Course Approval Form

For instructions: *http://registrar.gmu.edu/facultystaff/catalog-revisions/course/*

Action Requested: (definitions available at website above)
☐ Create NEW ☐ Inactivate
☒ Modify (check all that apply below)

Course Level:
☐ Undergraduate ☒ Graduate

☒ Title (must be 75% similar to original) ☐ Repeat Status ☐ Prereq/coreq ☐ Grade Mode
☐ Credits ☐ Schedule Type ☐ Restrictions ☐ Other: _____

College/School: College of Science **Department:** Chemistry and Biochemistry
Submitted by: Greg Foster **Ext:** 3-1081 **Email:** gfoster@gmu.edu

Subject Code: CHEM **Number:** 651
(Do not list multiple codes or numbers. Each course proposal must have a separate form.)

Effective Term: ☒ Fall ☐ Spring ☐ Summer *Year* 2016

Title: Current: Environmental Chemistry of Organic Substances
Banner (30 characters max w/ spaces):
New: Aquatic Organic Geochemistry

Fulfills Mason Core Req? (undergrad only)
☐ Currently fulfills requirement
☐ Submission in progress

Credits: (check one)
☐ Fixed →
☐ Variable → ☐ to
☐ Lec + Lab/Rct→ ☐ or

Repeat Status: (check one)
☐ Not Repeatable (NR)
☐ Repeatable within degree (RD) →
☐ Repeatable within term (RT) →
Max credits allowed: (required for RT/RD status only) ☐

Grade Mode: (check one)
☐ Regular (A, B, C, etc.)
☐ Satisfactory/No Credit
☐ Special (A, B C, etc. +IP)

Schedule Type: (check one)
LEC can include LAB or RCT if linked sections will be offered
☐ Lecture (LEC)
☐ Lab (LAB)
☐ Recitation (RCT)
☐ Internship (INT)
☐ Independent Study (IND)
☐ Seminar (SEM)
☐ Studio (STU)

Prerequisite(s) (NOTE: hard-coding requires separate Prereq Checking form; see above website):
One semester of organic chemistry and physical chemistry or geochemistry, or permission of instructor.

Corequisite(s):

Restrictions Enforced by System: Major, College, Degree, Program, etc. Include Code(s).

Equivalencies (check only as applicable):
☐ YES, course is 100% equivalent to _____
☐ YES, course renumbered to or replaces _____

Catalog Copy (Consult University Catalog for models)

Description (No more than 60 words, use verb phrases and present tense)	**Notes** (List additional information for the course)
The sources, structure, cycling and diagenesis of natural organic matter in streams, rivers, lakes and estuaries. Interactions of anthropogenic organic chemicals with natural organic matter, and reactions of organic substances in freshwater and brackish water systems, including photochemistry, hydrolysis, redox transformations, and biodegradation.	
Indicate number of contact hours: Hours of Lecture or Seminar per week: 3	Hours of Lab or Studio: 0
When Offered: (check all that apply) ☒ Fall ☐ Summer ☐ Spring	

Approval Signatures

[redacted] College/School Approval Date

If this course includes subject matter currently dealt with by any other units, the originating department must circulate this proposal for review by those units and obtain the necessary signatures prior to submission. Failure to do so will delay action on this proposal.

Unit Name	Unit Approval Name	Unit Approver's Signature	Date
Envr Sci and Policy	Robert B Jonas	[redacted]	

For Graduate Courses Only

Graduate Council Member Provost's Office Graduate Council Approval Date

Form revised 9/14/2015

Course Proposal Submitted to the College of Science Curriculum Committee (COSCC)

The form above is processed by the Office of the University Registrar. This second page is for the COSCC's reference. Please complete the applicable portions of this page to clearly communicate what the form above is requesting.

FOR ALL COURSES (required)
Course Number and Title: Chem 651. Aquatic Organic Geochemistry

Date of Departmental Approval:

FOR INACTIVATED/REINSTATED COURSES (required if inactivating/reinstating a course)

- Reason for Inactivating/Reinstating:

FOR MODIFIED COURSES (required if modifying a course)

- Summary of the Modification: Retitling course and description to reflect change in emphasis in the reactions of natural organic matter in aquatic environments.

