure to laboratory experience in 4 of the 5 major areas of chemistry (analytical, biological, inorganic, organic and physical) as well as lecture instruction in all 5 areas.

On a yearly basis, the department provides an update report to the ACS as to our current program and its requirements, and on a 5-year schedule, we re-apply for re-certification of our major programs. Thus, upon graduation, our BS majors can receive a certified ACS degree if they comply with the ACS requirements. Between 25 – 50% of our BS majors per year receive ACS certified degrees.

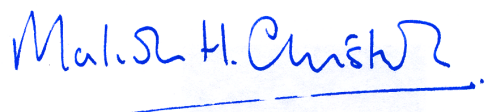
Our program continues to grow, with approximately 200% more chemistry majors as new first quarter freshmen (NFQFs) in autumn 2010 as compared to a typical number of 35–40 incoming students in the 1990s.

The process for the conversion of our undergraduate major and minor programs began in summer 2010 with many discussions with our faculty and teaching staff. The courses were discussed at numerous meetings of the faculty at large as well as the Undergraduate Curriculum Committee, chaired by the Vice Chair for Undergraduate Studies (Christopher Hadad). On December 10, 2010, the Undergraduate Curriculum Committee unanimously voted to adopt the envisioned programs presented here for the revised undergraduate programs under semesters. Then, the faculty voted on the same programs at a January 19, 2011 faculty meeting and voted 25 in favor, 0 against and 0 abstain to adopt these revisions to our programs.

The details of these revised programs are provided in the accompanying documentation.

If you have any questions, please contact Christopher Hadad at (614) 292–1204 or hadad.1@osu.edu.

Sincerely,



Malcolm H. Chisholm
Chair and Distinguished University Professor
Department of Chemistry



Christopher M. Hadad
Vice Chair for Undergraduate Studies
Department of Chemistry

Program Rationale Statement (Bachelor of Arts degree in Chemistry)

The revised program for the Bachelor of Arts (BA) degree in Chemistry is a relatively straightforward conversion of our existing BA degree under quarters. Our learning goals and outcomes have been abbreviated in terms of language as compared to the current assessment plan; however, the goals are relatively invariant.

Approximately half of our current majors are working towards the BA degree. We maintain core experiences in general, analytical, organic, and physical chemistry. Inorganic chemistry and biochemistry are elective courses. Exposure to biochemistry is strongly encouraged and would fulfill an advanced science elective, as would research experience. Advanced science electives can be fulfilled by pre-professional students who require specific courses in molecular genetics or biochemistry. Relative to our BA degree under quarters, we continue to require similar content in mathematics (through calculus, Math 1152) and a year of physics (1200–1201).

The most significant changes to our program relate to our laboratory courses. Many of our laboratory courses (for example, analytical, inorganic and physical chemistry courses) were one-quarter long offerings, and these quarter offerings are now expanded to one-semester courses (analytical: 2210; physical: 4410). Our organic laboratory courses were two-quarter sequences (254–255), but previously, required a pre-requisite one-quarter long lecture course (251). With semesters, we cannot require this pre-requisite lecture course, and our semester organic lab offerings (2540–2550) must be offered concurrent with lecture (2510–2520 or 2610–2620 or 2910H–2920H). Thus, these lab offerings had to be adjusted in terms of our current two 3-hour (or 4-hour) lab meetings per week to only be one 3-hour (or 4-hour) lab meeting per week.

For the BA major, the third quarter of the organic chemistry sequence (Chemistry 253, 4 credit hours) was an elective, but with semester conversion, both semesters of the organic chemistry sequence (2510–2520 or 2610–2620 or 2910H–2920H; each 4 credit hours) are now required of the BA major. Our physical chemistry series for the BA major was a two-quarter sequence (520–521, 3 credit hours each) and has been converted to a two-semester sequence (4200–4210, 3 credit hours each). Together, these changes have added to the total credit hours required for graduation under semesters.

Overall, our new semester plan is commensurate with semester offerings by peer institutions.

Relative to the BS degree, the BA chemistry major would have less mathematics and the non-calculus version of physics as required courses. As with our quarter curriculum, the calculus version of physics is an option.

Another change is an extension of our current effort to have a majors-only version of our high-enrollment courses. Until only recently, our Chemistry majors have been able to take our Honors sequence (201H–202H–203H) or the regular sequence (121–122–123) of general chemistry. In 2009, we created a new general chemistry sequence for chemistry (and biochemistry) majors: 161–162–163. These options have been maintained for general chemistry under semesters (honors, majors-only, and regular sequences). Organic chemistry has been a similar challenge with our 100+ chemistry majors immersed in a sea of 1500+ (predominantly pre-professional) students. While Honors organic chemistry was an option, there was no majors-only version of organic

chemistry. For semesters, we have created a 2610–2620 organic sequence for chemistry (and biochemistry) majors, along with retention of our honors (2910H–2920H) and regular (2510–2520) sequences. We anticipate that content of pertinent relevance to chemistry (and biochemistry) majors will be provided in the majors-only sequence (for example, state-of-the-art methodologies in carbon-carbon bond-forming reactions as well as asymmetric or catalytic processes).

