APPROVED

The University Of Toledo

Existing Graduate Course Modification Form

* denotes required fields

Contact Person*: Mark R. Mason Phone: 530-1532 (xxx-xxxx) Email: mark.mason5@utoledo.e

Present	Proposed
Supply all information asked for in this column. (Supply core, research intensive and transfer module info if applicable)	Fill in appropriate blanks only where entry differs from first column.
College*: College Nat Sci and Mathematics	**College:** --Select a College--
Dept/Academic Unit*: Chemistry	**Dept/Academic Unit:** --Select a Department--
Course Alpha/Numeric*: CHEM - 6200	**Course Alpha/Numeric:** -
Course Title: Green Chemistry	**Course Title:**
Credit hours: Fixed: 3 or Variable: to	**Credit Hours:** Fixed: or Variable: to
CrossListings: CHEM 8200	**CrossListings:**
Prerequisite(s)(if longer than 50 characters, please place it in Catalog Description): Organic Chemistry II (CHEM 2420)	**Prerequisite(s)**(if longer than 50 characters, please place it in Catalog Description): See Catalog Description
Corequisite(s)(if longer than 50 characters, please place it in Catalog Description):	**Corequisite(s)**(if longer than 50 characters, please place it in Catalog Description):
Catalog Description (*only if changed*) 75 words max: Advanced topics in green chemistry, including industrial applications, atom economy, safer solvent substitutions, alternatives assessment, green metrics (PMI, E-factor), basic life cycle analysis, and an introduction to chemical toxicology.	**Catalog Description** (*only if changed*) 75 words max: Advanced topics in green chemistry, including industrial applications, atom economy, safer solvent substitutions, alternatives assessment, green metrics (PMI, E-factor), basic life cycle analysis, and an introduction to chemical toxicology. Prerequisite: CHEM 2420 or admission

Has course content changed? ○ Yes ◉ No

If course content is changed, give a brief topical outline of the revised course below(less than 200 words)

Email attachment from college requesting syllabi changes made is included below.
mkb

Proposed effective term*: 201640 (e.g. 201140 for 2011 Fall)

File Type	View File	Delete
Syllabus	View	Delete
Attachment	View	Delete

List any course or courses to be deleted. Effective Date:

Effective Date:

Comments/Notes:

Rationale:

The proposed modification is a clarification of the prerequisite only. All students admitted into graduate programs in chemistry and chemical engineering satisfy the prerequisite for this course. Students are required to have taken undergraduate organic chemistry, the equivalent of CHEM 2420, for admission into these graduate programs. Unfortunately, with the prerequisite listed as CHEM 2420, graduate students in chemical engineering and chemistry who obtained their undergraduate degrees at other universities have not been permitted to register for this course without prior approval of the department. This is inconvenient for the student and a waste of time in the chemistry office. The proposed change will simplify the registration process for the students and does not change the intent of the original prerequisite. There is no change to course content.

Approval:

Department Curriculum Authority:	Xiche Hu	Date	2015/12/07
Department Chairperson:	Jon R. Kirchhoff	Date	2015/12/07
College Curriculum Authority or Chair:	Michael Cushing	Date	2015/12/10
College Dean:	Karen Bjorkman	Date	2015/12/11
Graduate Council:	Constance Schall (GC 2.23.2016)	Date	2016/03/29
Dean of Graduate Studies:	Patricia R. Komuniecki	Date	2016/04/08
Office of the Provost :		Date	

Submit

Administrative Use Only

Effective Date:	(YYYY/MM/DD)
CIP Code:	
Subsidy Taxonomy:	
Program Code:	
Instructional Level:	

Registrar's Office Use Only

Processed in Banner on:	
Processed in Banner by:	
Banner Subject Code:	
Banner Course Number:	
Banner Term Code:	
Banner Course Title:	

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Green Chemistry

Department of Chemistry and Biochemistry
College of Natural Sciences and Mathematics
CHEM 6200; Section: 001; CRN: 60349

Instructor: Dr. Mark Mason
3260 Wolfe Hall, 530-1532
Mark.Mason@utoledo.edu

Lecture: Tuesday and Thursday, 5:30- 6:45 p.m.; Memorial Field House, Room 2240

Office Hours: Tuesday and Thursday, 3:00-5:00 pm

Credit Hours: 3

Course Description:

Advanced topics in green chemistry, including industrial applications, atom economy, safer solvent substitutions, alternatives assessment, green metrics (PMI, E-factor), basic life cycle analysis, and an introduction to chemical toxicology.

