# **CHME 479: Corrosion and Degradation of Materials**

## Instructor Information

Dr. P. K. Andersen, Associate Professor

Department of Chemical and Materials Engineering

Office hours via Zoom (by appointment)

## Course Information

Corrosion and Degradation of Materials

Spring 2025

Log into [Canvas](http://learn.nmsu.edu/) at using your NMSU username and password.

## Course Description

Failure of engineering materials in aggressive environments. Chemical and electrochemical mechanisms of corrosion. Influence of chemical composition and microstructure on corrosion behavior. Types of corrosion and chemical attack, including uniform corrosion, galvanic corrosion, pitting and other forms of localized corrosion, stress corrosion cracking, and corrosion fatigue. Methods of corrosion mitigation including cathodic protection, coatings, passivation, and corrosion inhibitors. Corrosion in nuclear reactors and nuclear waste repositories.

## Prerequisites

### CHME 361

## Course Delivery Method

CHME 479 is a fully online course.

Course Objectives

Students successfully completing this course will demonstrate the ability to do the following:

### Basic Concepts. Explain the basic principles related to the corrosion and degradation of materials.

### 2. Problem Solving. Solve problems involving mechanical, chemical and electrochemical processes in materials exposed to harsh environments.

### 3. Mitigation. Discuss methods for preventing the degradation and failure of materials.

## Textbook and Materials

### P. K. Andersen (2025). *Degradation of Materials* (Available as PDF files from the course Canvas site).

## Communication

The best way to communicate with the instructor is via the Canvas Inbox messaging tool (also known as Canvas Conversations). All such messages will be answered within 24 hours.

Questions judged to be of general interest will likely be answered by a Canvas Announcement to the entire class.

### Messages dealing with personal issues will be answered directly via the Canvas Inbox messaging tool. Be sure to inform the instructor as soon as possible of any emergency (such as accident, illness, computer or network failure, and so forth) that may interfere with your course work.

You can set your Canvas Notification Preferences to send notifications to your mobile phone or email. To do this, go to the course Canvas site and select

Account > Settings > Other Contacts > + Contact Method

Select your preferred contact method (Email or Text), and enter your Email address, Cell Number, etc.

## Announcements

The instructor will use Canvas Announcements to send time-sensitive information to the entire class. You are required to set your New Announcements in Notifications to “Notify me right away” to ensure that you receive any announcements immediately.  To do this, go to the course Canvas site and select

Account > Notifications > P Announcement.

## Virtual Office Hours

Office hours will be conducted Mondays and Wednesdays from 09:00 to 10:00 via Zoom video conferencing. Attendance at these meetings is optional. Zoom meetings will be recorded and the recordings posted on the course Canvas site.

## Grading and Feedback

Quiz and test scores will be available with 48 hours after you finish the quiz or test.

## Online Preparation

To earn passing grade, you should plan on spending at least 128 hours (7680 minutes) on the course.

## Required Technical Skills

To begin in this course, you must be able to do the following:

* Obtain access to an internet connection (preferably broadband), a working computer, and a working web camera for the duration of this course.
* Use Microsoft© Office applications (principally, Microsoft PowerPoint).
* Use Zoom videoconferencing software.
* Conduct research searches on the Internet; see the [NMSU LibGuides](http://nmsu.libguides.com/?b=t) and [Cornell’s Guide to Online Research](https://www.library.cornell.edu/research/introduction)
* Send and receive emails and email attachments in and out of class.
* Change your Canvas Notification settings.
* Maintain backups of all work you create for this course.

If you have questions about technical requirements for the course, please contact the course instructor immediately.

