NEW MEXICO
HIGHER EDUCATION
DEPARTMENT

Fostering Student Success from Cradle to Career

Michelle Lujan Grisham, Govenor
Stephanie M. Rodriguez, Cabinet Secretary
Patricia Trujillo, Deputy Secretary

General Education Request Application

Application Number	4419
Institution	SFCC
Applicant(s)	sarah.hood@sfcc.edu
Status	NMHED_REVIEW
Submitted	2025-09-10 10:25 AM (US/Mountain)

Gened Request Form

Contact Information

Chief Academic Officer Name
Margaret Peters

Chief Academic Officer Email
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Registrar Name
Bernadette Gonzales

Registrar Email
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Course's Academic Department
English

Is this a Application a Re-Submission
no

Institutional Course Information

Prefix
LIBR

Number
1111

Title
Introduction to Information Literacy in an Electronic Environment

Number of credits
3

Was this course previously part of the New Mexico General Education curriculum?
No

Is this application for your entire system (ENMU, NMSU, & UNM)?
Yes

Co-requisite Course

Prefix
na

Number
na

Title
na

New Mexico Common Course Information

Prefix
LIBR

Number
1111

Title
Introduction to Information Literacy in an Electronic Environment

A. Content Area and Essential Skills

To which area should this course be added?
Humanities

Selected Areas
Critical Thinking, Personal & Social Responsibility, Information & Digital Literacy

Section B. Learning Outcomes

List all common course student learning outcomes for the course.

1. Develop a research plan based on an information need.
2. Find information efficiently and effectively using a variety of search tools.
3. Evaluate the reliability of an information resource.
4. Practice ethical behavior in using information.

-Per pp. 612-613 of https://hed.nm.gov/uploads/documents/Course_Catalog_V7.pdf

List all institution-specific Student Learning Outcomes that are common to all course sections offered at the institutions regardless of instructor.

1. Develop a research plan based on an information need.
2. Find information efficiently and effectively using a variety of search tools.
3. Evaluate the reliability of an information resource.
4. Practice ethical behavior in using information.

Section C. Narrative

In the boxes provided, write a short (~300 words) narrative explaining how the course weaves the essential skills associated with the content area throughout the course. Explain what students are going to do to develop the essential skills and how you will assess their learning. The narrative should be written with a general audience in mind and avoid discipline specific jargon as much as possible.

Critical Thinking. Problem Setting; Evidence Acquisition; Evidence Evaluation; and Reasoning /Conclusion. In this box, provide a narrative that explains how the proposed course addresses all of the components of critical thinking.

Critical thinking is at the heart of this course, and students will practice it consistently through both structured assignments and ongoing discussions. At the beginning of the semester, students learn to identify and frame questions about information; this is the problem-setting stage. For example, when choosing a topic for their final research project, they are guided to refine broad interests into specific, researchable questions.

Once a problem is set, students practice evidence acquisition by locating relevant information across different platforms, ranging from library databases and websites to digital tools. Along the way, they gain hands-on experience in organizing their search strategies, expanding or narrowing keywords, and exploring how context shapes what information is available.

Evidence evaluation is emphasized in every unit. Students do more than just collect sources; they learn to question credibility, examine potential bias, and weigh the strengths and weaknesses of each piece of evidence. For instance, they compare how different news outlets report on the same issue or analyze how algorithms influence the visibility of online information.

Finally, students bring these skills together in reasoning and conclusion. Through discussions, quizzes, and short assignments, they practice drawing logical connections between evidence and their original questions. The culminating activity (Final Project) requires students to synthesize what they have gathered and evaluated, presenting their findings in a way that demonstrates clear reasoning and justified conclusions.

Assessment of these skills occurs throughout the course. Weekly discussions allow for low-stakes practice and peer feedback. Quizzes provide checks for understanding. Project check-ins give structured opportunities to apply skills step-by-step. The final research project serves as a comprehensive measure, showing how well students can move from defining a problem to presenting a thoughtful, evidence-based conclusion.

Personal & Social Responsibility. Intercultural reasoning and intercultural competence; Sustainability and the natural and human worlds; Ethical reasoning; Collaboration skills, teamwork and value systems; and Civic discourse, civic knowledge and engagement – local and global In this box, provide a narrative that explains how the proposed course addresses 2 of the components of personal & social responsibility.

This course emphasizes personal and social responsibility by helping students practice ethical reasoning and civic engagement in the context of information use.

First, ethical reasoning is woven throughout the course as students explore how information is created, shared, and used. They examine issues such as plagiarism, copyright, academic publishing, and the ethical implications of generative AI tools. Students are asked to reflect on their own responsibility when using information, whether that means citing sources properly, being transparent about AI use, or recognizing the potential harm of spreading misinformation. By engaging with real-world scenarios, such as analyzing misleading advertisements or questioning the credibility of online news, students learn to balance personal convenience with ethical responsibility to others. These activities help students see how their choices affect not only their own academic integrity but also the broader information environment.

Second, civic discourse and engagement are addressed through assignments that connect course content to democratic participation and social well-being. For example, students analyze how misinformation, media bias, and the decline of local journalism impact civic knowledge and decision-making. Discussions encourage students to respectfully engage with differing viewpoints and to consider the role of trustworthy information in sustaining healthy communities. The course highlights how informed citizens can critically evaluate information before sharing it and how doing so contributes to more responsible public discourse.

Assessment of these components happens through weekly discussions, reflective assignments, and the final research project. Students demonstrate their ethical reasoning by applying citation practices, evaluating the credibility of information, and reflecting on their own media habits. They demonstrate civic knowledge and discourse skills through structured discussions, where they practice articulating informed positions, listening to peers, and connecting information literacy concepts to broader social issues.

Information & Digital Literacy. Authority and Value of Information; Digital Literacy; Information Structure; and Research as Inquiry. In this box, provide a narrative that explains how the proposed course addresses 3 of the components of digital literacy.

This course develops students' ability to navigate today's complex information landscape by focusing on three essential components: authority and value of information, digital literacy, and research as inquiry.

First, students examine the authority and value of information by learning how credibility is established and challenged in different contexts. They explore questions such as: Who decides what counts as trustworthy knowledge? How does authority shift depending on cultural or disciplinary perspectives? Through activities comparing scholarly sources, news media, and community-based knowledge, students learn to assess value not just by surface-level markers like publication type, but also by context, purpose, and audience.

Second, the course builds digital literacy through hands-on practice with search engines, databases, and digital tools. Students learn advanced search strategies, evaluate websites for credibility, and analyze how algorithms influence the information they encounter daily. By tracking their own media habits and considering the role of social media and AI tools in shaping what they see, students develop the skills to not only locate digital content but to question how and why it appears. This strengthens their ability to engage responsibly in an information-rich world.

Finally, the course emphasizes research as inquiry, showing students that research is not a one-time task but an ongoing, iterative process. Students begin by setting broad questions, then refine them as they gather, evaluate, and reflect on evidence. Regular project check-ins, discussion boards, and reflective assignments guide them through this cycle of inquiry. The culminating research project allows students to synthesize their learning, demonstrating how inquiry evolves from curiosity to evidence-based understanding.

Together, these components prepare students to critically and confidently engage with digital information, equipping them to be thoughtful researchers and informed participants in academic and civic life.

Section D. Assessment Plan

Link to Institution's General Education Assessment Plan

https://www.sfcc.edu/54536-2/

Application History

Type	username	Text	Timestamp
Submittal	sarah.hood@sfcc.edu	Submitted by sarah.hood@sfcc.edu	2025-09-10 10:25 AM (US/Mountain)
Authorization	sarah.hood@sfcc.edu	sarah.hood@sfcc.edu has authorized the application for submittal	2025-09-10 10:25 AM (US/Mountain)
Created	sarah.hood@sfcc.edu	Application started by sarah.hood@sfcc.edu	2025-09-08 04:24 PM (US/Mountain)

🔍 S.I.F.T. Method for Evaluating Information

When evaluating information use the S.I.F.T. Method!
Modified from Mike Caulfield's "SIFT: The Four Moves:
https://hapgood.us/2019/06/19/sift-the-four-moves/

✅ Stop, Investigate, Find better coverage, Trace info to original source

SIFT was developed to evaluate dubious claims, but it can be applied to any research you do! This worksheet is adapted and modified slightly to reflect this.

