



UW-Madison Syllabus Template

1 Course Subject, Number and Title

MSE803: Data Science in Materials

2 Credits

3 credits, contact hours = 150min/wk (consistent with credit hours requirements specified in Sec. 8).

3 Course Designations and Attributes

None (I don't think – need to check this).

4 Course Description

This course will provide students with an introduction to applications of data science in materials science and engineering, including many closely related concepts from chemometrics. Topics will include understanding the creation and use of modern data resources, data-centric approaches to materials, and the integration of machine learning across the materials landscape. Some specific areas of focus are expected to include the use of databases in materials discovery and design, the application of machine learning to materials property prediction, analysis of characterization data of images and spectra, text mining and large language models, and replacing physical models (with a particular focus on interatomic potentials). The course will be python based and application oriented, with a goal of learning to effectively use tools at an advanced level. A large part of the course will be centered on hands on computational laboratories and a final project. The course is targeted for beginning graduate and upper-level undergraduate students but I am happy to make exceptions if it makes sense – just email me. Note that undergraduates will need to request permission from me to register. Prior familiarity with programming, machine learning, computer modeling, etc. is not required but the more relevant background one has the easier the course will be.

5 Requisites

None.

6 Meeting Time and Location

MoWeFr 9:55AM - 10:45AM

MECH ENGR 1143

7 Instructional Modality

In-person. Maybe zoom sometimes if things come up (e.g., sickness). I will try to record lectures and share on Canvas but this does not always work well and will not be done for labs and discussions.

8 How Credit Hours are Met by the Course

Traditional Carnegie Definition – One hour (i.e. 50 minutes) of classroom or direct faculty/instructor instruction and a minimum of two hours of out of class student work each week over approximately 15 weeks, or an equivalent amount of engagement over a different number of weeks. This is the status quo and represents the traditional college credit format used for decades. If you have regular classroom meetings and assign homework, reading, writing, and preparation for quizzes and exams, make this choice.

9 Regular and Substantive Student-Instructor Interaction

1

Last updated September 2022

This course engages students in teaching, learning and assessment through direct instruction, providing feedback on student work, and facilitating discussion of course content. Regular interaction includes class times.

10 Other Course Information

None.

11 Instructors & Teaching Assistants

None at present but may have graduate students and postdocs help at different points.

11.1 Instructor Title and Name

Professor Dane Morgan (just call me Dane).

11.2 Instructor Availability

Office hours will be conducted in-person and remotely.

11.3 Instructor Email/Preferred Contact

ddmorgan@wisc.edu

11.4 Teaching Assistant (if applicable)

None at present.

11.5 TA Office Hours

None.

11.6 TA Email/Preferred Contact

None.

12 Course Learning Outcomes

1. Recall and utilize basic principles and methods of how informatics (data science and machine learning) can be used in materials science and engineering.
2. Assess and utilize literature and software tools related to materials informatics.
3. Communicate effectively about technical work in oral and written presentation.

13 Grading

- Quizzes (3% each (about 1%/question), total 15-30%), Projects (proposal and project presentation and report) (35%), ~4 Labs (Balance = 100 – Quizzes – Projects).
- Quizzes are graded automatically. Other assignments graded by instructor or TA.
- Grades may be curved depending on the overall mean of the class.
- Attendance is strongly encouraged but not formally graded. However, strong attendance can influence a borderline grade.
- Collaboration is strongly encouraged. It is a great way to learn from each other and more fun. But please always submit your own work.
- Grading is an A-F scale.
- Requirements for each grade are below
 - A: Excellent performance on all measures (94-100).
 - AB: Minor lapses in performance in some areas (87-93).

- B: Good average performance across all areas (80-86).
- BC: Poor performance in some areas (75-79).
- C: Poor performance in most areas (70-75).
- D: Very poor performance in most areas (60-69).
- F: Unacceptably poor performance in most areas (0-59).

The numerical boundaries are based on the CoE defaults which are similar to the standard ranges in the U.S. https://en.wikipedia.org/wiki/Academic_grading_in_the_United_States. The instructor may move the grade boundaries depending on the overall mean of the class.