## Netiquette

## Online course expectations for netiquette include the following:

* Don’t flame (personally attack) others. It is possible to disagree with an idea without flaming the person espousing the idea.
* Remember that the concept of “politeness” is defined for us by the families and cultures of which we are a part. What is considered polite communication in one family or culture may be impolite in another. Sometimes you may inadvertently seem impolite or feel that someone else was being impolite. Talk it out instead of assuming the person meant to be rude.
* Listen actively.
* Think critically. Critical thinking, grounded in intellectual integrity, is expected. In other words, seek clarity of meaning and understanding.
* Question ideas, not people.
* Attempt to see things from other perspectives.
* Use supporting relevant information.

In short, you are expected to model professional and collegial behavior at all times.

## Grading Criteria

Your final semester grade will be based on the following assignments (which are described in greater detail below):

|  |  |  |  |
| --- | --- | --- | --- |
| **Category** | **Number** | **Weight** | **Notes** |
| Discussions (MP & KP) | 24 | 5% | Muddy points (MP) & Knotty Problems (KP) |
| Homework (HW) | 12 | 15% | End-of-chapter problems |
| Basic Concept Quizzes  (BCQ) | 12 | 40% | Closed-book quizzes  over reading |
| Problem-Solving Quizzes  (PSQ) | 12 | 4% | Open-book quizzes  based on HW |

Grades will be assigned according to the following scale:

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|  |  |  |  |
| --- | --- | --- | --- |
| **Score (%)** | **Grade** | **Score (%)** | **Grade** |
| 97–100 | A+ | 77–80 | C+ |
| 94–97 | A | 74–77 | C |
| 90–94 | A– | 70–74 | C– |
| 87­–90 | B+ | 67–70 | D+ |
| 84–87 | B | 60–67 | D |
| 80–­84 | B– | 64–67 | D– |
|  |  | Below 60 | F |

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### Incomplete Grades

An Incomplete (“I”) grade can be assigned for passable work that could not be completed due to circum-stances beyond the student’s control that develop after the last day to withdraw from the course. An Incomplete may **not** be given for marginal or failing work. If you believe an “I” grade is appropriate in your case, be sure to read the relevant regulations online:

[*Grade Reports*](https://arp.nmsu.edu/4-55/)

## Assignments

### Online discussions (5% of your course grade). You will be given the opportunity to specify especially unclear points (“muddy points”) and difficult problems (“knotty problems”) that you would like the instructor to discuss.

### Homework (15% of your course grade). You will be required to complete twelve (12) homework assignments during the semester. (See the Canvas calendar for due dates.) You are strongly encouraged to work with your classmates on homework.

### Basic Concept Quizzes (40%). Twelve (12) closed-book basic-concept quizzes will be given during the semester. (See the Canvas calendar for quiz dates.).

### Typically, a BCQ will consist of 10 multiple-choice, matching, or short-answer questions based on the current reading assignment. Quiz questions may test nomenclature and qualitative understanding. Basic-concept quizzes are administered in the classroom.

### Problem-Solving Quizzes (40%). Twelve (12) open-book problem-solving quizzes (PSQ) will be given during the semester. (See the Canvas calendar for quiz dates.).

### Typically, a PSQ will consist of a problem similar to a homework problem and will be administered in the classroom.

## Late Work and Excused Absences

Late work will not be accepted for credit except in cases of excused absences. Absences may be excused for emergencies (such as accidents or illness), or when approved in advance by the instructor. As soon as you know you must miss an assignment deadline, contact the instructor via Canvas Inbox messaging.

## Class Withdrawals

It is your responsibility to know important dates such as the final day to withdraw from courses. You must officially withdraw from any course that you intend to drop.

## Academic Misconduct

**Academic and non-academic misconduct.** The Student Code of Conduct defines academic misconduct, non-academic misconduct and the consequences or penalties for each. The [Student Code of Conduct](http://studenthandbook.nmsu.edu/student-code-of-conduct/academic-misconduct/) is available in the [NMSU Student Handbook](http://studenthandbook.nmsu.edu/).

