

# DSML - 4360 - Senior Experience in Data Science and Machine Learning

## o8. UG Senior Experience (New or Modification)

<b>Due Dates</b>
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If you have questions or need assistance in filling out this proposal form, you may contact the [Office of Curriculum](#).

Deadlines for curriculum can be found:

[Curriculum SharePoint Curriculum Website Procedural Calendar](#)

On your Curriculog dashboard under 'My Upcoming Events'

In order to meet the deadline, this proposal must be on the *Substantive University Level Review Senior Experience* step on or before the listed due date.

Resources for curriculum can be found:

[Curriculum SharePoint Originator How-To Guide](#)

This form **SHOULD** be used for the following:

Creating a new course with the Senior Experience designation.

Modifying any portion of a course currently designated as a Senior Experience course.

Requesting the Senior Experience designation on an existing course.

Converting an Omnibus or Individual Variable Topic Course into a regular course and request the Senior Experience designation.

Removing the Senior Experience designation from a course

This form **SHOULD NOT** be used for the following:

Creating or modifying a course **WITHOUT** the Senior Experience

designation.

Modifying a  
course with  
Senior Experience  
and additional  
special  
designations.  
Please use that  
specific form.

## Directions for Form

### General Instructions and Information

You may collapse individual sections of this form by clicking the arrow or "V" icon to the right of the section title.

All fields that are marked with an asterisk (\*) are required.

Each section may have additional directions attached. Please follow all instructions.

**Note: Proposals that are incomplete or filled out incorrectly will be returned to the originator.**

**INSTRUCTIONS  
FOR CREATING  
A NEW SENIOR  
EXPERIENCE  
COURSE**

Fill out all of the below fields. New courses can skip Part II.

Launch the proposal.  
Approve the proposal.

Use the checkmark icon on the right of the screen to approve the proposal.

**INSTRUCTIONS  
FOR MODIFYING  
AN  
EXISTING COURSE  
OR  
CONVERTING  
AN  
OMNIBUS/VARIABLE  
TOPICS COURSE**

Import the course you wish to modify.

Fill out Part I of the form.

LAUNCH the proposal.

Fill out Part II to indicate all the modifications you make to the course.

Modify any course fields in Part III.

**Modification**

**Note:**

**DO**

**NOT**

**MAKE**

**CHANGES**

**TO**

**YOUR**

**COURSE**

**INFORMATION**

**(PART**

**III)**

**UNTIL**

**AFTER**

**YOU**

**LAUNCH**

**THE**

**PROPOSAL** in

order

to

track  
changes.

Failure

to

use

the

track

changes

feature

may

cause

a

delay.

or

denial

of

your

proposal.

If you

modify

additional

fields

not

already

indicated

in

Part

II,

please

make

sure

you

add

them

to the

modification

list.

Complete or  
revise Part IV as  
needed.

Approve the  
proposal.

Use

the

checkmark

icon

icon  
on  
  
the  
right  
of the  
screen  
to  
approve  
the  
proposal.

## Specific Instructions for the Senior Experience Designation

The following is required for a senior experience course. You **MUST** follow these guidelines:

Minimum of three (3) credits at the 4000 level  
Must include "Senior Standing" as a prerequisite and registration restriction in addition to other prerequisite(s) determined by department.

Answer the questions in the Senior Experience Designation section to illustrate how the course meets the Senior Experience criteria.

If you have questions about the Senior Experience designation you may contact the [Chair of the Faculty Senate Curriculum Committee](#) or the [Office of Curriculum](#).

### Part I: Department and Originator Information (Fill out BEFORE launching the proposal)

College/School:\*

College of Aerospace, Computing, Engineering, and Design

Department:\*

Department of Computer Sciences

Name of Proposal Originator:\* Steve Geinitz

Email of Proposal Originator:\* geinitz@msudenver.edu

### Proposal Purpose

- Please Select:\*
- Creating a new course with Senior Experience designation
  - Modifying existing Senior Experience course
  - Requesting Senior Experience designation to existing course
  - Converting an omnibus or individual variable topic course into a Senior Experience designated course
  - Removing the current Senior Experience designation

- Please Select:** \*
- Content Changes (course description, course outline, evaluation of student, student learning objectives)
  - Non-Content Changes (course title, number of credits, pre/co/pre or corequisites, course prefix, course number)
  - N/A - I am creating a new course and/or designation on an existing course or converting a course and designating it as Senior Experience or removing the designation

**Justification and resource implication for proposed curriculum action:** \*

We are creating a new undergraduate degree program, Data Science and Machine Learning. This course will be the culmination of the program.