🛑 STOP

We can all be tempted to lower our guard and accept information that isn't reliable. So before you accept information you come across as accurate, reliable and trustworthy – stop – and do your best to gauge whether you may be experiencing one or more of the following:

"Yep - this'll work"

- 😴 Search Fatigue: You've been searching for a long time and just want to settle for whatever looks good enough.
- ⏰ Rushed Deadlines: You're in a hurry, and accuracy starts to feel less important than finishing on time.
- 🛋️ Convenience Over Quality: Easy access or immediate availability of information makes it appealing, even if questionable.

"Yes! They get me!"

- 😡 Emotional Appeal: The content provokes strong emotions (fear, excitement, anger), clouding your judgment about its credibility.
- 💡 Confirmation Bias: The information aligns with what you already believe or want to hear, so you don't look deeper.

"Looks good to me"

- 🤔 Lack of Expertise: You feel uncertain about your own knowledge in the subject, leading you to accept the first thing that seems plausible.

- 🌟 Surface Credibility: At first glance, the source looks professional or authoritative, causing you not to investigate further.
- 🔥 Popular or Viral Content: The information is widely shared, making it feel trustworthy even if it hasn't been vetted.

Okay, now we're ready to dig in!

📑 Pick a Source 📝

Pick a source related to your chosen topic for your Final Project. It could be a source you already know you're going to include in your Annotated Bibliography, a source you're still sniffing out, or even a brand new source you've just come across. That's the source you'll be working with throughout this worksheet.

🖊️ Title of Your Source: ____

📖 Type of Source (website, library database resource, book/ebook, video, podcast, print/hardcopy document, interview, etc.):

____

😵 INVESTIGATE THE SOURCE 🔎

Who is the author/creator? What expertise do they have? What organization(s) are they affiliated with?

👤 Who is the author/creator? ______________________________________

Is this their full, real name? If not, what is their full, real name?

____

🎓 Educational background:

• Degrees/Credentials: ____

• Field of study: ____

🔍 What else can you find out about them? (Look beyond their own website to avoid bias!):

💼 Relevant work experience and past positions:

🌟 Lived experiences relevant to the source:

This can be a little hard to navigate. For some fields/areas, one's lived experiences can be a powerful and unique means of informing. Does the author/creator of your source have a lived experience that adds value to their information?

🏢 Organization responsible for the content (Is the creator/author affiliated with an organization?):

🌐 If yes, note important info about that organization (consider potential bias!):

🧨 Reputation check (Google them. See what others have said about them):

⚖️ Does it seem like this group/organization is objective and fact-based? Biased? Do they have an agenda? Mixture?

🌐 FIND ADDITIONAL COVERAGE 📢

Is your source making a controversial claim or taking a controversial position?

(If not, assume, for the sake of this exercise, that you have a skeptical naysayer who doesn't trust the information from the source you're using, and identify any claim, position or piece of information you believe you could 'back up' with additional reputable sources.)

Summarize that claim or position into a question, statement, or keywords below:

🔑 Summary of Claim/Position:

____

____

Are you able to find at least one additional, reputable source that supports the claim, position or piece of information you identified above?

YES NO

If yes,

📌 Name of Source:

____

____

🛡️ Reason for Trust:

____

____

🔍 TRACE IT BACK 😨

If you're not able to find at least one additional, reputable source that supports the claim, position or piece of information you identified, you'll need to trace it back to its original source if at all possible. (I realize that, depending on your topic and source, this may not always be possible, but Ido ask that you make a good faith effort to do so! 😊)

____

____

Rubric: SIFT Method Worksheet (20 pts)

Criteria	Excellent (18-20)	Satisfactory (11-14)	Needs Improvement (4-8)	Absent/Missing (0-1 pts)
SOURCE: Pick/identify a source (2 pts)	Source and Source Type are clearly identified. (2)	Title or Type of source is missing (1)		Both Title and Type are missing (0)
INVESTIGATE: Author/Source Evaluation (8 pts)	Thoroughly investigates the author/organization with specific details about credentials, affiliations, and possible bias. Cross-checks with external sources. (7-8)	Provides basic information on author/organization with some effort to assess credibility and bias. (4-6)	Provides minimal or vague information; little to no effort to evaluate credibility or verify details. (1-3)	This section is missing (0)
FIND: Additional Coverage (7 pts)	Identifies a claim and successfully finds a reputable source for comparison or verification. Clearly explains why the new source is trustworthy.(6-7)	Identifies a claim and attempts to find another source; provides some reasoning for trustworthiness. (4-5)	Struggles to identify a claim or fails to find/justify an additional source. (1-3)	This section is missing (0)
Overall Critical Thinking and Application of SIFT (3 pts)	Demonstrates deep understanding of SIFT method; applies it critically and insightfully throughout worksheet. (3)	Shows general understanding of SIFT; applies it with some critical thought. (2)	Demonstrates limited understanding or misapplication of SIFT concepts. (1)	

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📖 Type of Source (website, library database resource, book/ebook, video, podcast, print/hardcopy document, interview, etc.):

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🧐 INVESTIGATE THE SOURCE 🔎

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👤 Who is the author/creator? ______________________________________

Is this their full, real name? If not, what is their full, real name?

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🎓 Educational background:

• Degrees/Credentials: ____

• Field of study: ____

🔍 What else can you find out about them? (Look beyond their own website to avoid bias!):

💼 Relevant work experience and past positions:

🌟 Lived experiences relevant to the source:

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____

Are you able to find at least one additional, reputable source that supports the claim, position or piece of information you identified above?

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If yes,

📌 Name of Source:

____

____

🛡️ Reason for Trust:

____

____

🔍 TRACE IT BACK 🦉

If you're not able to find at least one additional, reputable source that supports the claim, position or piece of information you identified, you'll need to trace it back to its original source if at all possible. (I realize that, depending on your topic and source, this may not always be possible, but Ido ask that you make a good faith effort to do so! 😊)

____

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Rubric: SIFT Method Worksheet (20 pts)

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Fostering Student Success from Cradle to Career

Michelle Lujan Grisham, Govenor
Stephanie M. Rodriguez, Cabinet Secretary
Patricia Trujillo, Deputy Secretary

General Education Request Application

Application Number	5594
Institution	NTU
Applicant(s)	pboahene@navajotech.edu
Status	NMHED_REVIEW
Submitted	2025-12-16 09:06 AM (US/Mountain)

Gened Request Form

Contact Information

Chief Academic Officer Name
Colleen Bowman

Chief Academic Officer Email
cbowman@navajotech.edu

Registrar Name
Jason Wright

Registrar Email
jasonwright@navajotech.edu

Course's Academic Department
Arts & Humanities

Is this a Application a Re-Submission
yes

Describe the Clarifications to the Original Application
In the original application, the instructor incorrectly identified communication as the content area. The reapplication correctly classifies the course under Creative & Fine Arts.

Institutional Course Information

Prefix
ENGL

Number
2340

Title
Introduction to Creative Nonfiction Writing

Number of credits
3

Was this course previously part of the New Mexico General Education curriculum?
No

Is this application for your entire system (ENMU, NMSU, & UNM)?
No

Co-requisite Course

Prefix
N/A

Number
N/A

Title
N/A

New Mexico Common Course Information

Prefix
ENGL

Number
2340

Title
Introduction to Creative Nonfiction Writing

A. Content Area and Essential Skills

To which area should this course be added?
Creative & Fine Arts

Selected Areas
Critical Thinking, Personal & Social Responsibility, Communication

Section B. Learning Outcomes

List all common course student learning outcomes for the course.

1. Engage in a constructive conversation and community about Creative Nonfiction.
2. Read and critically engage with a variety of Creative Nonfiction works.
3. Compose Creative Nonfiction.
4. Provide respectful, honest, and critical feedback to peers on their work.
5. Learn a language that provides groundwork for workshop structure and peer critique.
6. Revise creative work based on peer feedback and critique.
7. Develop thoughtful workshop reflections on students' own writing and writing process.
8. Evaluate and engage with the publication process.

List all institution-specific Student Learning Outcomes that are common to all course sections offered at the institutions regardless of instructor.