- Text before Modification (title, repeat status, catalog description, etc.):

  - CHEM 651 – Environmental Chemistry of Organic Substances (3:3:0); Not Repeatable
  - Study of principles governing multimedia distribution and fate of organic chemicals in environment. Overview of origin and occurrence of major classes of natural and anthropogenic organic chemicals in environment. Environmental core course.
  -
  - **Prerequisite(s):** One semester of physical chemistry or geochemistry, or permission of instructor.
  - **Notes:**
  - **Hours of Lecture or Seminar per week:** 3
  - **Hours of Lab or Studio per week:** 0

- Text after Modification (title, repeat status, catalog description, etc.):

  - CHEM 651 – Aquatic Organic Geochemistry (3:3:0); Not Repeatable
  - The sources, structure, cycling and diagenesis of natural organic matter in streams, rivers, lakes and estuaries. Interactions of anthropogenic organic chemicals with natural organic matter, and reactions of organic substances in freshwater and brackish water systems, including photochemistry, hydrolysis, redox transformations, and biodegradation. ***Environmental core course.***
  -
  - **Prerequisite(s):** One semester of organic chemistry and physical chemistry, or permission of instructor.
  - **Notes:**
  - **Hours of Lecture or Seminar per week:** 3
  - **Hours of Lab or Studio per week:** 0

- Reason for the Modification: To reflect new research directions in environmental organic chemistry, and make the study of natural organic matter (especially aquatic humic substances) a focus along with organic pollutants. The course will better integrate chemistry with the ecology and earth science curricula offered at Mason.

FOR NEW COURSES (required if creating a new course)

- Reason for the New Course:
- Relationship to Existing Programs:
- Relationship to Existing Courses:
- Semester of Initial Offering:
- Proposed Instructors:
- Insert Tentative Syllabus Below

2/5/16 5:53 AM

AQUATIC ORGANIC GEOCHEMISTRY

Chemistry 651

Fall 2016

Location: TBA

INSTRUCTOR: Gregory D. Foster; Office--Planetary Hall, Room 317 (Telephone, 993-1081; E-mail, gfoster@gmu.edu).

READING MATERIALS: Assigned reading list

NOTES: Course notes are available online at http://mason.gmu.edu/~gfoster

CHEM 651 OBJECTIVES: Chemistry 651 covers the sources, distribution, and reactions of organic substances, both natural and synthetic, in the aquatic environment. The outcome of this course is to allow in depth scientific decision-making and interpretation of the distribution and reactions pathways of organic chemicals in the environment to protect human and environmental health. The primary goals of the course are to gain an understanding of the theory of (a) the primary sources of organic substances in the aquatic environment, (b) fundamental processes that determine the multimedia distribution and transport of organic substances in the environment, (c) estimation techniques for determining important physicochemical properties that influence environmental fate, and (d) predictions regarding the multimedia distributions of organic substances within environmental compartments.

SCHEDULE FOR Fall 2016:

Week	TOPIC
	Part I: Natural Organic Matter in the Aquatic Environment
1	The carbon cycle and natural organic matter in soils and sediments: humin, humic and fulvic acid chemistry
2	Origin, reactions and cycling of aquatic humic substances
3	Complexation of aquatic humic substances with mineral surfaces; flocculation and agglomeration processes in aquatic systems
4	Land-to-sea transport of AHS; sediment diagenesis of natural organic matter
5	***Exam I***
	Part II: Distribution and Reactions of Anthropogenic Organic Substances
6	Solution theory governing volatility, water solubility and partitioning of organic substances
7	Sorption process in environmental media
8	Bioaccumulation in the human food chain
9	***Exam II***
10	Aqueous hydrolysis
11	Direct and indirect photolysis
12	Biodegradation & biotransformation reactions
13	Fugacity modeling
14	*(Thanksgiving break)*
15	Air-water exchange & atmospheric deposition
16	***Final Exam*** *(Cumulative)*

GRADING:

Exams 30%	Final 25%	HW 15%	Modeling Project 15%
Presentations 15%			

Exams: Two exams and one final will be given during the semester. The final exam will be cumulative.

HW: Three homework problem sets will be distributed during the semester. The HW assignments will involve analyzing data from previous research and drawing conclusions based on theory presented in class lectures.