Course Overview:

Green chemistry is the utilization of a set of principles that reduces or eliminates the use or generation of hazardous substances in the design, manufacture and application of chemical products, including fuels, plastics, polymers, synthetic fibers, pharmaceuticals, food additives, fragrances, pesticides, herbicides, detergents and cleaning supplies. This course will introduce the principles and fundamental concepts of green chemistry, and provide examples of commercial applications of green chemistry. The course will be especially pertinent for students studying chemistry, medicinal chemistry, chemical engineering, and environmental sciences.

Student Learning Outcomes

Upon completion of this course, students will be able to:

1. Apply the principles of green chemistry to chemical-related problems and waste reduction.
2. Apply the principles of green chemistry to improve chemical manufacturing processes.
3. Calculate atom economy, process mass intensity, and E-factor.
4. Analyze toxicology data, materials properties, and regulatory requirements to choose safer chemicals for product formulations and process chemistry.
5. Understand the fundamentals of chemical alternatives assessment using QCAT and Green Screen.
6. Search authoritative lists for data required to perform a chemical alternatives assessment using QCAT.
7. Utilize EPA software packages to predict physical, chemical, and toxicological properties of chemical substances

Prerequisites: CHEM 2420 or admission into a graduate program in chemistry or chemical engineering or the Masters in Education and Science.

University Policies: The University is an equal opportunity educational institution. Please read The University's Policy Statement on Nondiscrimination on the Basis of Disability Americans with Disability Act Compliance.

Academic Accommodations: The University of Toledo is committed to providing equal access to education for all students. If you have a documented disability or you believe you have a disability and would like information regarding academic accommodations/adjustments in this course please contact the Student Disability Services Office.

Academic Dishonesty: The University Policy on Academic Dishonesty will be strictly enforced. See: http://www.dl.utoledo.edu/current_students/academic_dishonesty.htm.

Textbooks: Course material will be taken from the text by Lancaster, supplemented with material from texts by Anastas and Warner, Baird and Cann, and Manahan. Additional examples will be taken from scientific articles and reviews.

Recommended Textbook

Lancaster, M. *Green Chemistry: An Introductory Text*, Second Edition; RSC Publishing; 2010. ISBN: 978-1-84755-873-2

Supplementary Texts

Anastas, P. T.; Warner, J. C. *Green Chemistry: Theory and Practice*, Oxford University Press, Oxford; 1998. ISBN: 0-19-850234-6

Baird, C.; Cann, M. *Environmental Chemistry*, Fifth Edition; W. H. Freeman and Company, New York; 2012. ISBN-13: 978-1-4292-7704-4. (Toxicology, Chapters 13-15)

Manahan, S. E. *Environmental Chemistry*, Eighth Edition; CRC Press, 2005. ISBN: 1-56670-633-5. (Toxicology, Chapters 22-23)

Grading: Final grades will be based on two exams (100 points each), five quizzes (10 points each), an in-depth project/presentation (50 points), and a comprehensive final exam (150 points). The following final grading scale (out of a possible 450 points) will be applied:

A	382 points	C+	285
A–	360	C	270
B+	337	C–	255
B	315	D+	240
B–	300	D	225

Exam and quiz dates are provided below:

Exam 1	Tuesday, September 29
Exam 2	Tuesday, November 17
Final Exam	Tuesday, December 15 (5:00-7:00 pm)
Quizzes	Tuesday, September 8
	Tuesday, September 22
	Thursday, October 22
	Tuesday, November 10
	Tuesday, December 8

Midterm grades will be assigned based on student performance on the first exam and the first two quizzes.

Homework: Problem sets will be distributed periodically. These will not be collected or graded. Answer keys will be posted online.