**Related Curriculum Proposals:** \*

DSML 4220 - <https://msudenver.curriculog.com/proposal:10611/form>

DSML 3850 - <https://msudenver.curriculog.com/proposal:10923/form>

DSML degree - <https://msudenver.curriculog.com/proposal:10946/form>

**Impact Report Results:** \*

## Impact Report for DSML 4360

There are no results for this report.

According to the Undergraduate Curriculum Manual, it is the responsibility of both the originator as well as each level of review to consider potential overlap and curriculum conflict. Any potential overlap or conflict with existing curriculum should be reviewed, and the impacted department(s) should be requested to provide a letter of notification or support, depending on the circumstances.

Attach documentation that supports affected Departments were notified and/or provided support of the proposed changes in the Proposal Toolbox by clicking on the paperclip icon on the right side of the form.

- Please Confirm That:** \*
- I, the originator of this proposal, have completed the necessary due diligence to review this proposal for any potential overlap and/or conflict with existing curriculum. Any departments identified as having potential overlap and/or conflicts have been contacted and a letter of notification and/or a letter of support has been obtained.

### Part II: Course Modification Information

**Date of Last Course Review** N/A  
(MM/DD/YYYY) \*

Please select from the below list all of the course modifications you are making. Please do not make changes to fields you do not specify are being modified and make sure to list ALL fields that you modify. If this is not applicable, select "Not Applicable"

Specify ALL course  
Modifications:

Evaluation of student

Required reading

**Reminder if you are making modifications to this course:**

**DO NOT MAKE CHANGES TO YOUR COURSE INFORMATION (PART III) UNTIL AFTER YOU LAUNCH THE PROPOSAL in order to track changes. Failure to use the track changes feature may cause a delay or denial of your proposal.**

**If you modify additional fields not already indicated, please make sure you add them to the modification list.**

### Part III: Course Information

Prefix:\*

DSML

Course Number:\* 4360

Course Title:\* Senior Experience in Data Science and Machine Learning

Transcript/Banner Course Title:\* Senior Experience in DS and ML

Course Type:\*

Computer Science

CIP Code: 30.7001

**Please check all that apply from the selections below. You may select more than one option if applicable.**

- Check All that Apply:\*
- Required for Major
  - Required for Minor
  - Required for Concentration
  - Required for Certificate
  - Elective
  - Specified Elective

To receive Title IV financial aid funds, all institutions of higher education must comply with the federal definition of a credit hour. The Higher Learning Commission requires institutions to maintain policies and procedures for verifying compliance with this definition.

**Federal Credit Hour Definition:** A credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally-established equivalency that reasonably approximates not less than:

(1) one hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work each week for approximately fifteen weeks for one semester or trimester hour of credit, or ten to twelve weeks for one quarter hour of credit, or the equivalent amount of work over a different amount of time; or (2) at least an equivalent amount of work as required in paragraph (1) of this definition for other activities as established by an institution, including laboratory work, internships, practica, studio work, and other academic work leading toward the award of credit hours. 34CFR 600.2 (11/1/2010)

Credits:\* 4

Distribution of Credits:\* 4 + 0

Schedule Type(s):\*

Lecture

Grade Mode(s):\*

Letter

#### Face-to-Face or Equivalent Hours per course

Consult Appendix B and C of the [Curriculum Manual](#) to determine the hours for the course

Lecture: 50

Lab:

Internship:

Practicum:

Other Hours:

Additional Student Work Hours: 120

**Please answer yes or no to the below questions. If you answer yes to any of the questions, please fill out the related field on the right.**

A specified repeatable course is a course that allows a student to repeat the course either in its entirety or for a certain identified total number of credit hours. If you decide to make your course repeatable, please specify either how many times a student can repeat the course for credit, or for the total number of credits they can receive.

Is this course a specified repeatable course? \*  No  Yes

If yes, indicate specified repeatable number of credits and/or repeats allowed:

A crosslisting is when a course is made available under additional prefixes for students in other programs.

An equivalency is when two courses are coded in Banner to be equal to each other.