We do not have specializations or subprograms for our BA degree; instead, from one-on-one discussions between the undergraduate student and our chemistry advisors, we create the ideal program of courses that will cater to the specific interests of the student. For example, a chemistry major who plans to attend medical school would be advised to take some additional courses in molecular genetics and biochemistry prior to graduation. Those courses would count as advanced science electives in the junior and senior years.

Research remains a highly recommended and encouraged science elective.

With regard to the four-year plan, the Bachelor of Arts curriculum is intended for students who want to have a background in chemistry as a basis for future work in other areas of science, such as the life sciences, or in such professional areas as medicine or veterinary medicine. Chemistry 1610 – 1620 is the recommended general chemistry sequence for chemistry majors who present high school chemistry for entrance, although qualified students are strongly urged to take the honors general chemistry sequence, Chemistry 1910H – 1920H, instead. (Chemistry 1210 – 1220 are acceptable, but are not the preferred sequence for chemistry majors.)

Organic Chemistry and Quantitative Analysis 2210 (or 2210H) are taken in the second year. As with general chemistry, Chemistry 2610 – 2620 is the recommended organic chemistry lecture sequence for chemistry majors, although qualified students are strongly urged to take the honors sequence, Chemistry 2910H – 2920H, instead. (Chemistry 2510 – 2520 are acceptable, but are not the preferred organic lecture sequence for chemistry majors.) The Organic Chemistry lab experience is either the 2540 – 2550 sequence or the honors version (2940H – 2950H).

Physical Chemistry 4200 – 4210 and Physical Chemistry Laboratory 4410 are required; Chemistry 4300 – 4310 may be taken instead of 4200 – 4210 with the proper math prerequisite. The major is completed by 9 credit hours of advanced science electives that must include at least 3 credit hours of chemistry courses. Advanced science electives must be approved by the undergraduate chemistry advisors. Examples of science electives include: any un-required, graded 4000 – 6000 level courses in Chemistry; 4000 or 5000 level courses in Astronomy, Biochemistry, Plant Biology, Molecular Genetics, Earth Sciences, Microbiology, Physics, and EEOB; and most courses in Mathematics at the 2000 – 4000 level. Not more than six hours of undergraduate research (Chemistry 4998/4999, or honors versions) may be used to fulfill the science elective requirement.

While we show a typical sequence of courses, we will offer many of these course offerings in both the autumn and spring quarters so that students can adjust their schedules for their particular needs. We anticipate that an undergraduate student who starts with general chemistry in their first year will have little difficulty to graduate in 4 years.

The Bachelor of Arts Degree in Chemistry (B.A.)

The Bachelor of Arts curriculum is intended for students who want to have a background in chemistry as a basis for future work in other areas of science, such as the life sciences, or in such professional areas as medicine or veterinary medicine. Chemistry 1610 – 1620 is the recommended general chemistry sequence for chemistry majors who present high school chemistry for entrance, although qualified students are strongly urged to take the honors general chemistry sequence, Chemistry 1910H – 1920H, instead. (Chemistry 1210 – 1220 are acceptable, but are not the preferred sequence for chemistry majors.) Organic Chemistry and Quantitative Analysis 2210 (or 2210H) are taken in the second year. As with general chemistry, Chemistry 2610 – 2620 is the recommended organic chemistry lecture sequence for chemistry majors, although qualified students are strongly urged to take the honors sequence, Chemistry 2910H – 2920H, instead. (Chemistry 2510 – 2520 are acceptable, but are not the preferred organic lecture sequence for chemistry majors.) The Organic Chemistry lab experience is either the 2540 – 2550 sequence or the honors version (2940H – 2950H). Physical Chemistry 4200 – 4210 and Physical Chemistry Laboratory 4410 are required; Chemistry 4300 – 4310 may be taken instead of 4200 – 4210 with the proper math prerequisite. The major is completed by **9 credit hours of advanced science electives** which must include at least **3 credit hours of chemistry courses**. Advanced science electives must be approved by the undergraduate chemistry advisors. Examples of science electives include: any un-required, graded 4000 – 6000 level courses in Chemistry; 4000 or 5000 level courses in Astronomy, Biochemistry, Plant Biology, Molecular Genetics, Earth Sciences, Microbiology, Physics, and EEOB; and most courses in Mathematics at the 2000 – 4000 level. Not more than six hours of undergraduate research (Chemistry 4998/4999, or honors versions) may be used to fulfill the science elective requirement. A **sample curriculum** for semesters is given below. Your advisors will work with you to design your ideal curriculum. Check with your chemistry advisor to design a schedule for your chemistry, math, physics, and other science courses.