Tentative Course Schedule

Week	Date	Topics	Notes
1	August 25 & 27	Introduction, Atom Economy, Principles of Green Chemistry	
2	September 1 & 3	Alternative Solvents/Energy Efficiency	
3	September 8 & 10	Catalysis, Abiotic Depletion of Elements	**Quiz 1**, Sept. 8
4	September 15 & 17	Renewable Feedstocks	
5	September 22 & 24	Climate Change (Prof. Jorgensen) Biodegradation	**Quiz 2**, Sept. 22
6	September 29	**Exam 1**	No lecture on October 1. Attend lecture by Paul Anastas on September 30
7	October 8	Toxicology, Designing Safer Chemicals	No class on October 6. Fall Break.
8	October 13 & 15	Metrics: E-Factor and PMI	No lecture on October 13.
9	October 20 & 22	Commercial Examples of PMI Life Cycle Assessment	**Quiz 3**, Oct. 22
10	October 27 & 29	Triple Bottom Line, Supply Chain Issues, Business Considerations	
11	November 3 & 5	Risk vs. Hazard Assessment, Chemical Alternatives Assessment	Attend Michigan Green Chemistry Conference on Nov. 4. (optional)
12	November 10 & 12	Environmental Laws, Policies, and Regulations	**Quiz 4**, Nov. 10
13	November 17 and 19	Inherently Safer Design	**Exam 2** on November 17.
14	November 24	Emerging Green Technologies	No class on Nov. 26. Thanksgiving
15	December 1 & 3	Presidential Green Chemistry Award Winners	
16	December 8 & 10	Graduate Student Presentations	**Quiz 5**, Dec. 8
17	December 15	**Final Exam**, 5:00 – 7:00 pm	Cumulative

Green Chemistry

Department of Chemistry and Biochemistry
College of Natural Sciences and Mathematics
CHEM 8200; Section: 002; CRN: 61351

Instructor: Dr. Mark Mason
3260 Wolfe Hall, 530-1532
Mark.Mason@utoledo.edu

Lecture: Tuesday and Thursday, 5:30- 6:45 p.m.; Memorial Field House, Room 2240

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4. Analyze toxicology data, materials properties, and regulatory requirements to choose safer chemicals for product formulations and process chemistry.
5. Understand the fundamentals of chemical alternatives assessment using QCAT and Green Screen.
6. Search authoritative lists for data required to perform a chemical alternatives assessment using QCAT and Green Screen.
7. Perform a complete chemical alternatives assessment. Compare results from QCAT and Green Screen.
8. Utilize EPA software packages to predict physical, chemical, and toxicological properties of chemical substances.

Prerequisites: CHEM 2420 or admission into a graduate program in chemistry or chemical engineering or the Masters in Education and Science.

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A	467 points	C+	348
A–	440	C	330
B+	412	C–	312
B	385	D+	293
B–	367	D	275

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King-Blandford, Marcia

From: Mason, Mark R.
Sent: Tuesday, March 22, 2016 3:48 PM
To: King-Blandford, Marcia
Cc: Jorgensen, Andrew D.; Hu, Xiche
Subject: RE: Problem with curriculum tracking website
Attachments: Green Chemistry, Syllabus, CHEM 4200.pdf; Green Chemistry, Graduate Syllabi, CHEM 6200.pdf; CHEM 4210 Environmental Chem Full Syllabus.pdf; CHEM 6210 and 8210 Environmental Chem Full Syllabus.pdf

Marcia,

Attached are the revised syllabi for CHEM 4200 and CHEM 4210. Also attached are revised syllabi for CHEM 6200 and CHEM 6210 which are supporting documents that need uploaded. Please remove the previous attachments.

Let us know once these are uploaded so that the college committee can sign off on the tracking system.

Thanks
Mark

-----Original Message-----
From: King-Blandford, Marcia
Sent: Tuesday, March 22, 2016 2:55 PM
To: Mason, Mark R.
Cc: Jorgensen, Andrew D.
Subject: RE: Problem with curriculum tracking website

Please send me the attachment and I can make the change. mkb

From: Mason, Mark R.
Sent: Tuesday, March 22, 2016 12:31 PM
To: King-Blandford, Marcia
Cc: Jorgensen, Andrew D.
Subject: RE: Problem with curriculum tracking website

Marcia,

How do we get the updated syllabi for CHEM 4200 and CHEM 4210 uploaded on the Curriculum Tracking Site? My previous email is below.

