

General Studies Request Form

Please see the [General Studies Request Overview and FAQ](#) for information and quick answers.

New permanent numbered courses must be submitted to the workflow in [Kuali CM](#) before a General Studies request is submitted here. The General Studies Council will not review requests ahead of a new course proposal being reviewed by the Senate.

Proposal Contact Information

Submitter Name	Submitter Email	Submitter Phone Number
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College/School	Department/School
The College of Liberal Arts and Sciences (CLA)	School of Molecular Sciences (CCHEMBIO)

Submission Information

Type of submission:

Mandatory Review (Course or topic currently holds this designation and is undergoing 5-year review)

What is Mandatory Review?

Courses and topics previously approved for General Studies must be reviewed every five years by the General Studies Council to verify requirements are still met.

ASU Request

Is this request for a permanent course or a topic?

Permanent Course

Subject Code	Course Number	Units/Credit Hours
CHM	240	3

Course Information

Courses approved for General Studies require mandatory review every five years.

Course Title

Mathematical Methods in Chemistry

Course Catalog Description

Introduces mathematical/computational methods in chemical kinetics, thermodynamics, quantum chemistry. Mathematical-based computer lab.

Is this a crosslisted course?

No

Is this course offered by another academic unit?

No

General Studies

Requested Designation

CS - Computer/Statistics/Quantitative Applications

CS: Computer/Statistics/Quantitative Applications

Rationale and Objectives

The Mathematical Studies requirement is intended to ensure that students have skill in basic mathematics, can use mathematical analysis in their chosen fields, and can understand how computers can make mathematical analysis more powerful and efficient. The Mathematical Studies requirement is completed by satisfying both the Mathematics "MA" requirement and the Computer/Statistics/Quantitative Applications "CS" requirement explained below.

The Mathematics "MA" requirement, which ensures the acquisition of essential skill in basic mathematics, requires the student to complete a course in College Mathematics, College Algebra, or Precalculus; or demonstrate a higher level of skill by completing a mathematics course for which a course in the above three categories is a prerequisite.

The Computer/Statistics/Quantitative Applications "CS" requirement, which ensures skill in real world problem solving and analysis, requires the student to complete a course that uses some combination of computers, statistics, and/or mathematics.* Computer usage is encouraged but not required in statistics and quantitative applications courses. At a minimum, such courses should include multiple demonstrations of how computers can be used to perform the analyses more efficiently.

*CS does not stand for computer science in this context; the "S" stands for statistics. Courses in computer science must meet the criteria stated for CS courses.

[Approved April 2014]

A Computer/Statistics/Quantitative Applications "CS" course must satisfy one of the following criteria: 1, 2, OR 3.

Select the type of course to see the appropriate criteria.

1. Computer applications
3. Quantitative applications

1. Computer applications* courses must satisfy both A and B:

*The computer applications requirement cannot be satisfied by a course, the content of which is restricted primarily to word processing or report preparation skills, the study of the social impact of computers, or methodologies to select software packages for specific applications. Courses that emphasize the use of a computer software package are acceptable only if students are required to understand, at an appropriate level, the theoretical principles embodied in the operation of the software and are required to construct, test, and implement procedures that use the software to accomplish tasks in the applicable problem domains. Courses that involve the learning of a computer programming language are acceptable only if they also include a substantial introduction to applications to one of the listed problem domains.

"CS" Criteria 1A

Course involves the use of computer programming languages or software programs for quantitative analysis, algorithmic design, modeling, simulation, animation, or statistics.

Identify the submitted documentation that provides evidence.

CHM 240 syllabus

How does this course meet the spirit of this criteria?

The course is intended to provide our chemistry students with the appropriate post-calculus mathematical and computational skills needed to solve chemical problems. An introduction to advanced mathematical and computational methods used in chemical kinetics, thermodynamics, and quantum chemistry with 'MATHEMATICA' based computer laboratory. Appropriate topics in differential equations, linear algebra, Fourier series, complex numbers, and numerical methods will be presented.

Please provide detailed evidence of how this course meets this criteria (i.e. where in the syllabus or other course materials).

The learning objectives described in the Course Objective in the syllabus provide this evidence.