Generally equivalencies are used when an old, archived course is needed to be equal to a new course. Crosslistings are used for all active courses. Supporting documentation should be included to demonstrate

Crosslistings are used for all active courses. Supporting documentation should be included to demonstrate approval for crosslistings.

Are there course equivalencies? \*  No  Yes

If yes, list all equivalent courses in alphabetical order:

Are there or will there be any course crosslistings? \*  No  Yes

If yes, list all crosslistings in alphabetical order:

## Registration Restrictions

Program:

Major:

Level:

Undergraduate

Class:

Senior

Student Attribute:

### Part III: Course Information, continued

The following fields will allow you to attach prerequisites, corequisites, or prerequisites or corequisites to your course. Please specify if you want any of these prerequisites, corequisites, or prerequisites or corequisites Banner enforced.

Banner enforcement means that the requirement will be enforced when the student attempts to register for a course. If you do not Banner enforce the requirement, the system will not check the student's record for the requirement to be met.

Please also indicate the minimum passing grade.

**Prerequisite(s):** Senior standing, completion of all lower-division courses required for the BS DSML degree, DSML 3850, MTH 3270, DSML 4220, JMP 2610, PHI 3370, and (COMM 1010 or COMM 1100), all with grades of "C-" or better; or permission of instructor.

**Banner Enforced Prerequisite(s):** CS1050, CS2050, CS3250, CS3120, CS3810, MTH1410, MTH3210, MTH3130, MTH3270, MTH3220, JMP2610, (COMM1010 or CAS1010 or SPE1010 or COMM1100 or SPE1710 or CAS 1710), PHI3370, DSML3850, and DSML4220

**Minimum Passing Grade for Banner Enforced Prerequisite(s):** C- or T

**Corequisite(s):**

**Banner Enforced Corequisite(s):**

**Prerequisite(s) or Corequisite(s):**

Corequisite(s).

**Banner Enforced  
Prerequisite(s) or  
Corequisite(s):**

**Minimum Passing  
Grade for Banner  
Enforced  
Prerequisite(s) or  
Corequisite(s):**

**Catalog Course  
Description:\***

This senior-level capstone course reflects a culmination of learning and an opportunity to develop and apply knowledge in the areas of Data Science, Computer Science, Statistics, and Machine Learning to a specific domain. Students will identify and engage in semester-long projects that require a synthesis of the knowledge and skills acquired from earlier courses, and that will require planning and communication on the phases and progress of the project. Some projects may be solicited from constituents within MSU Denver or externally, and progress evaluated in conjunction with constituent representatives.

**The note field DOES show up in the course listing in the university catalog. A note should be made in specific instances where additional information about a course needs to be conveyed to students. The most common reasons for adding a note are:**

The course is crosslisted Example: *(Note: Credit will be granted for only one prefix.)*

Variable credit courses Example: *(Note: Variable Credit)*

A course is repeatable Example: *(Note: This course may be repeated up to 3 times under different topics) OR (Note: This course is repeatable for a maximum of six semester hours)*

If a student cannot take two courses and earn credit for both Example: *(Note: Students cannot earn credit for XXX1234 and XXX2345)*

**Note:**

**Lab Fees:**

**Field Trips:**

## Part III C: Course Content

The following section is the course content. You must adhere to the following format for each section:

**Required reading: Please list materials in preferred citation style (eg. MLA, APA, etc.).**

**List each material in this format. If there are multiple materials please format them in a bullet or list style**

**Specific Measurable Student Behavioral Learning Objectives: Please list the SBLOs in your preferred numbering or bulleting style. Start section with: Upon completion of this course, the student should be able to:.**

**Detailed Outline of Course Content or Outline of Field Experience/Internship: Please list the course outline in your preferred numbering or bulleting style. It is recommended that you use a numbering format for this field.**

**Evaluation of Student Performance: Please list the evaluation of student performance in your preferred numbering or bulleting style.**

**You must use the numbering list feature within the toolbar above each field. Right click on a number in the list and select "Numbered List Properties" to change the numbering style. Please maintain consistency in the selected numbering or bulleting styles.**

**Required reading and other materials will be equivalent to:\***

\* Lakshmanan, V. (2022). Data Science on the Google Cloud Platform. " O'Reilly Media, Inc.".