Autumn Semester (Year 1)		Spring Semester (Year 1)	
General Chemistry 1 (1910H, 1610, 1210)	5	General Chemistry 2 (1920H, 1620, 1220)	5
Calculus 1 (Math 1151)	5	Calculus 2 (Math 1152)	5
GE Elective (e.g. biological sciences)	4	GE Elective	3
GE Elective	3	GE Elective	3
Survey	1		
	18		16
Autumn Semester (Year 2)		Spring Semester (Year 2)	
Analytical Chemistry 1 (2210H, 2210)	5	Organic Chemistry 2 (2920H, 2620, 2520)	4
Organic Chemistry 1 (2910H, 2610, 2510)	4	Organic Chemistry Laboratory 2 (2950H, 2550)	2
Organic Chemistry Laboratory 1 (2940H, 2540)	2	Introductory Physics II (1201 or 1251)	5
Introductory Physics I (1200 or 1250)	5	GE Elective	3
	16		14
Autumn Semester (Year 3)		Spring Semester (Year 3)	
Physical Chemistry 1 (4200)	3	Physical Chemistry 2 (4210)	3
Advanced Chemistry Elective	3	Physical Chemistry Laboratory (4410)	3
Elective	3	Elective	3
GE Elective	4	GE Elective	3
		GE Elective	4
	13		16
Autumn Semester (Year 4)		Spring Semester (Year 4)	
Advanced Science Elective (e.g. Biochem 4511 ^a)	3	Advanced Science Elective	3
Elective	3	Elective	3
Elective	3	GE Elective	3
GE Elective	4	GE Elective	3
		GE Elective	3
	13		15

^a Biochemistry 4511 = 4 credit hours

The Bachelor of Arts Degree in Chemistry (B.A.)

The Bachelor of Arts curriculum is intended for students who want to have a background in chemistry as a basis for future work in other areas of science, such as the life sciences, or in such professional areas as medicine or veterinary medicine. Chemistry 161, 162, and 163 is the recommended general chemistry sequence for chemistry majors who present high school chemistry for entrance, although qualified students are strongly urged to take the honors general chemistry sequence, Chemistry 201H, 202H and 203H, instead. (Chemistry 121, 121, and 123 are acceptable, but not the preferred sequence for chemistry majors.) Organic Chemistry 251, 252, 254, and 255 (or 251H, 252H, 254H, 255H) and Quantitative Analysis 221 (or 221H) are taken in the second year. Physical Chemistry 520-521 and Physical Chemistry Laboratory 541 are required; Chemistry 530 and 531 may be taken instead of 520-521 with the proper math prerequisite. The major is completed by **16 hours of advanced science electives** which must include **at least 6 hours of chemistry courses**. Advanced science electives must be approved by the undergraduate chemistry advisor. Examples of science electives include: Chemistry 253 and any unrequired graded 500-700 level courses in Chemistry; 500 or 600 level courses in Astronomy, Biochemistry, Plant Biology, Molecular Genetics, Earth Sciences, Microbiology, Physics, and EEOB; Chemical Engineering 520, 521, 610; Computer and Information Science 221; most courses in Mathematics at the 200-500 level; and Statistics 427, 428. Not more than six hours of Chemistry 699 may be used to fulfill the science elective requirement. A **sample curriculum** based on the quarter system is given below. The curriculum will change when Ohio State changes to semesters in Summer 2012, although the overall curriculum content will be very similar. Your advisers will work with you to design a curriculum transition plan. You may take your GEC courses in a much different order than is shown here. Check with your chemistry advisor to design a schedule for your chemistry, math, physics, and other science courses.