14 Course Website, Learning Management System & Digital Instructional Tools

Canvas: <https://canvas.wisc.edu/courses/365653>

(see assignments calendar, take quizzes, upload labs and projects, see grades, get announcements)

Zoom – see announcement on canvas for Zoom meeting information if needed.

15 Discussion Sessions (remote)

Office hours: Th 12-1 pm (Room MSE 244 and Zoom): Join Zoom Meeting

<https://uwmadison.zoom.us/j/8574021221?pwd=S3pEaGtMN0NBU0VBSFFCdUJnTW83dz09>.

16 Laboratory Sessions (in-person or remote)

None, although we will do computational labs during class times.

17 Required Textbook, Software & Other Course Materials

None.

Useful resources:

- Logan Ward course from Univ. of Chicago: <https://github.com/WardLT/applied-ai-for-materials> (links to slide decks, videos, and notebooks).
- Andrew Medford course from Georgia Institute of Technology: https://github.com/medford-group/data_analytics_ChE
- Many related Nanohub courses: <https://nanohub.org> ; <https://nanohub.org/groups/mlmodules>

18 Homework & Other Assignments

The course is set up as 2 stages

1. Modules, 1...N
2. Projects

Key materials and information:

1. All assignments are to be submitted through Canvas.
2. Class files are in Google drive, maybe Canvas. Key links will be provided.
3. General google files:
https://drive.google.com/drive/folders/1Kp0EWsMP4bl_sfdnWKSxuhe9zy2YwdAV
4. Module structure and details on HW, etc. given in this file:
<https://docs.google.com/document/d/1R72mcSv1-c56EcQM36bSfZalaAY5jyBA/edit>
5. Projects description is in this folder (F22):
<https://docs.google.com/document/d/1TatrnXo7cZyPP-hUGq3W8T8ZkXZ-KZgo/edit>

19 Campus Spaces for Virtual Learning & Testing

Dedicated on-campus spaces with high-speed internet are available for students to [reserve](#) for any exam/quiz taken during the semester. Computers can also be requested. See <https://virtuallearning.wisc.edu/>.

20 Exams, Quizzes, Papers & Other Major Graded Work

- Quizzes are at home, closed book (honor system), and timed at ~10min. ~3 questions per quiz, worth 1 pt each. Labs are graded out of 10 points. Projects are graded out of 10 points. I may update this as the semester progresses.
- Deadlines for all assignments will be in canvas calendar.
- Late assignments optionally get the following deductions (this deductions will likely not be used unless we have issues)
 - Quiz a: no credit.
 - Quiz b: up to -1 point (33%).
 - Labs: up to -2 points (20%) (-1 per day) until solution posted, then 0.
 - Projects: -2 for any lateness.
- No exams.

21 Privacy of Student Information & Digital Tools: Teaching & Learning Analytics & Proctoring Statement

The privacy and security of faculty, staff and students' personal information is a top priority for UW-Madison. The university carefully reviews and vets all campus-supported digital tools used to support teaching and learning, to help support success through [learning analytics](#), and to enable proctoring capabilities. UW-Madison takes necessary steps to ensure that the providers of such tools prioritize proper handling of sensitive data in alignment with FERPA, industry standards and best practices.

Under the Family Educational Rights and Privacy Act (FERPA which protects the privacy of student education records), student consent is not required for the university to share with school officials those student education records necessary for carrying out those university functions in which they have legitimate educational interest. 34 CFR 99.31(a)(1)(i)(B). FERPA specifically allows universities to designate vendors such as digital tool providers as school officials, and accordingly to share with them personally identifiable information from student education records if they perform appropriate services for the university and are subject to all applicable requirements governing the use, disclosure and protection of student data.

22 Privacy of Student Records & the Use of Audio Recorded Lectures

Summary: Please don't make or share recorded materials outside of class.

See information about [privacy of student records and the usage of audio-recorded lectures](#).