Thanks
Mark Mason

-----Original Message-----
From: Mason, Mark R.
Sent: Monday, March 07, 2016 10:09 AM
To: King-Blandford, Marcia
Subject: RE: Problem with curriculum tracking website

Marcia,

After discussion, NSM Council wanted a few revisions to the syllabi and supporting syllabi that had been uploaded for CHEM 4200 and CHEM 4210. How do I make those changes to the New Course Proposals on the Curriculum Tracking Site? If I send the syllabi to you, can you upload those onto the curriculum tracking site? The College of NSM will approve the new courses on the tracking system once the updated materials are uploaded. They already voted to approve the new course proposals.

Thanks
Mark Mason

-----Original Message-----
From: King-Blandford, Marcia
Sent: Friday, December 18, 2015 9:11 AM
To: Mason, Mark R.; Hu, Xiche
Subject: RE: Problem with curriculum tracking website

Good! Thanks for the update. mkb

-----Original Message-----
From: Mason, Mark R.
Sent: Friday, December 18, 2015 8:50 AM
To: King-Blandford, Marcia; Hu, Xiche
Subject: RE: Problem with curriculum tracking website

It looks like submission of the proposed program revision for the PSM in Green Chemistry and Engineering also worked.

Thanks

-----Original Message-----
From: King-Blandford, Marcia
Sent: Thursday, December 17, 2015 4:33 PM
To: Mason, Mark R.; Hu, Xiche
Subject: RE: Problem with curriculum tracking website

Great! I will be here tomorrow if you need assistance, mkb

-----Original Message-----
From: Mason, Mark R.
Sent: Thursday, December 17, 2015 4:06 PM
To: Hu, Xiche
Cc: King-Blandford, Marcia
Subject: RE: Problem with curriculum tracking website

Xiche and Marcia,

I was successful in submitting the new graduate course proposal forms for the Graduate Professional Internship, CHEM 8970/6970. I submitted those separately. I received confirmations so everything appears to have worked.

Marcia's suggestions helped. I removed all parentheses, hyphens, etc. I will try some of the other submissions later today or in the morning.

Thanks again for your help.

Mark

-----Original Message-----
From: Mason, Mark R.
Sent: Tuesday, December 15, 2015 4:26 PM
To: Hu, Xiche
Cc: King-Blandford, Marcia
Subject: RE: Problem with curriculum tracking website

Thanks, Xiche. She called a little bit ago and had some suggestions. I will try again tomorrow night or Thursday and will let both of you know if I have any difficulty.

Mark

-----Original Message-----
From: Hu, Xiche
Sent: Tuesday, December 15, 2015 4:14 PM
To: Mason, Mark R.
Cc: King-Blandford, Marcia
Subject: RE: Problem with curriculum tracking website

Mark,
Marcia will contact you directly via phone to resolve the problems that you had experienced on the UT curriculum tracking system.

Thanks,
Xiche

From: Hu, Xiche
Sent: Monday, December 07, 2015 2:34 PM
To: King-Blandford, Marcia
Cc: Mason, Mark R.
Subject: RE: Problem with curriculum tracking website

No error message was issued after clicking the "submit" button in the case of program modification. In the case of new course proposal, clicking the "submit" button will go back to the "catalog" box.

From: King-Blandford, Marcia
Sent: Monday, December 07, 2015 2:18 PM
To: Hu, Xiche
Subject: RE: Problem with curriculum tracking website

Did the system send an error message? Thanks, Marcia

-----Original Message-----
From: Cushing, Michael C
Sent: Monday, December 07, 2015 2:02 PM
To: Hu, Xiche

Cc: King-Blandford, Marcia
Subject: Re: Problem with curriculum tracking website

Unfortunately I cannot advise because I am not responsible for the system. I am cc-ing Marcia King-Blandford who might be able to help.

-Mike Cushing

> On Dec 7, 2015, at 1:40 PM, Hu, Xiche <xiche.hu@utoledo.edu> wrote:
>
> Mike,
> The Department of chemistry and biochemistry attempted to submit new course proposal (graduate level) and program modification proposal (graduate level) through the curriculum tracking site (CurriculumTracking.utoledo.edu). After entering all required texts, clicking the "submit" button did not do anything.
>
> Please advise.
>
> Thanks,
> Xiche HU
> UT Phone: (419-530-1513)
>
> PS. Course modification at the graduate level worked without any problem.