N/A

Section C. Narrative

In the boxes provided, write a short (~300 words) narrative explaining how the course weaves the essential skills associated with the content area throughout the course. Explain what students are going to do to develop the essential skills and how you will assess their learning. The narrative should be written with a general audience in mind and avoid discipline specific jargon as much as possible.

Communication. Genre and Medium Awareness, Application and Versatility; Strategies for Understanding and Evaluating Messages; and Evaluation and Production of Arguments. In this box, provide a narrative that explains how the proposed course addresses all of the components of communication.

Genre and Medium Awareness, Application and Versatility:
This course introduces students to the fundamental modes of Creative Nonfiction (CNF) through reading, discussion, and workshop practice. Students read and analyze classic and contemporary CNF, identifying the craft techniques writers use to shape truth-based storytelling. Through writing assignments and workshops, they practice these techniques in their own work. Homework, projects, and quizzes assess their understanding of CNF's principles and creative application. In Blackboard discussions and workshop sessions, students communicate ideas, share feedback, and refine their voices as writers. The midterm oral presentation allows them to present arguments grounded in analysis and reflection, while the final portfolio showcases their creativity, authenticity, and mastery of the genre. The Diné Philosophy of Education guides each stage of learning and reflection (See attachments).
Strategies for Understanding and Evaluating Messages:
Students engage in critical conversations about texts, examining how narrative techniques communicate meaning and emotion. They apply these insights in their own writing, transforming theoretical understanding into creative practice. Discussions, reading responses, and short written analyses assess their ability to interpret messages and evaluate how form and style influence meaning.
Evaluation and Production of Arguments:
Students evaluate peers' writing and provide constructive, evidence-based feedback through workshops and discussions. They learn to describe, analyze, and interpret the elements of CNF while building their own arguments about storytelling and truth. Through peer review, revision, and reflection, students strengthen their analytical and persuasive writing. Assessments focus on their ability to produce well-supported arguments and thoughtfully integrate critique into improved drafts.

Critical Thinking. Problem Setting; Evidence Acquisition; Evidence Evaluation; and Reasoning /Conclusion. In this box, provide a narrative that explains how the proposed course addresses all of the components of critical thinking.

Problem Setting:
Students formulate a clear, researchable question that addresses an open-ended issue within a relevant context. They define and describe the components of the problem, demonstrating curiosity, critical thinking, and intellectual engagement consistent with Nitsáhákees (intellect and imagination). Class discussions, proposal drafts, and reflective statements assess their ability to articulate meaningful questions and connect them to course concepts and real-world applications.
Evidence Acquisition:
Students gather information from a variety of credible sources, demonstrating discernment and self-reliance aligned with Nahat'á (preparation and motivation). They identify, compare, and evaluate resources for relevance and credibility, recognizing how personal assumptions influence their interpretations. Research logs, annotated bibliographies, and source evaluations assess their ability to collect and organize reliable evidence that supports their research question.
Evidence Evaluation:
Students critically analyze the information they have gathered, assessing the strength and credibility of evidence. They evaluate perspectives, detect bias, and synthesize key insights into coherent arguments. These activities reflect Iiná (collaboration and respect) as students engage with peer feedback and diverse viewpoints. Analytical summaries, class discussions, and peer review exercises measure their ability to interpret and evaluate data effectively.
Reasoning and Conclusion:
Students apply Sih Hasin (wisdom and reflection) as they draw reasoned conclusions from their research and analyses. They identify weak and strong arguments, recognize logical fallacies, and employ sound evidence and reasoning to construct persuasive claims. Writing assignments, oral presentations, and final projects assess their ability to integrate evidence, demonstrate reflective judgment, and communicate well-supported conclusions grounded in both critical and Diné-centered ways of thinking (See figure 2)

Personal & Social Responsibility. Intercultural reasoning and intercultural competence; Sustainability and the natural and human worlds; Ethical reasoning; Collaboration skills, teamwork and value systems; and Civic discourse, civic knowledge and engagement – local and global In this box, provide a narrative that explains how the proposed course addresses 2 of the components of personal & social responsibility.

Intercultural Reasoning and Intercultural Competence
Students engage with creative nonfiction texts that explore a wide range of cultural, social, and personal experiences. Through reading memoirs, essays, and literary nonfiction from diverse authors, students analyze how identity, culture, and context influence narrative voice and storytelling choices. They then create their own nonfiction pieces in which they thoughtfully incorporate perspectives different from their own, demonstrating empathy and ethical engagement. Classroom discussions and reflective writing exercises further encourage students to consider how cultural differences shape understanding and communication, helping them to navigate diverse viewpoints responsibly.
Collaboration Skills, Teamwork, and Value Systems
Students enhance collaboration skills and understanding of value systems through structured peer review workshops and group writing exercises. In these activities, students provide and receive constructive feedback, negotiate differing interpretations, and reflect on how personal values influence both their own writing and their responses to others. Participation in these collaborative processes cultivates effective teamwork, active listening, and respectful dialogue. Students' growth in collaboration is assessed through peer review contributions, group project outcomes, and self-reflections that evaluate their ability to work ethically and effectively within a team setting.

Section D. Assessment Plan

Link to Institution's General Education Assessment Plan

https://www.navajotech.edu/academics/general-education/

Application History

Type	username	Text	Timestamp
Submittal	pboahene@navajotech.edu	Submitted by pboahene@navajotech.edu	2025-12-16 09:06 AM (US/Mountain)
Authorization	pboahene@navajotech.edu	pboahene@navajotech.edu has authorized the application for submittal	2025-12-16 09:06 AM (US/Mountain)
Created	pboahene@navajotech.edu	Application started by pboahene@navajotech.edu	2025-12-16 09:00 AM (US/Mountain)

Sample Assessment

Essential Skills: Communication, Critical Thinking, and Personal & Social Responsibility
Evaluation Criteria for Creative Nonfiction: 100 points possible

Exchange papers with your Writing Partner, then evaluate their work using this form. *

Title of Piece: **Written by:**

Reviewed by: **Date:**

Does the opening or "lead" draw you in by teasing your interest, creating a mystery, a puzzle or a question that in some way grabs and holds your attention? Yes or No. Comments:

Is the theme of the story clearly stated? That is, does it answer the question, what's this story all about and, more importantly, why should we care? [Typically, when the theme isn't clearly stated, the story will start to meander in different directions.] Yes or No. Comments:

Does the opening or "lead" of the story relate and connect to its main theme? [Every writer has an assumed "contract with the reader" to deliver what's promised. If the story doesn't deliver what the lead promises, readers will likely stop reading.] Yes or No. Comments:

Does the writer use specific, concrete detail and relevant facts or vague or abstract generalities?

Yes or No. Comments:

Does the story touch us emotionally? Does it provoke, enrage, incite, inspire, delight, numb, make us laugh, make us cry or, in other ways, move us on an emotional level? Yes or No. Comments:

Does the work deliver sufficient proof to make it credible? Does it demonstrate the writer's use of telling details, facts, statistics, quotes, and /or other material from primary and secondary sources? Yes or No. Comments:

Does the story provide historical context to help illuminate the current developments and the characters who are acting or being acted upon by the current development? Yes or No. Comments:

Does the story have parts and a structure that fit together into a coherent whole, with a clear beginning, middle and end? Yes or No. Comments:

Has the writer identified and sufficiently developed the story's dramatic elements, such as conflict, contention, confusion and resolution?

Do the people presented in the story come across as multi-dimensional characters that think, feel, laugh and cry? Yes or No. Comments:

Does the writer employ metaphor, scenes, dialogue, and other storytelling devices to make their tales more vivid and alive on the page? Yes or No. Comments:

Does the story possess a lyrical quality and give the impression that the writer has considered the tone, the sound of the language, the rhythm, and the pacing of the prose? Yes or No. Comments:

Figure 1

Diné Philosophy of Education Critical Thinking Model
<u>Course-level</u>
Nitsahakees
Nahat'a
Íiná
Siihasin

SETTING GOALS

NITSAHAKEES.	THINKIT.
NAHAT'A.	PLANIT.
IINA.	IMPLEMENT IT.
SIIHASIN.	REFLECTONIT.