Presentations: Each student will be required to give a mini-lecture on a class topic and a 15 minute research presentation in class. The purpose of the presentations is to allow students to learn particular lecture topics in more detail and share them with the class.

Modeling Project: A fugacity modeling project will be assigned. Each student will be given a unique organic chemical, and a short report describing predicted multimedia distributions will be submitted. This will be handed out during the last quarter of the semester and submitted the last day of class, so students will need to plan their time wisely at the end of the semester.

Primary References:

1. Tinsley, I.J. 2004. Chemical Concepts in Pollutant Behavior, 2nd Ed. Wiley-Interscience.
2. Schwarzenbach, R.P., P.M. Gschwend and D.M. Imboden. 2003. Environmental Organic Chemistry, 2nd Ed., Wiley-Interscience.
3. Hessen, D.O. and Tranvik, L.J. (eds.) 2003. Aquatic Humic Substances: Ecology and Biogeochemistry. Academic Press.
4. Steinbuchel, A. and Hofrichter, M. (eds) 2001. Biopolymers. Vol. 1. Lignin, Humic Substances, and Coal. Wiley-VCH.

Other References:

1. Acree, W.E., Jr. 1984. Thermodynamic Properties of Nonelectrolyte Solutions. Academic Press.
2. Boethling, R.S. and Mackay, D. 2000. Handbook of Property Estimation Methods for Chemicals in Environmental and Health Sciences. Lewis Publishers, Boca Raton, FL.
3. Calvert, J.C.; Pitts, J.N., Jr. 1966. Photochemistry. John Wiley and Sons, Inc.
4. Connell, D.W. 1997. Basic Concepts of Environmental Chemistry. Lewis Publishers, Boca Raton, FL.
5. Crosby, D.G. 1998. Environmental Toxicology and Chemistry. Oxford University Press, New York, NY.
6. Drever, J. 1988. The Geochemistry of Natural Waters. Saunders, New York.
7. Hemond, H.F. and E.J. Fechner. 1994. Chemical Fate and Transport in The Environment. Academic Press.
8. Hildebrand, J.H.; Scott, R.L. 1964. The Solubility of Nonelectrolytes. Dover Publications.
9. Jacob, D.J. 1999. An Introduction to Atmospheric Chemistry. Princeton University Press, Princeton, NJ.

10. Larson, R.A. and Weber, E.J.1994. Reaction Mechanisms in Environmental Organic Chemistry. Lewis Publishers.
11. Mackay, D., W.Y. Shiu, and K.C. Ma. 1992. Illustrated Handbook of Physical-Chemical Properties and Environmental Fate for Organic Chemicals, Lewis Publishers, Chelsea, MI (Volumes I-V).
12. Mackay, D. 1991. Multimedia Environmental Models. The Fugacity Approach. Lewis Publishers, Chelsea, MI.
13. Macalady, D. (Editor). 1998. Perspectives in Environmental Chemistry. Oxford University Press, New York, NY.
14. Neely, W.B.; Blau, G.E. 1985. Environmental Exposure from Chemicals. CRC Press, Boca Raton, FL.
15. Pankow, J.F. 1991. Aquatic Chemistry Concepts. Lewis Publishers, Chelsea, MI
16. Pepper, I.L., Gerba, C.P., and Brusseau, M.L. (Eds.) 1996. Pollution Science. Academic Press, San Diego, CA
17. Samiullah, Y. 1990. Prediction of the Environmental Fate of Chemicals. Elsevier Applied Science, London.
18. Sawyer, C.N., McCarty, P.L., and Parkin, G.F. 1994. Chemistry for Environmental Engineering, 4th Ed. McGraw-Hill, New York, NY.
19. Spiro, T.G. and Stigliani, W.M. 1996. Chemistry of the Environment. Prentice Hall, Upper Saddle River, New Jersey.
20. Thibodeaux, L.J. 1996. Environmental Chemodynamics: Movement of Chemicals in Air, Water, and Soil. John Wiley & Sons, Inc., New York, NY.
21. Thurman, E.M. 1985. Organic Geochemistry of Natural Waters. Martinus Nijhoff/Dr. W. Junk Publishers.