Lecture materials and recordings for this course are protected intellectual property at UW-Madison. Students in this course may use the materials and recordings for their personal use related to participation in this class. Students may also take notes solely for their personal use. If a lecture is not already recorded, you are not authorized to record my lectures without my permission unless you are considered by the university to be a qualified student with a disability requiring accommodation. [Regent Policy Document 4-1] Students may not copy or have lecture materials and recordings outside of class, including posting on internet sites or selling to commercial entities. Students are also prohibited from providing or selling their personal notes to anyone else or being paid for taking notes by any person or commercial firm without the instructor's express written permission. Unauthorized use of these copyrighted lecture materials and recordings constitutes copyright infringement and may be addressed under the university's policies, UWS Chapters 14 and 17, governing student academic and non-academic misconduct.

23 How to Succeed in This Course

1. Stay on top of material as much of it can be very new and take time to digest. Do reading before discussion classes to make them useful learning experiences.
2. Start projects early and work steadily. An hour + a few questions to me can be worth 10 hours the night before.
3. Use class discussions to develop a personalized understanding of the material.

24 Course Evaluations

I strongly encourage unsolicited feedback at any time to help make the course better. This is a fairly new course in a fast changing field and we are all learning how to make it most effective. I may also solicit feedback as a survey part way through the semester.

UW-Madison now uses an online course evaluation survey tool, [AEFIS](#). In most instances, you will receive an official email two weeks prior to the end of the semester when your course evaluation is available. You will receive a link to log into the course evaluation with your NetID where you can complete the evaluation and submit it, anonymously. Your participation is an integral component of this course, and your feedback is important to me. I strongly encourage you to participate in the course evaluation.

25 Students' Rules, Rights & Responsibilities

During the global COVID-19 pandemic, we must prioritize our collective health and safety to keep ourselves, our campus, and our community safe. As a university community, we must work together to prevent the spread of the virus and to promote the collective health and welfare of our campus and surrounding community.

26 COVID-19

Please follow campus guidelines and be respectful of people's choices regarding whether or not to wear masks.

Quarantine or Isolation Due to COVID-19

Student should continually monitor themselves for COVID-19 symptoms and get [tested](#) for the virus if they have symptoms or have been in close contact with someone with COVID-19. Student should reach out to instructors as soon as possible if they become ill or need to isolate or quarantine, in order to make alternate plans for how to proceed with the course. Students are strongly encouraged to communicate with their Instructor concerning their illness and the anticipated extent of their absence from the course (either in-person or remote). The instructor will work with the student to provide alternative ways to complete the course work.

27 Diversity & Inclusion Statement

[Diversity](#) is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals. The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world.

28 Academic Integrity Statement

By virtue of enrollment, each student agrees to uphold the high academic standards of the University of Wisconsin-Madison; academic misconduct is behavior that negatively impacts the integrity of the institution. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these previously listed acts are examples of misconduct which may result in disciplinary action. Examples of disciplinary action include, but is not limited to, failure on the assignment/course, written reprimand, disciplinary probation, suspension, or expulsion.

29 Accommodations for Students with Disabilities Statement

The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA. (See: [McBurney Disability Resource Center](#))

30 Academic Calendar & Religious Observances

See: <https://secfac.wisc.edu/academic-calendar/#religious-observances>

31 UW-Madison Health & Wellbeing Resources

There are numerous campus resources to help support you individually and help create an academic environment to allow you to succeed. I want to assure you that it is normal to seek support and I encourage you to explore the resources listed below.

- [Open Seat food pantry](#) - for students, by students; hosted by ASM
- [University Health Services](#) - Students can schedule medical or counseling appointments by calling 608-265-5600. 24/7 nurse advice and crisis lines are also available.
- [RecWell Wellness Coaching](#) – Peer wellness coaching is available in one-on-one or group formats to support students in their wellbeing
- [Badger Recovery](#) – Provides meetings, events, and services for students in recovery, or considering recovery, from substance use
- [Healthy Academics Initiative](#) – Health-promoting strategies and resources from University Health Services