WITHDINEPRINCIPLES

Sample Assessment

Essential Skills: Communication, Critical Thinking, and Personal & Social Responsibility
Evaluation Criteria for Creative Nonfiction: 100 points possible

Exchange papers with your Writing Partner, then evaluate their work using this form. *

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Does the opening or "lead" draw you in by teasing your interest, creating a mystery, a puzzle or a question that in some way grabs and holds your attention? Yes or No. Comments:

Is the theme of the story clearly stated? That is, does it answer the question, what's this story all about and, more importantly, why should we care? [Typically, when the theme isn't clearly stated, the story will start to meander in different directions.] Yes or No. Comments:

Does the opening or "lead" of the story relate and connect to its main theme? [Every writer has an assumed "contract with the reader" to deliver what's promised. If the story doesn't deliver what the lead promises, readers will likely stop reading.] Yes or No. Comments:

Does the writer use specific, concrete detail and relevant facts or vague or abstract generalities?

Yes or No. Comments:

Does the story touch us emotionally? Does it provoke, enrage, incite, inspire, delight, numb, make us laugh, make us cry or, in other ways, move us on an emotional level? Yes or No. Comments:

Does the work deliver sufficient proof to make it credible? Does it demonstrate the writer's use of telling details, facts, statistics, quotes, and /or other material from primary and secondary sources? Yes or No. Comments:

Does the story provide historical context to help illuminate the current developments and the characters who are acting or being acted upon by the current development? Yes or No. Comments:

Does the story have parts and a structure that fit together into a coherent whole, with a clear beginning, middle and end? Yes or No. Comments:

Has the writer identified and sufficiently developed the story's dramatic elements, such as conflict, contention, confusion and resolution?

Do the people presented in the story come across as multi-dimensional characters that think, feel, laugh and cry? Yes or No. Comments:

Does the writer employ metaphor, scenes, dialogue, and other storytelling devices to make their tales more vivid and alive on the page? Yes or No. Comments:

Does the story possess a lyrical quality and give the impression that the writer has considered the tone, the sound of the language, the rhythm, and the pacing of the prose? Yes or No. Comments:

Figure 1

Diné Philosophy of Education Critical Thinking Model
Course-level
Nitsahakees
Nahat'a
Íiná
Siihasin

SETTING GOALS

NITSAHAKEES.	THINKIT.
NAHAT'A.	PLANIT.
IINA.	IMPLEMENT IT.
SIIHASIN.	REFLECTONIT.

WITHDINEPRINCIPLES

NEW MEXICO
HIGHER EDUCATION
DEPARTMENT

Fostering Student Success from Cradle to Career

Michelle Lujan Grisham, Govenor
Stephanie M. Rodriguez, Cabinet Secretary
Patricia Trujillo, Deputy Secretary

General Education Request Application

Application Number	5636
Institution	NTU
Applicant(s)	pboahene@navajotech.edu
Status	NMHED_REVIEW
Submitted	2025-12-21 02:25 PM (US/Mountain)

Gened Request Form

Contact Information

Chief Academic Officer Name
Colleen Bowman

Chief Academic Officer Email
cbowman@navajotech.edu

Registrar Name
Jason Wright

Registrar Email
jasonwright@navajotech.edu

Course's Academic Department
Science

Is this a Application a Re-Submission
no

Institutional Course Information

Prefix
CHEM

Number
2130

Title
ORGANIC CHEMISTRY I

Number of credits
3

Was this course previously part of the New Mexico General Education curriculum?
No

Is this application for your entire system (ENMU, NMSU, & UNM)?
No

Co-requisite Course

Prefix
CHEM

Number
1225C

Title
General Chemistry II Lecture and Laboratory for STEM Majors

New Mexico Common Course Information

Prefix
CHEM

Number
2130

Title
ORGANIC CHEMISTRY I

A. Content Area and Essential Skills

To which area should this course be added?
Science

Selected Areas
Critical Thinking, Quantitative Reasoning, Personal & Social Responsibility

Section B. Learning Outcomes

List all common course student learning outcomes for the course.

1. Review properties of elements and molecules discussed in general chemistry (electronegativity, bonding, formal charge, octet rule).
2. Review chemical reactions discussed in general chemistry (products, reactants, balanced equations, byproducts).
3. Classify organic compounds and their properties by functional group, including substitution and elimination reactions of alkyl halides, reactions of alkenes, alkynes, alcohols, ethers, epoxides, amines, and thiols.
4. Use common and IUPAC rules of nomenclature to name organic compounds.
5. Review the structure and stability of compounds.
6. Comprehend the relationship between structure and reactivity.
7. Comprehend configurations of organic compounds (resonance structures, stereochemistry, isomers).
8. Interpret spectral properties and use in structure determination.
9. Correctly describe the 45 step synthesis of a simple organic molecule using reactions learned in the class.

List all institution-specific Student Learning Outcomes that are common to all course sections offered at the institutions regardless of instructor.

N/A

Section C. Narrative

In the boxes provided, write a short (~300 words) narrative explaining how the course weaves the essential skills associated with the content area throughout the course. Explain what students are going to do to develop the essential skills and how you will assess their learning. The narrative should be written with a general audience in mind and avoid discipline specific jargon as much as possible.

Critical Thinking. Problem Setting; Evidence Acquisition; Evidence Evaluation; and Reasoning /Conclusion. In this box, provide a narrative that explains how the proposed course addresses all of the components of critical thinking.

Problem Setting
Students define and frame organic chemistry problems by interpreting reaction scenarios, synthesis prompts, and structural analysis questions. They identify what needs to be solved, select relevant chemical concepts (e.g., functional groups, stereochemistry, resonance), and translate information into chemical representations such as structures and reaction schemes. Instructors assess this skill through homework, quizzes, and exam questions that require students to correctly formulate problems, identify key variables, and set up appropriate solution strategies.

Evidence Acquisition
Students gather chemical evidence by analyzing molecular structures, reaction pathways, and spectral data (IR, NMR, and UV/Vis). They extract relevant information from lectures, readings, and provided datasets to support predictions and structural assignments. Instructors assess evidence acquisition through problem sets, quizzes, and exams that require students to interpret spectra, identify functional groups, and collect data needed to support chemical claims.

Evidence Evaluation
Students evaluate evidence by comparing predicted reactions with mechanistic rules and by testing

proposed structures against spectral and stability data. They weigh alternative explanations, identify inconsistencies, and determine whether evidence supports or refutes a hypothesis. Instructors assess this skill using exam questions and data-analysis problems that require students to justify decisions, eliminate incorrect options, and explain outcomes using chemical principles.

Reasoning and Conclusion
Students integrate evidence and theory to explain reaction mechanisms, stereochemical outcomes, and synthesis plans. They articulate logical, step-by-step reasoning and defend conclusions with chemical evidence. Instructors assess reasoning through cumulative exams and synthesis-based problems that measure clarity, accuracy, and the strength of evidence-based conclusions.

Quantitative Reasoning. Communication/Representation of Quantitative Information; Analysis of Quantitative Arguments; and Application of Quantitative Models. In this box, provide a narrative that explains how the proposed course addresses all of the components of quantitative reasoning.

Communication / Representation of Quantitative Information:
Students learn to accurately interpret and represent quantitative chemical information using tables, spectra, graphs, and calculations. They translate given data, such as reaction yields, melting points, retention times, or absorbance values, into precise numerical and visual formats. This practice reinforces their ability to communicate chemical information clearly, logically, and in alignment with structural, mechanistic, and functional group concepts discussed in class.

Analysis of Quantitative Arguments:
Students critically evaluate numerical and spectral data to identify trends, assess reaction efficiency, and compare theoretical predictions. They interpret spectral information (IR, NMR, UV/VIS) and theoretical chromatographic outcomes, assess uncertainties, and determine whether data support proposed mechanisms, stereochemical reasoning, or predicted product formation. This process strengthens students' ability to connect quantitative evidence to molecular structure and reactivity.

Application of Quantitative Methods:
Students apply quantitative reasoning to solve problems involving reaction yields, purity estimates, kinetics, thermodynamic trends, and spectral features (e.g., NMR integration, IR peak intensity). Problem sets, case studies, and spectral interpretation exercises reinforce the use of quantitative methods to understand organic reactions and multi-step syntheses. Assessments through quizzes, homework, and data-analysis tasks develop students' skills in data-driven reasoning and chemical problem-solving.