<u>Autumn First Year</u>		<u>Winter First Year</u>		<u>Spring First Year</u>	
Chem 201H, 161, or 121	5	Chem 202H, 162, or 122	5	Chem 203H, 163, or 123	5
Math 151	5	Math 152	5	Math 153	5
GEC-social science	<u>5</u>	GEC-biol. science	<u>5</u>	GEC-English 110	<u>5</u>
	15		15		15
<u>Autumn Second Year</u>		<u>Winter Second Year</u>		<u>Spring Second Year</u>	
Chem 251H or 251 (org. lec)	4	Chem 252H or 252 (org. lec)	4	Adv. chemistry elective	4
Chem 221H or 221 (quant)	5	Chem 254H or 254 (org. lab)	3	Chem 255H or 255 (org. lab)	3
Physics 111 or 131	<u>5</u>	Physics 112 or 132	5	Physics 113 or 133	5
	14	GEC-2nd writing course	<u>5</u>	GEC-history	<u>5</u>
			17		17
<u>Autumn Third Year</u>		<u>Winter Third Year</u>		<u>Spring Third Year</u>	
Advanced chem elective	3	Chem 520 (p.chem lecture)	3	Chem 521 (p.chem lecture)	3
GEC-foreign language	5	GEC-foreign language	5	GEC-foreign language	5
GEC-history	5	GEC-arts & human (Lit)	<u>5</u>	GEC-social science	<u>5</u>
Advanced science elective	<u>5</u>		13		13
	18				
<u>Autumn Fourth Year</u>		<u>Winter Fourth Year</u>		<u>Spring Fourth Year</u>	
Chemistry 541 (p.chem lab)	3	Advanced science elective	5	GEC-arts & human (VPA)	5
GEC-foreign language	5	GEC-contemporary world	5	Elective	5
Elective	5	Elective	<u>5</u>	Elective	<u>5</u>
Elective	<u>3</u>		15		15
	16				

The GEC Social Diversity and International Issues requirements should be fulfilled by selecting courses that overlap with another GEC category, such as the Second Writing Course, Social Sciences, Arts and Humanities, and/or Historical Study. Otherwise additional credit hours may be added to the minimum required for the degree.

Bachelor of Arts Chemistry Courses for Semesters

<i>Title</i>	<i>Quarter Course Number</i>	<i>Quarter Credits</i>	<i>Semester Course Number</i>	<i>Semester Credits</i>	<i>Course Information (L = lecture, R = recitation, B = lab)</i>	<i>Comments</i>
Pre-requisite Courses for B.A. Chemistry degree (choose one of the following sequences)						
General Chemistry 1	121	5	1210 1220	5	3 hr L, 1 hr R, 1 x 3 hr B 3 hr L, 1 hr R, 1 x 3 hr B	simple conversion (GEC-lab)
General Chemistry 2	122	5				
General Chemistry 3	123	5				
General Chemistry for Majors 1	161	5	1610 1620	5	3 hr L, 1 hr R, 1 x 3 hr B 3 hr L, 1 hr R, 1 x 3 hr B	simple conversion (GEC-lab)
General Chemistry for Majors 2	162	5				
General Chemistry for Majors 3	163	5				
Honors General Chemistry 1	201H	5	1910H 1920H	5	3 hr L, 1 hr R, 1 x 3 hr B 3 hr L, 1 hr R, 1 x 3 hr B	simple conversion (GEC-lab)
Honors General Chemistry 2	202H	5				
Honors General Chemistry 3	203H	5				
Required Core Chemistry Courses for B.A. Chemistry degree						
Analytical Chemistry 1: Quantitative Analysis	221	5	2210	5	3 hr L, 1 hr R, 1 x 4 hr B	simple conversion (2 x 4 hr B, qtr to 1 x 4 hr B, sem)
Honors Analytical Chemistry 1: Quantitative Analysis	221H	5	2210H	5	3 hr L, 1 hr R, 1 x 4 hr B	simple conversion (2 x 4 hr B, qtr to 1 x 4 hr B, sem)
Organic Chemistry 1	251	4	2510 2520	4	3 hr L, 1 hr R 3 hr L, 1 hr R	simple conversion
Organic Chemistry 2	252	4				
Organic Chemistry 3	253	4				
Organic Chemistry Laboratory 1	254	3	2540	2	1.5 hr L, 1 x 4 hr B	simple conversion
Organic Chemistry Laboratory 2	255	3	2550	2	1.5 hr L, 1 x 4 hr B	simple conversion
Organic Chemistry for Majors 1	---	---	2610	4	3 hr L, 1 hr R	NEW course sequence for majors
Organic Chemistry for Majors 2	---	---	2620	4	3 hr L, 1 hr R	
Honors Organic Chemistry 1	251H	4	2910H 2920H	4	3 hr L, 1 hr R 3 hr L, 1 hr R	simple conversion
Honors Organic Chemistry 2	252H	4				
Honors Organic Chemistry 3	253H	4				
Honors Organic Chemistry Laboratory 1	254H	3	2940H	2	1.5 hr L, 1 x 4 hr B	simple conversion
Honors Organic Chemistry Laboratory 2	255H	3	2950H	2	1.5 hr L, 1 x 4 hr B	simple conversion
Fundamentals of Physical Chemistry 1	520	3	4200	3	3 hr L, 1 hr R	expanded content
Fundamentals of Physical Chemistry 2	521	3	4210	3	3 hr L, 1 hr R	expanded content