## Technology Requirements

You will need the following hardware and software to participate fully in CHME 479:

* Windows or macOS laptop with internet access, microphone, and speakers
* Working web camera (required for tests)
* Canvas Learning Management System
  + [NMSU Canvas](http://learn.nmsu.edu) login
  + [Canvas student FAQ](https://learning.nmsu.edu/canvas-faq-for-students/)
* [Microsoft Office 2007 or higher](https://studenttech.nmsu.edu/microsoft-office-365-pro-plus/get-verified-office-365-for-nmsu-students-faculty-staff/)
* [Adobe Reader](https://get.adobe.com/reader/) (for reading PDF files)
* Zoom video conferencing app. Available through Canvas.

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## Web Browsers

Use only the latest version of Google Chrome or Mozilla Firefox for Canvas. Safari, Internet Explorer, and Microsoft Edge have known issues that can interfere with performing basic tasks within Canvas. The links to download the recommended browsers as well as instructions on how to ensure you have the latest version are listed below:

* [Download Google Chrome](https://www.google.com/chrome/?brand=CHBD&gclid=EAIaIQobChMI7brQ2_2Q4QIVfh6tBh1g6gIsEAAYASAAEgLU4PD_BwE&gclsrc=aw.ds)
* [How to update Google Chrome](https://support.google.com/chrome/answer/95414?co=GENIE.Platform%3DDesktop&hl=en)
* [Download Mozilla Firefox](https://www.mozilla.org/en-US/firefox/new/)
* [How to update Mozilla Firefox](https://support.mozilla.org/en-US/kb/update-firefox-latest-version)

Canvas does not fully support mobile devices; while there is a free Canvas mobile app available through iTunes store, some functionality is unavailable when using a mobile phone.  It is assumed you have access to a computer or laptop for full access to functionality in this course.

## Student Support

### Discrimination and Disability Accommodation

Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act Amendments Act (ADAAA) covers issues relating to disability and accommodations. If a student has questions or needs an accommodation in the classroom (all medical information is treated confidentially), contact:

Jesse Haas, Interim Director  
Student Accessibility Services (SAS)  
Corbett Center Student Union, Rm. 208  
Phone: (575) 646-6840  
E-mail: [sas@nmsu.edu](mailto:sas@nmsu.edu) Website: <http://sas.nmsu.edu/>

New Mexico State University, in compliance with applicable laws and in furtherance of its commitment to fostering an environment that welcomes and embraces diversity, does not discriminate on the basis of age, ancestry, color, disability, gender identity, genetic information, national origin, race, religion, retaliation, serious medical condition, sex (including pregnancy), sexual orientation, spousal affiliation, or protected veteran status in its programs and activities, including employment, admissions, and educational programs and activities. Inquiries may be directed to:

Laura Castille, Executive Director

Title IX and Section 504 Coordinator

Office of Institutional Equity

P.O. Box 30001, E. 1130 University Avenue

Las Cruces, NM 88003

575.646.3635; 575-646-7802 (TTY)

[equity@nmsu.edu](mailto:equity@nmsu.edu)

Title IX prohibits sexual harassment, sexual assault, intimate partner violence, stalking and retaliation. For more information on discrimination or Title IX, or to file a complaint contact:

Laura Castille, Executive Director and Title IX Coordinator

Office of Institutional Equity (OIE)

O'Loughlin House, 1130 University Avenue

Phone: (575) 646-3635 E-mail: [equity@nmsu.edu](mailto:equity@nmsu.edu)

Website: <http://equity.nmsu.edu/>

**Other NMSU Resources**

|  |  |  |
| --- | --- | --- |
| NMSU Police Department: | (575) 646-3311 | [www.nmsupolice.com](http://www.nmsupolice.com/) |
| NMSU Police Victim Services: | (575) 646-3424 |  |
| NMSU Counseling Center: | (575) 646-2731 |  |
| NMSU Dean of Students: | (575) 646-1722 |  |
| For Any On-campus Emergencies: | 911 |  |

### Academic Resources

NMSU provides students with academic resources such as tutoring, final exam schedules, library and research, and transcript information on the [NMSU Current Student](https://inside.nmsu.edu/current-students/) webpage.