Personal & Social Responsibility. Intercultural reasoning and intercultural competence; Sustainability and the natural and human worlds; Ethical reasoning; Collaboration skills, teamwork and value systems; and Civic discourse, civic knowledge and engagement – local and global In this box, provide a narrative that explains how the proposed course addresses 2 of the components of personal & social responsibility.

Ethical Reasoning
Students practice ethical scientific reasoning by accurately recording, analyzing, and reporting chemical data in problem sets, exams, and applied analysis tasks. They follow accepted scientific conventions, avoid fabrication or misrepresentation of results, and clearly document assumptions and limitations in their analyses. Through guided discussions and case-based examples, students examine the environmental, societal, and safety implications of chemical reactions and processes. Instructors assess ethical reasoning by evaluating the accuracy and transparency of student work, the appropriate use of data and chemical evidence, and students' ability to articulate responsible decision-making in written responses and exam explanations.

Collaboration, Teamwork, and Value Systems
Students actively collaborate during group problem-solving activities, structured discussions, and case-study

analyses. They share approaches, question assumptions, provide constructive feedback, and jointly develop solutions to organic chemistry problems. These activities emphasize professionalism, accountability, and respect for diverse perspectives. Instructors assess collaboration through group assignments, participation in guided discussions, and peer-informed evaluations that measure engagement, contribution to group work, and the quality of collaborative reasoning and communication.

Section D. Assessment Plan

Link to Institution's General Education Assessment Plan

https://www.navajotech.edu/academics/general-education/

Application History

Type	username	Text	Timestamp
Submittal	pboahene@navajotech.edu	Submitted by pboahene@navajotech.edu	2025-12-21 02:25 PM (US/Mountain)
Authorization	pboahene@navajotech.edu	pboahene@navajotech.edu has authorized the application for submittal	2025-12-21 02:25 PM (US/Mountain)
Created	pboahene@navajotech.edu	Application started by pboahene@navajotech.edu	2025-12-21 02:10 PM (US/Mountain)

Assignment: Organic Chemistry-I CHEM-2130

Read and strictly follow all instructions below:

Note: This sheet is only for questions. Do not write answers on this sheet. Use separate physical pages for your hand-written assignment.

Instructions:

- All assignments must be hand-written on separate physical pages.
- Include steps, observations, calculations, and conclusions for every task or question.
- Last date of submission: 2 weeks from date of posting. There will not be any individual reminders.
- Clearly write your name, date, and class on the assignment.
- Assignments must be submitted in physical form. Not online, not via email, and not on Blackboard.

Assignment: Stereochemistry in Organic Molecules

Objective: To understand stereochemistry concepts in organic chemistry by identifying types of isomerism, determining chirality, drawing stereoisomers, and analyzing optical activity.

Instructions:

1. **Identify Stereocenters:**
   - For each given molecule, identify all stereocenters (chiral centers).
   - Clearly mark the stereocenters on the structure.
2. **Determine Types of Isomerism:**
   - Identify if the molecule exhibits:
     - **Structural isomerism** (constitutional isomers)
     - **Stereoisomerism**: Enantiomers or diastereomers
     - **Geometrical (cis/trans or E/Z) isomerism**

    - Explain your reasoning.

3. **Draw All Stereoisomers:**
    - For molecules with chiral centers, draw all possible stereoisomers.
    - Use wedges (solid and dashed) to indicate three-dimensional orientation.
4. **Assign R/S Configuration:**
    - For each stereocenter, assign **R** or **S** configuration using the Cahn-Ingold-Prelog priority rules.
5. **Determine Optical Activity:**
    - Indicate whether each stereoisomer is optically active or inactive.
    - Provide reasoning (e.g., meso compounds are optically inactive).
6. **Create a Table:**
    - Organize your results into a table with the following columns:| Molecule | Stereocenters | Type of Isomerism | Drawn Stereoisomers | R/S Configuration | Optical Activity | Notes/Reasoning |

Example: 2-Butanol

Step 1: Identify Stereocenters: Carbon 2 has four different groups → chiral center

Step 2: Type of Isomerism: Stereoisomerism: Enantiomers (non-superimposable mirror images)

Step 3: Draw Stereoisomers: Draw (R)-2-butanol and (S)-2-butanol using wedges and dashes

Step 4: Assign R/S Configuration: Apply Cahn-Ingold-Prelog rules:

- (R)-2-butanol: clockwise priority
- (S)-2-butanol: counterclockwise priority

Step 5: Optical Activity: Both enantiomers are optically active and rotate plane-polarized light in opposite directions

Step 6: Table Entry

Molecule	Stereocenters	Type of Isomerism	Drawn Stereoisomers	R/S Configuration	Optical Activity	Notes/Reasoning
2-Butanol	C2	Enantiomers	(R) & (S) forms	R, S	Active	Mirror images

Suggested Molecules for Assignment

2-Butanol, 2-Chlorobutane, 1,2-Dichlorocyclohexane, Lactic Acid (2-Hydroxypropanoic acid), 2,3-Butanediol, Cis-2-Butene and Trans-2-Butene, 1-Bromo-1-chloro-2-fluoroethane

Instructions for Students:

- Follow the example of 2-Butanol for all molecules.
- Show all steps, clearly mark stereocenters, and provide reasoning for all configurations.
- Fill in the table completely for each molecule.
- Use separate physical pages for each molecule.

All assignments must be hand-written on separate physical pages.

<u>Assignment: Organic Chemistry-I CHEM-2130</u>

Read and strictly follow all instructions below:

Note: This sheet is only for questions. Do not write answers on this sheet. Use separate physical pages for your hand-written assignment.

Instructions:

- All assignments must be hand-written on separate physical pages.
- Include steps, observations, calculations, and conclusions for every task or question.
- Last date of submission: 2 weeks from date of posting. There will not be any individual reminders.
- Clearly write your name, date, and class on the assignment.
- Assignments must be submitted in physical form. Not online, not via email, and not on Blackboard.

Assignment: Stereochemistry in Organic Molecules

Objective: To understand stereochemistry concepts in organic chemistry by identifying types of isomerism, determining chirality, drawing stereoisomers, and analyzing optical activity.

Instructions:

1. **Identify Stereocenters:**
    - For each given molecule, identify all stereocenters (chiral centers).
    - Clearly mark the stereocenters on the structure.
2. **Determine Types of Isomerism:**
    - Identify if the molecule exhibits:
        - **Structural isomerism** (constitutional isomers)
        - **Stereoisomerism**: Enantiomers or diastereomers
        - **Geometrical (cis/trans or E/Z) isomerism**

- Explain your reasoning.

3. **Draw All Stereoisomers:**
    - For molecules with chiral centers, draw all possible stereoisomers.
    - Use wedges (solid and dashed) to indicate three-dimensional orientation.
4. **Assign R/S Configuration:**
    - For each stereocenter, assign **R** or **S** configuration using the Cahn-Ingold-Prelog priority rules.
5. **Determine Optical Activity:**
    - Indicate whether each stereoisomer is optically active or inactive.
    - Provide reasoning (e.g., meso compounds are optically inactive).
6. **Create a Table:**
    - Organize your results into a table with the following columns:| Molecule | Stereocenters | Type of Isomerism | Drawn Stereoisomers | R/S Configuration | Optical Activity | Notes/Reasoning |

Example: 2-Butanol

Step 1: Identify Stereocenters: Carbon 2 has four different groups → chiral center

Step 2: Type of Isomerism: Stereoisomerism: Enantiomers (non-superimposable mirror images)

Step 3: Draw Stereoisomers: Draw (R)-2-butanol and (S)-2-butanol using wedges and dashes

Step 4: Assign R/S Configuration: Apply Cahn-Ingold-Prelog rules:

- (R)-2-butanol: clockwise priority
- (S)-2-butanol: counterclockwise priority

Step 5: Optical Activity: Both enantiomers are optically active and rotate plane-polarized light in opposite directions

Step 6: Table Entry

Molecule	Stereocenters	Type of Isomerism	Drawn Stereoisomers	R/S Configuration	Optical Activity	Notes/Reasoning
2-Butanol	C2	Enantiomers	(R) & (S) forms	R, S	Active	Mirror images

Suggested Molecules for Assignment

2-Butanol, 2-Chlorobutane, 1,2-Dichlorocyclohexane, Lactic Acid (2-Hydroxypropanoic acid), 2,3-Butanediol, Cis-2-Butene and Trans-2-Butene, 1-Bromo-1-chloro-2-fluoroethane

Instructions for Students:

- Follow the example of 2-Butanol for all molecules.
- Show all steps, clearly mark stereocenters, and provide reasoning for all configurations.
- Fill in the table completely for each molecule.
- Use separate physical pages for each molecule.