Physical Chemistry Laboratory 1	541	3	4410	3	1 hr L, 2 x 3 hr B	simple conversion
Physical Chemistry Laboratory 2	542	3				
Elective Chemistry Courses for B.A. Chemistry degree						
Physical Chemistry 1	530	3	4300	3	3 hr L, 1 hr R	simple conversion
Physical Chemistry 2	531	3				
Physical Chemistry 3	532	3	4310	3	3 hr L, 1 hr R	
Analytical Chemistry 2: Instrumental Analysis	587	3	4870	3	3 hr L	simple conversion
Laboratory Practice in Instrumental Analysis	588	3	4880	2	2 x 3 hr B	simple conversion
Nanochemistry	611	3	5520	3	3 hr L	simple conversion
Spectroscopic Methods in Organic Chemistry	632	3	5420	3	3 hr L	simple conversion
Carbohydrate Chemistry	635	3	5430	3	3 hr L	simple conversion
Atmospheric Chemistry	641	3	6550	1.5	3 hr L	simple conversion
Introduction to Computational Chemistry	644	3	5440	3	3 hr L	simple conversion
Inorganic Chemistry 1	651	3	3510	3	3 hr L, 1 hr R	selected content
Inorganic Chemistry 2	652	3				
Inorganic Chemistry Laboratory	755	3	4550	2	2 x 3 hr B	simple conversion (undergraduate only)
Introduction to Quantum Chemistry and Spectroscopy	673	3	5730	3	3 hr L	simple conversion
Individual Studies	693	0-15	5193	0-15	arranged	simple conversion
Undergraduate Research	699	1-10	4998	1-10	arranged	undergraduate research (letter grade)
Undergraduate Research (thesis)	699	1-10	4999	1-10	arranged	undergraduate thesis (letter grade)
Honors Research	783H	3-10	4998H	1-10	arranged	honors undergraduate research (letter grade)
Honors Research (thesis)	783H	3-10	4999H	1-10	arranged	honors undergraduate thesis (letter grade)
Survey of Instrumental Methods	---		6110	1.5	3 hr L	new course
Analytical Data Treatment: Statistical and Numerical Analysis	720	3	6120	1.5	3 hr L	re-envisioned course

Chemistry at the Interface of Biology	---		6210	1.5	3 hr L	new course
Fundamentals of Coordination Chemistry	---		6310	1.5	3 hr L	new course
Synthetic Principles in Inorganic Chemistry	753	3	6320	1.5	3 hr L	re-envisioned course
Group Theory and Bonding	851	3	6330	1.5	3 hr L	re-envisioned course
Physical Methods in Inorganic Chemistry	752	3	6340	1.5	3 hr L	re-envisioned course
Basic Organic Reaction Mechanisms	---		6410	1.5	3 hr L	new course
Stereochemistry and Conformational Analysis	730	3	6420	1.5	3 hr L	re-envisioned course
Introduction to Organic Synthesis	832/833	3-6	6430	1.5	3 hr L	re-envisioned course
Introduction to Physical Organic Chemistry	731/831	3-6	6440	1.5	3 hr L	re-envisioned course
Quantum Mechanics and Spectroscopy	---		6510	1.5	3 hr L	new course
Thermodynamics	775/880	3-6	6520	1.5	3 hr L	re-envisioned course
Kinetics	775	3	6530	1.5	3 hr L	re-envisioned course
Introduction to Electronic Structure	866	3	6540	1.5	3 hr L	re-envisioned course

Upper-level chemistry courses are possible as chemistry electives, especially for undergraduate chemistry majors considering graduate school in a chemical discipline. Consultation with a chemistry advisor is required in order to obtain permission to enroll in those courses.

Bachelor of Arts Degree in Chemistry – Typical Plan for Students with 4 Years on Semesters

Freshman Year (Semesters)			Total
Autumn		Spring	
General Chemistry 1 (1910H, 1610, 1210)	5	General Chemistry 2 (1920H, 1620, 1220)	5
Calculus 1 (Math 1151)	5	Calculus 2 (Math 1152)	5
GE Elective (e.g. biological sciences)	4	GE Elective	3
GE Elective	3	GE Elective	3
Survey	1		
	18		16 34
Sophomore Year (Semesters)			
Autumn		Spring	
Analytical Chemistry 1 (2210H, 2210)	5	Organic Chemistry 2 (2920H, 2620, 2520)	4
Organic Chemistry 1 (2910H, 2610, 2510)	4	Organic Chemistry Laboratory 2 (2950H, 2550)	2
Organic Chemistry Laboratory 1 (2940H, 2540)	2	Introductory Physics II (1201 or 1251)	5
Introductory Physics I (1200 or 1250)	5	GE Elective	3
	16		14 30
Junior Year (Semesters)			
Autumn		Spring	
Physical Chemistry 1 (4200)	3	Physical Chemistry 2 (4210)	3
Advanced Chemistry Elective	3	Physical Chemistry Laboratory (4410)	3
Elective	3	Elective	3
GE Elective	4	GE Elective	3
	13	GE Elective	4
			16 29
Senior Year (Semesters)			
Autumn		Spring	
Advanced Science Elective (e.g. Biochem 4511 ^a)	3	Advanced Science Elective	3
Elective	3	Elective	3
Elective	3	GE Elective	3
GE Elective	4	GE Elective	3
	13	GE Elective	3
			15 28
			121