RELEVANT JOURNALS:
Organic Geochemistry
Applied Geochemistry
Aquatic Geochemistry
Chemosphere
Environmental Pollution
Environmental Science & Technology
Environmental Toxicology & Chemistry
Estuarine, Coastal and Shelf Science
Marine Chemistry
Marine Environmental Research
Science of the Total Environment
Water Research

INFORMATION SITES ON THE WEB:

1. Chemfinder (http://www.chemfinder.com)
2. NIST Chemistry WebBook (http://webbook.nist.gov/chemistry).
3. USDA Pesticide Properties Database (http://www.ars.usda.gov/Services/docs.htm?docid=14199)
4. Sorption isotherm spreadsheet (http://www.ars.usda.gov/pandp/docs.htm?docid=14971)
5. SPARC online calculator of properties (http://sparc.chem.uga.edu/sparc/)

STUDENT RESPONSIBILITIES

If you are a student with a disability and you need academic accommodations, please see the instructor after contacting the Disability Resource Center (DRC) at 703-993-2474. All arrangements for academic accommodations must be initiated through that office.

GRADING POLICIES

1. Maintain Your Records: It is your responsibility to maintain records of all graded materials. Recording errors are to be cleared up with the instructor prior to the last day of class. Requests for re-grades and total points adjustment (due to addition errors, etc.) will not be entertained after the class officially ends (the last day of lecture).

HONOR CODE

GMU HONOR CODE: All students enrolled in the course are expected to abide by the honor code. The instructor reserves the right to award a grade of zero for any plagiarized work. This includes any work that is not your own, *i.e.,* it has been copied from the internet or another classmate or used during the previous time that you took the course. Work that has been copied cannot be submitted for credit. In other words, copying another person's presentation or work will result in honor code violation being filed with the Office of Academic Integrity. It is your responsibility to be familiar with the GMU Honor Code and have a working knowledge of activities that are considered honor code violations: http://oai.gmu.edu/honor-code/ Cheating, along with some examples of forms of cheating, can be found at http://oai.gmu.edu/the-mason-honor-code-2/cheating/ . If you are complicit with cheating activity, inclusive of "giving help or information/work to a friend/classmate", then you will also be included in the honor code violation that is filed with the Office of Academic Integrity.

- First time offenders will receive a grade of ZERO for the graded exercise/activity.
- Second time/repeat offenders will receive a grade of "F" for the course.
- If a student has previously been reprimanded for honor code violations in other courses at the university, the recommendation will be for a grade of "F" for course as well as expulsion from the university.

LEARNING GOALS/EXPECTATIONS

- **Learning goals and expectations:** Learning goals for students enrolled in this course include chemistry body of knowledge, comprehension, critical and analytical thinking, communication, and presentation. Since the topics covered in the course vary each week, students will be exposed to the subject/topic areas and assessed at an advanced level commensurate with graduate breadth of knowledge.

ACADEMIC INTEGRITY:

Mason is an Honor Code university; please see the University Catalog for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely. Academic integrity in this course means any sharing of information or obtaining or providing assistance on any written assignment unless authorized by the instructor. Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When in doubt (of any kind) please ask for guidance and clarification.

MASON EMAIL ACCOUNTS

Students must use their MasonLive email account to receive important University information, including messages related to this class. See http://masonlive.gmu.edu for more information.

OFFICE OF DISABILITY SERVICES

If you are a student with a disability and you need academic accommodations, please see me and contact the Office of Disability Services (ODS) at 993-2474. All academic accommodations must be arranged through the ODS. http://ods.gmu.edu

OTHER USEFUL CAMPUS RESOURCES:

WRITING CENTER: A114 Robinson Hall; (703) 993-1200; http://writingcenter.gmu.edu

UNIVERSITY LIBRARIES "Ask a Librarian"
http://library.gmu.edu/mudge/IM/IMRef.html

COUNSELING AND PSYCHOLOGICAL SERVICES (CAPS): (703) 993-2380;
http://caps.gmu.edu

UNIVERSITY POLICIES
The University Catalog, http://catalog.gmu.edu, is the central resource for university policies affecting student, faculty, and staff conduct in university academic affairs. Other policies are available at http://universitypolicy.gmu.edu/. All members of the university community are responsible for knowing and following established policies.