All assignments must be hand-written on separate physical pages.

NEW MEXICO HIGHER EDUCATION DEPARTMENT

Fostering Student Success from Cradle to Career

Michelle Lujan Grisham, Govenor
Stephanie M. Rodriguez, Cabinet Secretary
Patricia Trujillo, Deputy Secretary

General Education Request Application

Application Number	5637
Institution	NTU
Applicant(s)	pboahene@navajotech.edu
Status	NMHED_REVIEW
Submitted	2025-12-21 02:37 PM (US/Mountain)

Gened Request Form

Contact Information

Chief Academic Officer Name
Colleen Bowman

Chief Academic Officer Email
cbowman@navajotech.edu

Registrar Name
Jason Wright

Registrar Email
jasonwright@navajotech.edu

Course's Academic Department
Science

Is this a Application a Re-Submission
no

Institutional Course Information

Prefix
CHEM

Number
2130L

Title
Organic Chemistry I Laboratory

Number of credits
1

Was this course previously part of the New Mexico General Education curriculum?
No

Is this application for your entire system (ENMU, NMSU, & UNM)?
No

Co-requisite Course

Prefix
CHEM

Number
1225C

Title
General Chemistry II Lecture and Laboratory for STEM Majors

New Mexico Common Course Information

Prefix
CHEM

Number
2130L

Title
Organic Chemistry I Laboratory

A. Content Area and Essential Skills

To which area should this course be added?
Science

Selected Areas
Critical Thinking, Quantitative Reasoning, Personal & Social Responsibility

Section B. Learning Outcomes

List all common course student learning outcomes for the course.

1. Appreciate, understand, and conduct experiments safely in the laboratory, being aware of the possible consequences of not adhering to appropriate safety guidelines.
2. Practice and demonstrate skill in the use of molecular drawing and modeling software.
3. Conduct laboratory scale separations to include, but not be limited to distillation, filtration, extraction, recrystallization and chromatography.
4. Conduct characterization experiments using the following techniques: melting points, solubility tests, IR spectroscopy, MS, TLC, and GC.
5. Synthesize, purify, and characterize simple organic compounds.
6. Apply theory and practice in the interpretation of spectroscopic data including, but not limited to FTIR, MS, 1H NMR, 13C NMR and UV/VIS.
7. Assess and account for sources of error in data collection and analysis.
8. Present experimental results in laboratory reports of appropriate length, style and depth, or through other modes as required.

List all institution-specific Student Learning Outcomes that are common to all course sections offered at the institutions regardless of instructor.

N/A

Section C. Narrative

In the boxes provided, write a short (~300 words) narrative explaining how the course weaves the essential skills associated with the content area throughout the course. Explain what students are going to do to develop the essential skills and how you will assess their learning. The narrative should be written with a general audience in mind and avoid discipline specific jargon as much as possible.

Critical Thinking. Problem Setting; Evidence Acquisition; Evidence Evaluation; and Reasoning /Conclusion. In this box, provide a narrative that explains how the proposed course addresses all of the components of critical thinking.

Problem Setting
Students frame laboratory problems by interpreting experimental objectives, reaction schemes, and expected outcomes before entering the lab. They plan experiments, select appropriate reagents and techniques, and anticipate how molecular structure will influence reaction behavior, purification, and analysis. Instructors assess this skill through pre-lab assignments, experimental plans, and quizzes that evaluate students' ability to define the problem, choose suitable methods, and outline logical laboratory procedures.

Evidence Acquisition
Students generate experimental evidence by synthesizing, purifying, and characterizing organic compounds using standard laboratory techniques such as distillation, extraction, recrystallization, chromatography, and spectroscopy (IR, NMR, TLC, melting point). They follow safety protocols, make careful observations, and record data accurately in laboratory notebooks. Instructors assess evidence acquisition through notebook checks, practical lab performance, data tables, and the completeness and accuracy of recorded observations.

Evidence Evaluation
Students evaluate experimental evidence by comparing results to theoretical expectations and literature values. They analyze yields, purity, and spectral data, identify sources of experimental error, and determine

whether the data support proposed structures and reaction mechanisms. Instructors assess this skill through lab reports, data-analysis questions, and post-lab assignments that require students to interpret results, explain discrepancies, and justify conclusions using chemical evidence.

Reasoning and Conclusion
Students synthesize experimental data and chemical principles to draw evidence-based conclusions about reaction success, molecular structure, and stereochemical outcomes. They explain their reasoning clearly using experimental results, spectra, and molecular representations. Instructors assess reasoning through graded lab reports, molecular drawings, and written or oral presentations that emphasize logical organization, accuracy, and strength of evidence-based explanations

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Quantitative Reasoning. Communication/Representation of Quantitative Information; Analysis of Quantitative Arguments; and Application of Quantitative Models. In this box, provide a narrative that explains how the proposed course addresses all of the components of quantitative reasoning.

Communication / Representation of Quantitative Information:
Students accurately record and present quantitative laboratory data using tables, graphs, spectra, and calculations. Observations such as reaction yields, melting points, retention times, or absorbance values are converted into clear numerical and visual formats. This practice reinforces students' ability to communicate chemical information precisely and logically within a laboratory setting.

Analysis of Quantitative Arguments:
Students critically analyze numerical data to identify trends, evaluate reaction efficiency, compare purification or separation techniques, and interpret spectral or chromatographic results. They assess measurement uncertainty, compare experimental results with theoretical predictions, and determine whether the data support the expected reaction outcomes or molecular structures. This process develops careful, evidence-based evaluation skills in organic chemistry experiments.

Application of Quantitative Methods:
Students apply quantitative reasoning to calculate reaction yields, analyze patterns in kinetics or thermodynamics, interpret spectral peak data (e.g., NMR integration, IR absorbance), and assess purity from chromatographic results. Laboratory exercises, problem sets, and spectral interpretation activities reinforce the use of calculations and models to understand organic reactions. Assessments through lab reports, quizzes, and data-analysis tasks strengthen students' ability to make data-driven conclusions and solve problems accurately.

Personal & Social Responsibility. Intercultural reasoning and intercultural competence; Sustainability and the natural and human worlds; Ethical reasoning; Collaboration skills, teamwork and value systems; and Civic discourse, civic knowledge and engagement – local and global In this box, provide a narrative that explains how the proposed course addresses 2 of the components of personal & social responsibility.

Ethical Reasoning (Laboratory)
Students demonstrate ethical scientific reasoning by accurately recording experimental procedures, observations, and data in laboratory notebooks and reports. They follow laboratory safety protocols, properly handle chemicals and waste, and report results honestly without fabrication, manipulation, or omission of data. Students clearly document sources of error, limitations of methods, and deviations from procedures. Through guided discussions and lab-based case examples, students examine the environmental, safety, and societal implications of organic chemistry experiments. Instructors assess ethical reasoning through notebook checks, lab reports, safety compliance, and the transparency and accuracy of reported data and conclusions.

Collaboration, Teamwork, and Value Systems (Laboratory)
Students collaborate in laboratory pairs or groups to plan experiments, share responsibilities, and complete synthesis, purification, and analysis tasks. They communicate procedures, troubleshoot experimental

challenges together, and provide constructive feedback while maintaining a safe and respectful lab environment. These activities reinforce professionalism, accountability, and respect for diverse perspectives and working styles. Instructors assess collaboration through observation of lab participation, group lab reports, adherence to shared responsibilities, and peer or instructor evaluations that measure effective teamwork, communication, and cooperative problem-solving.