^a Biochemistry 4511 = 4 credit hours

Bachelor of Arts Degree in Chemistry – Plan for Students with 1 Year on Quarters & 3 Years on Semesters

Freshman Year (Quarters)

Autumn		Winter		Spring	
Chemistry 201H, 161, or 121	5	Chemistry 202H, 162, or 122	5	Chemistry 203H, 163, or 123	5
Math 151	5	Math 152	5	Math 153	5
GEC	5	GEC	5	GEC	5
Survey	1				
	16		15	15	46
					(31)

Sophomore Year (Semesters)

Autumn		Spring	
Analytical Chemistry 1 (2210H, 2210)	5	Organic Chemistry 2 (2920H, 2620, 2520)	4
Organic Chemistry 1 (2910H, 2610, 2510)	4	Organic Chemistry Laboratory 2 (2950H, 2550)	2
Organic Chemistry Laboratory 1 (2940H, 2540)	2	Introductory Physics II (1201 or 1251)	5
Introductory Physics I (1200 or 1250)	5	GE Elective	3
	16		14
			30

Junior Year (Semesters)

Autumn		Spring	
Physical Chemistry 1 (4200)	3	Physical Chemistry 2 (4210)	3
Advanced Chemistry Elective	3	Physical Chemistry Laboratory (4410)	3
Elective	3	Elective	3
GE Elective	3	GE Elective	3
GE Elective	4	GE Elective	4
	16		16
			32

Senior Year (Semesters)

Autumn		Spring	
Advanced Science Elective (e.g. Biochem 4511 ^a)	3	Advanced Science Elective	3
Elective	3	Elective	3
Elective	3	GE Elective	3
GE Elective	4	GE Elective	3
		GE Elective	3
	13		15
			28

^a Biochemistry 4511 = 4 credit hours

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Bachelor of Arts Degree in Chemistry – Plan for Students with 2 Years on Quarters & 2 Years on Semesters

Freshman Year (Quarters)					
Autumn		Winter		Spring	
Chemistry 201H, 161, or 121	5	Chemistry 202H, 162, or 122	5	Chemistry 203H, 163, or 123	5
Math 151	5	Math 152	5	Math 153	5
GEC	5	GEC	5	GEC	5
Survey	1				
	16		15	15	46
					(31)

Sophomore Year (Quarters)					
Autumn		Winter		Spring	
Chemistry 251H or 251	4	Chemistry 252H or 252	4	Chem elective (Chem 253H or 253)	4
Chemistry 221H or 221	5	Chemistry 254H or 254	3	Chemistry 255H or 255	3
Physics 111 or 131	5	Physics 112 or 132	5	Physics 113 or 133	5
		GEC	5	GEC	5
	14		17	17	48
					(32)

Junior Year (Semesters)			
Autumn		Spring	
Physical Chemistry 1 (4200)	3	Physical Chemistry 2 (4210)	3
Advanced Chemistry Elective	3	Physical Chemistry Laboratory (4410)	3
Elective	3	Elective	3
GE Elective	4	GE Elective	3
		GE Elective	4
	13		16
			29

Senior Year (Semesters)			
Autumn		Spring	
Advanced Science Elective (e.g. Biochem 4511 ^a)	3	Advanced Science Elective	3
Elective	4	Elective	3
Elective	3	GE Elective	3
GE Elective	4	GE Elective	3
		GE Elective	3
	14		15
			29

^a Biochemistry 4511 = 4 credit hours

Bachelor of Arts Degree in Chemistry – Plan for Students with 3 Years on Quarters & 1 Year on Semesters

Freshman Year (Quarters)					
Autumn		Winter		Spring	
Chemistry 201H, 161, or 121	5	Chemistry 202H, 162, or 122	5	Chemistry 203H, 163, or 123	5
Math 151	5	Math 152	5	Math 153	5
GEC	5	GEC	5	GEC	5
Survey	1				
	16		15	15	46

(31)

Sophomore Year (Quarters)					
Autumn		Winter		Spring	
Chemistry 251H or 251	4	Chemistry 252H or 252	4	Chem elective (Chem 253H or 253)	4
Chemistry 221H or 221	5	Chemistry 254H or 254	3	Chemistry 255H or 255	3
Physics 111 or 131	5	Physics 112 or 132	5	Physics 113 or 133	5
		GEC	5	GEC	5
	14		17	17	48