"CS" Criteria 1B

Course requires students to analyze and implement procedures that are applicable to at least one of the following problem domains (check those applicable):

vi. Algorithmic design and computational thinking.

"CS" Criteria 1B.vi Information
Algorithmic design and computational thinking.

Identify the submitted documentation that provides evidence.

CHM 240 syllabus

How does this course meet the spirit of this criteria?

Students are required to spend one 3-hour class period per week in the SMS computer lab solving computational problems related to chemistry using Mathematica.

Please provide detailed evidence of how this course meets this criteria (i.e. where in the syllabus or other course materials).

This activity is described in the Course Objectives and in the "Type and Amount of Work Required" sections of the class syllabus.

3. Quantitative applications courses must satisfy A, B, and C.

"CS" Criteria 3A

Course has a minimum mathematical prerequisite of College Mathematics, College Algebra, or Pre-calculus, or a course already approved as satisfying the MA requirement.

Identify the submitted documentation that provides evidence.

CHM 240 Syllabus

Please provide detailed evidence of how this course meets this criteria (i.e. where in the syllabus or other course materials).

The prerequisites for this course are MAT 272 or MAT 267 with a grade of C or better

"CS" Criteria 3B

The course must be focused principally on the use of mathematical models in quantitative analysis and decision making. Examples of such models are (check all that apply):

vii. Other (explanation must be attached).

"CS" Criteria 3B.vii

Other (explanation must be attached).

Identify the submitted documentation that provides evidence.

CHM 240 syllabus

How does this course meet the spirit of this criteria?

Students in CHM 240 learn the fundamentals of probability and statistics and use the programming language in Mathematica to solve chemistry problems using differential equations, partial differential equations, Fourier series, Fourier transforms, linear algebra among other techniques.

Please provide detailed evidence of how this course meets this criteria (i.e. where in the syllabus or other course materials).

See the Table of Contents for the "Mathematical Methods for Molecular Science" textbook which is included on page 2 of the syllabus.

"CS" Criteria 3C

The course must include multiple demonstrations of how computers can be used to perform the above applications more efficiently, if use of computers is not required by students.

Identify the submitted documentation that provides evidence.

CHM 240 course syllabus

How does this course meet the spirit of this criteria?

The use of computers is required by the students

Please provide detailed evidence of how this course meets this criteria (i.e. where in the syllabus or other course materials).

On pages 1 and 2 of the course syllabus, the use of the Mathematica computer program and the computational lab work is described.

Attach a sample syllabus for this course or topic, including the list of any required readings.

[CHM 240_Spring22_Richert \(1\).pdf](#)

Attach the table of contents from any required textbook(s).

No Response

Attach any other materials that would be relevant or helpful in the review of this request.

No Response

Form Submission - Proposer

Submitted for Approval | Proposer

Barbara Munk - December 22, 2022 at 10:29 AM (America/Phoenix)

Department Approval

Approved

Tijana Rajh - December 27, 2022 at 9:42 AM (America/Phoenix)

Barbara Munk

Provost's Office Review

Approved

April Randall

Joni Lochtefeld - January 18, 2023 at 9:02 AM (America/Phoenix)

Mathematical Studies Mandatory Review

Acknowledgement Requested

Michelle Zandieh

Michelle Mancenido

Jose Lobo - February 1, 2023 at 4:10 PM (America/Phoenix)

Resubmit.

- (1) The application provided only a syllabus without information on the laboratory work.
 - (2) For most weeks the syllabus says only "Computational lab." The content is not specified, and it is unclear whether there will be the "real world problem solving and analysis" required by the criteria or whether students will simply copy and paste code to complete straight forward tasks.
 - (3) Other parts of the course may in fact ask students to do more problem solving and analysis but it was not clear how the Mathematica labs were connected to other parts of the course, if they were at all.
 - (4) The syllabus states, "One of the goals of the laboratory component of this course is for students to learn to program in MATHEMATICA, one of the most sophisticated computer programs for mathematics." This alone would not satisfy the criteria, but other goals are not made explicit.
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General Studies Council Meeting

Waiting for Approval

April Randall

Joni Lochtefeld

Proposer Notification

Notification