Section D. Assessment Plan

Link to Institution's General Education Assessment Plan

https://www.navajotech.edu/academics/general-education/

Application History

Type	username	Text	Timestamp
Submittal	pboahene@navajotech.edu	Submitted by pboahene@navajotech.edu	2025-12-21 02:37 PM (US/Mountain)
Authorization	pboahene@navajotech.edu	pboahene@navajotech.edu has authorized the application for submittal	2025-12-21 02:37 PM (US/Mountain)
Created	pboahene@navajotech.edu	Application started by pboahene@navajotech.edu	2025-12-21 02:27 PM (US/Mountain)

Assignment: Organic Chemistry I Laboratory – CHEM-2130L

Topic: UV-Visible (UV-Vis) Spectroscopy of Organic Compounds

Read and follow all instructions carefully:

Note: This sheet contains only instructions and questions. Do not write answers on this sheet. Use separate physical pages for your hand-written responses.

General Instructions:

- All assignments must be hand-written on separate physical pages.
- Include steps, observations, calculations, and conclusions for every task or question.
- Clearly write your name, date, and class on each page.
- Submit assignments in physical form only; no email, Blackboard, or online submission.
- Deadline: 2 weeks from the date of posting. No individual reminders will be provided.

Objective:
To understand and apply UV–Vis spectroscopy to study the electronic transitions of organic molecules, analyze absorption spectra, and relate observed λ_{max} values and molar absorptivities to molecular structure, conjugation, and functional groups. This assignment emphasizes careful observation, spectral interpretation, and laboratory-based reasoning.

Instructions:

1. **Sample Preparation and Observation:**
    - Prepare solutions of the given organic compounds at appropriate concentrations for UV-Vis measurement.
    - Record the physical state of each sample (solid dissolved in solvent or liquid) and any observations about handling or solubility.
    - Note the solvent used for each sample.
2. **Spectral Measurement:**

- Measure the UV-Vis absorption spectrum for each compound over the appropriate wavelength range (e.g., 200–400 nm).
- Record the λ_{max} (wavelength of maximum absorption) for each peak.
- Measure the absorbance at λ_{max} and, if applicable, additional characteristic peaks.

3. **Compare Spectra:**
   - Compare spectra of similar compounds to observe shifts in λ_{max} due to structural differences, conjugation, or functional group effects.
   - Discuss bathochromic (red shift) or hypsochromic (blue shift) changes and possible causes.
4. **Data Analysis:**
   - Determine the relationship between molecular structure and observed UV–Vis absorption.
   - Analyze how conjugation, aromaticity, and functional groups influence electronic transitions.
   - Calculate molar absorptivity (ε) if concentration and path length are provided, using Beer–Lambert Law: $A = \varepsilon \cdot c \cdot l$.
5. **Organize Results in a Table:**

Molecule	**Physical State / Solvent**	**λ_{max} (nm)**	**Absorbance (A)**	**Electronic Transition / Functional Group**	**Notes / Observations**

Example:

Molecule	**Physical State / Solvent**	**λ_{max} (nm)**	**Absorbance (A)**	**Electronic Transition / Functional Group**	**Notes / Observations**
Benzene	Liquid / Ethanol	254	0.82	$\pi \rightarrow \pi^*$ transition (aromatic ring)	Strong absorption due to conjugated system

Suggested Compounds for Assignment:
Benzene, Toluene, Acetone, Aniline, Ethyl cinnamate, Benzoic acid

Student Instructions:

- Prepare solutions and measure UV–Vis spectra for each compound.
- Identify all major absorption peaks and record λ_{max} and absorbance values.
- Assign electronic transitions based on functional groups and molecular structure.
- Compare spectra of similar compounds and note shifts or trends.
- Complete the table for each compound on separate physical pages.

Assignment: Organic Chemistry I Laboratory – CHEM-2130L

Topic: UV-Visible (UV-Vis) Spectroscopy of Organic Compounds

Read and follow all instructions carefully:

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Instructions:

1. **Sample Preparation and Observation:**
    - Prepare solutions of the given organic compounds at appropriate concentrations for UV-Vis measurement.
    - Record the physical state of each sample (solid dissolved in solvent or liquid) and any observations about handling or solubility.
    - Note the solvent used for each sample.
2. **Spectral Measurement:**

- Measure the UV-Vis absorption spectrum for each compound over the appropriate wavelength range (e.g., 200–400 nm).
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   - Analyze how conjugation, aromaticity, and functional groups influence electronic transitions.
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Molecule	**Physical State / Solvent**	**λ_{max} (nm)**	**Absorbance (A)**	**Electronic Transition / Functional Group**	**Notes / Observations**

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NEW MEXICO
HIGHER EDUCATION
DEPARTMENT

Fostering Student Success from Cradle to Career

Michelle Lujan Grisham, Govenor
Stephanie M. Rodriguez, Cabinet Secretary
Patricia Trujillo, Deputy Secretary

General Education Request Application

Application Number	5113
Institution	CNM
Applicant(s)	kferris@cnm.edu
Status	NMHED_REVIEW
Submitted	2025-11-05 11:32 AM (US/Mountain)

Gened Request Form

Contact Information

Chief Academic Officer Name
Amardeep Kahlon

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Registrar Name
Noemi Hernandez

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Course's Academic Department
Liberal Arts

Is this a Application a Re-Submission
no

Institutional Course Information

Prefix
CCST

Number
1110

Title
Introduction to Comparative Global and Ethnic Societies

Number of credits
3

Was this course previously part of the New Mexico General Education curriculum?
Yes

Is this application for your entire system (ENMU, NMSU, & UNM)?
No

Co-requisite Course

Prefix
na

Number
na

Title
na

New Mexico Common Course Information

Prefix
CCST

Number
1110

Title
Introduction to Comparative Global and Ethnic Societies

A. Content Area and Essential Skills

To which area should this course be added?
Social & Behavioral Sciences

Selected Areas
Critical Thinking, Personal & Social Responsibility, Communication

Section B. Learning Outcomes

List all common course student learning outcomes for the course.

By the end of the course, students will
1. Apply various transdisciplinary perspectives and processes used by social scientists to discover, describe and understand human behavior across a range of diverse ethnic and gendered societies.
2. Write informed analytical essays that comprehensively explores key issues or events in order to provide the reader will a full understanding of the subject under evaluation.
3. Effectively identify, evaluate, and share information for the problem or issue at hand in all course assignments and discussions.
4. Articulate their roles as citizens in a global context; and develop an awareness and appreciation for diverse value systems in order to critically examine and work toward quality of life within a framework of human understanding and social justice.
5. Develop and explicate arguments supported by quantitative evidence (words, tables, and graphs) based in the authentic contexts of everyday life situations.

List all institution-specific Student Learning Outcomes that are common to all course sections offered at the institutions regardless of instructor.

N/A

Section C. Narrative

In the boxes provided, write a short (~300 words) narrative explaining how the course weaves the essential skills associated with the content area throughout the course. Explain what students are going to do to develop the essential skills and how you will assess their learning. The narrative should be written with a general audience in mind and avoid discipline specific jargon as much as possible.

Communication. Genre and Medium Awareness, Application and Versatility; Strategies for Understanding and Evaluating Messages; and Evaluation and Production of Arguments. In this box, provide a narrative that explains how the proposed course addresses all of the components of communication.

Genre and Medium Awareness, Application and Versatility
Students will examine historical and intercultural perspectives of BIPOC peoples through an interdisciplinary approach as it is applied within the field of ethnic studies. Drawing from social science paradigms, Indigenous methodologies, and feminist epistemologies, students will learn to navigate multiple genres and mediums of communication, from academic texts to community narratives.
Strategies for Understanding and Evaluating Messages
Through assigned readings, primary sources, and community narratives, students will identify strategies for interpreting complex messages about events, sociocultural practices, and public policy. Weekly "reading responses" will require students to summarize, synthesize, and evaluate the main arguments and key components of each text, fostering the ability to assess new information through interdisciplinary and culturally responsive lenses.
Evaluation and Production of Arguments
Each unit culminates in a 2–3-page, double-spaced paper that addresses major topics and themes presented in the readings and discussions. These written assignments serve as summative assessments of students' conceptual development and provide opportunities for instructors to employ individualized teaching

strategies. Writing pedagogy within the course emphasizes argument construction, self-reflection, and peer engagement. Students will practice articulating their own positionality and subjectivity while supporting or critiquing the perspectives of others.