(32)

Junior Year (Quarters)					
Autumn		Winter		Spring	
Advanced Chemistry elective	3	Chemistry 520	3	Chemistry 521	3
GEC	5	GEC	5	Chemistry 541	3
GEC	5	GEC	5	GEC	5
Advanced Science elective	5			GEC	5
	18		13	16	47

(31)

Senior Year (Semesters)			
Autumn		Spring	
Advanced Science Elective (e.g. Biochem 4511 ^a)	3	Advanced Science Elective	3
Elective	4	Elective	4
Elective	3	Elective	3
GE Elective	4	GE Elective	3
	14		13

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^a Biochemistry 4511 = 4 credit hours

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Curriculum map for the B.A. and B.S. degrees in Chemistry

Program outcomes (*B=beginning, I=intermediate, A=advanced*)

1. Students solve state-of-the-art chemistry problems, working both individually and in groups, and these problems will exemplify current disciplinary and interdisciplinary principles as well as modern pedagogical practice.
2. Students develop effective skills in oral and written communication of scientific knowledge.
3. Students plan experimental procedures, carry out chemical procedures, use laboratory equipment, analyze data and prepare laboratory reports that reinforce current chemical practices.
4. Students follow safe practices in the laboratory and demonstrate scientifically ethical practices.
5. Students retrieve information from the chemical literature, and become proficient in online database searching.
6. Students use modern computer software for graphing, manipulation of symbolic mathematical expressions, and quantum chemical calculations.

Course	Chemistry Program Goals					
	1	2	3	4	5	6
Chemistry 1210	B	B	B	B	B	B
Chemistry 1220	B	B	B	B	B	B
Chemistry 1610	I	I	I	B	I	I
Chemistry 1620	I	I	I	B	I	I
Chemistry 1910H	I	I	I	B	I	I
Chemistry 1920H	I	I	I	B	I	I
Chemistry 2210	I	I	I	I	I	I
Chemistry 2210H	I	I	I	I	I	I
Chemistry 2510	I	I	I		I	I
Chemistry 2520	I	I	I		I	I
Chemistry 2540	I	I	I	I	I	I
Chemistry 2540H	A	A	A	A	A	A
Chemistry 2550	I	I	I	I	I	I
Chemistry 2550H	A	A	A	A	A	A
Chemistry 2610	I	I	I		I	I
Chemistry 2620	I	I	I		I	I
Chemistry 2910H	A	A	A		A	A
Chemistry 2920H	A	A	A		A	A
Chemistry 3510	A	A	A		A	A
Chemistry 4200	A	A	A		A	A
Chemistry 4210	A	A	A		A	A
Chemistry 4300	A	A	A		A	A
Chemistry 4310	A	A	A		A	A
Chemistry 4410	A	A	A	A	A	A
Chemistry 4550	A	A	A	A	A	A
Chemistry 4870	A	A	A		A	A
Chemistry 4880	A	A	A	A	A	A
Biochemistry 4511	A	A	A		A	
Chemistry 5000 and above	A	A	A	A	A	A

Transition Policy for the Department of Chemistry

Students who begin their degree training under quarters will not be penalized as we transition to semesters. Our two chemistry advisors are available to help design the ideal program for each of our 400+ chemistry majors in order to facilitate an optimum transition.

In general, our current quarter courses are typically either a one-quarter class or a three-quarter sequence across an entire academic year. These courses will be converted to one-semester or two-semester courses, respectively.

Also, our chemistry majors and minors are typically successful in completing an entire sequence of either general or organic chemistry in the autumn-winter-spring academic year. As was evident with the various quarter and semester plans provided with this package, most sequences would normally end in the spring term of any academic year.

In general and organic chemistry, we will continue our current practice of offering multiple courses in the summer term – for example, general chemistry (121–122–123) courses are offered in each of the four quarters. We anticipate continuing these trends for general chemistry and also continuing to offer some organic chemistry in the summer session. Moreover, in the normal academic year, we will offer general and organic chemistry (1 and 2) courses in both semesters.

While we have created majors-only versions of general and organic chemistry, chemistry majors are eligible to take the Honors or the regular sequences instead of the majors-only version. Students who are off-sequence for whatever reason are not penalized in any way.

If space is available and enrollment demand is sufficiently evident, we plan on offering multiple sections of high enrollment courses in both semesters.

For advanced science electives, there will be multiple 5000-level and above courses for students to select. As our graduate program is sizeable, we will continue to offer graduate-level courses for our upper-level undergraduate students to select as electives.