### Student Support Services

Find information and support on advising, registration, and financial aid on [NMSU Current Student](https://inside.nmsu.edu/current-students/) webpage. You will also find links to the academic calendar, Student Affairs, the student handbook, and Student technologies on this page.

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### Technical Support

The ICT Customer Service Center is equipped to deal with all of your information technology (IT) and telecommunications needs at NMSU. Please feel free to contact them at (575) 646-1840 or via email at [helpdesk@nmsu.edu](mailto:helpdesk@nmsu.edu). You can also go to the Student Technology Help [Student Technology Help](http://studenttech.nmsu.edu/) web page and [Student Resources](http://studenttech.nmsu.edu/learnnmsuedu/) for additional information.

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### Campus Activities

Campus Activities offers activities outside the classroom involvement. The program/services are non-academic and are provided directly to the student. A complete list of offered activities can be found on the [Campus Activity](http://campusactivities.nmsu.edu/) website. You can also go to the [Student Technology Help](http://studenttech.nmsu.edu/) web page and [Student Resources](http://studenttech.nmsu.edu/learnnmsuedu/) located at the [Canvas](http://learn.nmsu.edu) page for additional information.

## Accessibility of eLearning Tools

This course uses several software programs and technologies.  Please read the following for more information about their accessibility.

**Note:** A Voluntary Product Accessibility Template (VPAT) is a standardized form developed by the Information Technology Industry Council to show how a software product meets key regulations of Section 508 of the Rehabilitation Act.

* [Canvas Accessibility](https://www.canvaslms.com/accessibility) Standards and help.
  + Canvas-compatible Screen Readers: [VoiceOver](http://www.apple.com/accessibility/voiceover/) (Mac), [JAWS](http://www.freedomscientific.com/products/fs/jaws-product-page.asp) (PC)
* [Adobe Products Accessibility](https://www.adobe.com/accessibility/products.html) for Adobe Connect 9, Adobe Acrobat, and more.
* [Apple Products VPATs](https://support.apple.com/accessibility/vpat) and [Accessibility features](https://www.apple.com/accessibility/) for Safari Web Browser, macOS, etc.
* [Microsoft Products: Section 508](https://www.microsoft.com/en-us/trustcenter/compliance/compliance-offerings/us-section-508) and [Microsoft Accessibility](https://www.microsoft.com/en-us/accessibility/resources?activetab=pivot_1%3aprimaryr3) for Office, Skype, etc.
* [Google VPATs](https://www.google.com/accessibility/initiatives-research.html) and [Accessibility Products and Features](https://www.google.com/accessibility/products-features.html) for Google Earth, Chrome Web Browser, Google Docs, and more.
* [Firefox Web Browser: Section 508](https://website-archive.mozilla.org/www.mozilla.org/firefox_vpat/firefox-vpat-3.html) (version 3.5 and later)
* [Zoom Accessibility Features](https://zoom.us/accessibility).

## Privacy Policies

We take seriously the protection of your personal privacy.  The privacy policies for the software used in this course are noted below:

* [Canvas Privacy Policy](https://www.canvaslms.com/policies/privacy)
* [Adobe Privacy Policy](https://www.adobe.com/privacy/policy.html)
* [FireFox Privacy Policy](https://www.mozilla.org/en-US/privacy/firefox/)
* [Google Product Privacy Guide](https://policies.google.com/technologies/product-privacy) (e.g., Chrome, Google Drive, YouTube)
* [Microsoft Privacy Policy](https://privacy.microsoft.com/en-us/privacystatement)
* [Apple Privacy Policy for software and devices](https://www.apple.com/privacy/)
* [Zoom Privacy Policy](https://zoom.us/privacy/)

## Course Schedule

See the Canvas calendar for recommended due dates.

## Syllabus Modifications

Should changes to this syllabus be necessary, the instructor will send you a Canvas announcement.