\* Fregly, C., Barth, A. (2021). Data Science on AWS. United States: O'Reilly Media.

Additionally, texts/references specific to a student's selected project domain/topic will likely include selected readings from the academic literature.

**Specific, Measurable Student Behavioral Learning Objectives:\***

Upon completion of this course the student should be able to:

1. Demonstrate the application of knowledge and skills in the areas of Computer Science, Data Science, Machine Learning, and Statistics to research, analysis, or development projects
2. Design a plan to address a data science or machine learning project
3. Apply knowledge gained from courses and literature reviews
4. Interact effectively with project stakeholders
5. Assess progress and adjust plans in accordance with such assessments
6. Reflect, verbally and in writing, on plans and activities associated with

carrying out those plans

**Detailed Outline of Course Content (Major Topics and Subtopics) or Outline of Field Experience/Internship \***

1. Follow process of a DS/ML project
  1. problem selection
  2. data acquisition and exploration
  3. data analysis and/or model development
  4. evaluation and interpretation
  5. model delivery and/or deployment
  6. retrospection and optimization
  
2. Specifications of data science and machine learning senior experience projects
  1. Data Science and Machine Learning knowledge as an integral component
  2. Analysis and/or modeling artifact deliverables demonstrate the application of a synthesis of knowledge and skills developed throughout a DS and ML program
  3. Group-based project work (optional)
  4. Oral and written presentation deliverables addressing:
    1. well-defined problem statement
    2. analyses of legal, social, and ethical impacts of proposed objectives
    3. a priori estimates of feasibility
    4. plans to achieve the objectives
    5. comparisons of estimates and plans with actual metrics and experiences
    6. evaluation of results
  
3. Work-in-Progress activities
  1. Providing periodic status updates, reflections, and work-in- progress presentations to peers and/or stakeholders
  2. Providing constructive feedback to others' project updates and presentations

**Evaluation of Student Performance:\***

Student evaluation can include assessments of the following types:

- Instructor, and peer and/or stakeholder evaluations of performance
- Written and/or oral reflections on the project development process
- Written and/or oral presentations of the completed project

**Part IV: Senior Experience Designation**

## Criteria for Senior Experience

The following is required for a senior experience course:

**Minimum of three (3) credits at the 4000 level**

**Must include "Senior Standing" as a prerequisite and registration restriction in addition to other prerequisite(s) determined by department.**

The following criteria must be addressed for all courses seeking Senior Experience designation. Please explain below how this course will meet the listed criteria.

The Senior Experience must allow students to:

**synthesize learning through critical analysis and logical thinking.**

**Explain (SE 1):**

- Students must invent or recognize an appropriate problem for their project for this course, including critical analysis of social and ethical implications of their proposed artifact/model.
- The project must be challenging enough, as judged by the instructor, that they will need to synthesize learning from a number of previous courses, including courses in Computer Science, Statistics, and Machine Learning, in order to successfully complete it.
- The requirement that they reflect on their on-going process and present their final model/product will require them to use expertise gained from the technical writing course and the public speaking course.

**apply theoretical constructs to practical applications.**

**Explain (SE 2):**

The core requirement of this course is that students use technical knowledge, much of which is theoretical in nature, to produce a analysis/model artifact that will answer or solve a practical, real-world problem.

**critique philosophical tenets and current practices.**

**Explain (SE 3):**

In analyzing possible problems, and later in examining possible solutions to arrive at the approach they will implement, students will need to consider the social and ethical impact of solving their proposed problem, and they will need to critique existing solutions to the problem.

**integrate and refine oral and/or written communication skills.**

**Explain (SE 4):** Throughout the course, students will be strengthening their oral and written communication skills by writing and presenting intermediate results, reflections on their ongoing development processes. Their final project will include a summary presentation of the full end-to-end project.

**verify their expertise.**

**Explain (SE 5):** By the end of the course, students will produce an analysis/model to illustrate that their approach answers the selected problem, or an appropriately narrowed version of their problem. This should include acknowledgement of other approaches/solutions that could have been used, and discuss the tradeoffs and justification for the chosen approach/solution.

<b>Academic Affairs and Registrar's Office Use Only</b>
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**Notes** This new course will be effective for the University 2024-2025 Undergraduate Catalog and will be reflected in Banner beginning in Fall 2024.

*Form Revised July 2022*