There will be bridge or transition courses for general chemistry and organic chemistry for a short period of time, and these may be offered in alternate formats, including 7-week half-semester. Students who have credit for Chemistry 121–122 under quarters will be very prepared for the second semester of general chemistry (1220). Similarly, students who have credit for Chemistry 251–252 will be prepared for the second semester (Chemistry 2520). Bridge or transition courses will be available for students who have not taken the middle quarter of a three-quarter sequence in order for those students to be successful in the second semester of the sequence. These bridge courses will include the offering of Chemistry 1210 as a 6-credit hour quarter offering in spring 2012 to prepare students for semester courses that will start in summer 2012. Also, students who have credit for Chemistry 121 but are lacking the 5 weeks of course content from the beginning of Chemistry 122, will be offered a bridge course (starting in summer 2012) for the transition to the semester offering of Chemistry 1220. This bridge course will have a course instructor, lecture videos, online assessments and an in-class exam for evaluating student success.

Revisions to the Chemistry Bachelor of Arts proposal

(Comments from the CCI are listed in italics.)

The PACER chart indicates a marked rise in total credit hours to degree. This rise is explained, but the explanation was unsatisfactory and needs clarification since it appears that some courses, and lab courses in particular, are undergoing a marked increase in contact hours from quarters to semesters. Part of the problem seems to be the straight conversion of individual courses (rather than sequences) from quarters to semesters with the same number of credit hours. The suggestion was made that if the second advanced science elective were dropped, some of the increase in total hours would be eliminated.

The program rationale has been updated to describe these changes more carefully. Specifically, text has been added on the first page of the Program Rationale for the BA degree:

The most significant changes to our program relate to our laboratory courses. Many of our laboratory courses (for example, analytical, inorganic and physical chemistry courses) were one-quarter long offerings, and these quarter offerings are now expanded to one-semester courses (analytical: 2210; physical: 4410). Our organic laboratory courses were two-quarter sequences (254–255), but previously, required a pre-requisite one-quarter long lecture course (251). With semesters, we cannot require this pre-requisite lecture course, and our semester organic lab offerings (2540–2550) must be offered concurrent with lecture (2510–2520 or 2610–2620 or 2910H–2920H). Thus, these lab offerings had to be adjusted in terms of our current two 3-hour (or 4-hour) lab meetings per week to only be one 3-hour (or 4-hour) lab meeting per week.

For the BA major, the third quarter of the organic chemistry sequence (Chemistry 253, 4 credit hours) was an elective, but with semester conversion, both semesters of the organic chemistry sequence (2510–2520 or 2610–2620 or 2910H–2920H; each 4 credit hours) are now required of the BA major. Our physical chemistry series for the BA major was a two-quarter sequence (520–521, 3 credit hours each) and has been converted to a two-semester sequence (4200–4210, 3 credit hours each). Together, these changes have added to the total credit hours required for graduation under semesters.

The credit hour expansion is due to the changes for these lab courses as well as lecture courses. The one-quarter lab (221, 541, 755) courses have been converted to one-semester lab (2210, 4410, 4550, respectively) courses. The assigned credit hours are consistent with the time spent in class, including the re-envisioned lecture, recitation and/or laboratory components. For example, Chemistry 2210 has 3 hours of lecture, 1 hour of recitation and one 4-hour lab per week – hence, 5 credit hours. The quarter version (221) had 3 hours of lecture and two 4-hour labs per week – and was 5 credit hours.

Also, under quarters, Chemistry 253 (third quarter organic chemistry lecture) was a Chemistry elective. Both semester lecture courses are now required for the BA major. Also, the two-quarter (520–521) physical chemistry lecture sequence has been converted to a two-semester lecture sequence, and with enhanced content.

We have discussed the removal of a second advanced science elective, but discussion with Chemistry faculty, teaching staff, and advisors unanimously favored retention of both advanced science electives. Typically, our BA majors have very little difficulty in graduating in four years – we do not believe that the re-envisioned program provides any obstacles to success, as many of our BA majors select advanced science electives that meet requirements for their targeted professional school. Moreover, the breadth of the BA degree is also considered one of its strengths.

Several recommendations duplicate those for the BS proposal: many of the courses are not listed with their quarter equivalent on the course list; the semester advising sheet is not clear about the total core hours, elective hours, and prerequisite hours; the four-year plans should be moved to the bottom of the document; and the transition plan should spell out more clearly the plans for bridge courses.

The course listing has been updated.

The semester advising sheet states the credit hours of the different courses, from Chemistry as well as from outside of our department.

The 4-year plans have been moved, as requested.

The transition plan has been updated – specifically, see the last paragraph on that page.

Christopher M. Hadad, Vice Chair for Undergraduate Studies, Chemistry
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