Critical Thinking. Problem Setting; Evidence Acquisition; Evidence Evaluation; and Reasoning /Conclusion. In this box, provide a narrative that explains how the proposed course addresses all of the components of critical thinking.

Problem Setting
Analyzing the historical and contemporary forces that impact diverse ethnic communities throughout the Americas requires an introduction to various critical and analytical approaches employed within the field of ethnic studies. With examining the global and international economic and political systems that impact Africana, Indigenous, Latino, and Asian-Pacific groups in the United States and throughout the western hemisphere, students are prepared to develop critical interventions based off the evaluation of evidence complied within each unit analysis.
Evidence Acquisition
From the weekly readings, students will engage with topics and issues that impact BIPOC peoples locally, nationally, and internationally. Students will be able to analyze artifacts, primary sources, newspaper and scholarly articles, in addition to other alternative sources of media to collect information regarding current events that pertain to the subject.
Evidence Evaluation
In the process of analysis, students will develop the skills to break down the issue or event into specific areas of interest that can be examined from an interdisciplinary social science framework. With the unit reflections, both formative and summative approaches are embedded within the assignment to ensure that students demonstrate their ability to write in analytical form and explore outcomes as they relate to an ethnic studies lens.
Reasoning/Conclusion
The final project culminates in students independently identifying a key issue or topic, evaluating the major points, and creating their own interventions that involves community-based participatory research methods.

Personal & Social Responsibility. Intercultural reasoning and intercultural competence; Sustainability and the natural and human worlds; Ethical reasoning; Collaboration skills, teamwork and value systems; and Civic discourse, civic knowledge and engagement – local and global In this box, provide a narrative that explains how the proposed course addresses 2 of the components of personal & social responsibility.

Intercultural reasoning and intercultural competence
While there is an expectation to provide a social science component to this course, there is also a strong emphasis on the humanities. Each unit lesson provides students with a specific teaching pedagogy that exemplifies intercultural reasoning and pluriversality. Assignments and student interactions all focus on building intercultural competence, collaboration, teamwork, and the ability to navigate difference. Discussion boards require students to engage within a civic discourse that also adheres to a sense of relationship and caring, uplifting human dignity and honoring voices that have historical been silenced.

Civic discourse, civic knowledge and engagement – local and global
As students work through the course they learn about their own positionality and subjectivity. As they engage with assignments, they are expected to reflect on how their personal and social identities interact with the issues and topics within the unit. Being exposed to different experiences, lifeways, and unique standpoints on many social and political topics and issues offers students the opportunity to engage local, regional, national, and international policies that shape life interaction between humans and within the biosphere. Key learning outcomes that demonstrate personal and social responsibility will include active listening, critical thinking, cultural responsivity and self-awareness, adaptability and the development of problem solving skills.

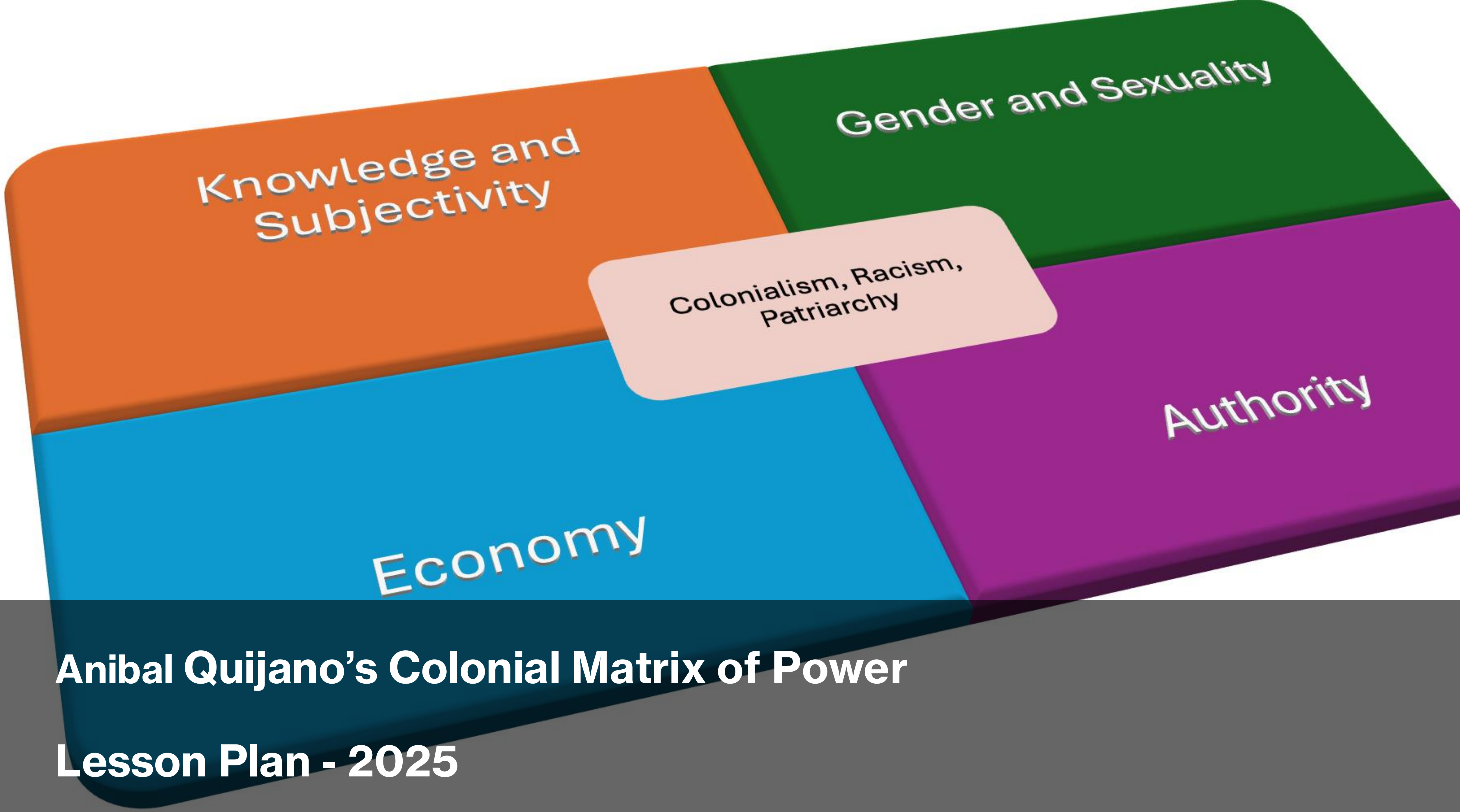
Section D. Assessment Plan

Link to Institution's General Education Assessment Plan

https://www.cnm.edu/depts/academic-affairs/saac/gen-ed-assessment-plan

Application History

Type	username	Text	Timestamp
Submittal	kferris@cnm.edu	Submitted by kferris@cnm.edu	2025-11-05 11:32 AM (US/Mountain)
Authorization	kferris@cnm.edu	kferris@cnm.edu has authorized the application for submittal	2025-11-05 11:32 AM (US/Mountain)
Created	kferris@cnm.edu	Application started by kferris@cnm.edu	2025-11-04 04:22 PM (US/Mountain)



Anibal Quijano's Colonial Matrix of Power

Lesson Plan - 2025

Objective:

- Students will analyze Aníbal Quijano’s concept of the colonial matrix of power and its implications for sociocultural interactions, identity, and coloniality within New Mexico.

Essential Question(s):

- What is the colonial matrix of power, and how does it shape political, social, and economic structures in New Mexico?

Module 3 Learning Objectives:

1. Remembering: Define key concepts of the colonial matrix of power.
2. Understanding: Explain the interconnections between race, labor, gender, and knowledge in the colonial matrix.
3. Applying: Analyze contemporary social issues through the lens of Quijano’s framework.
4. Analyzing: Compare and contrast the colonial matrix of power with other theories of power and oppression.
5. Evaluating: Assess the relevance of Quijano’s ideas in understanding current global inequalities.
6. Creating: Develop a visual representation that illustrates the colonial matrix of power and its implications.

Key Concepts:

TALKING POINTS

- Explain that Quijano's concept refers to the interconnected structures of power that emerged from colonialism, encompassing race, labor, gender, and knowledge.
- Discuss how this matrix continues to influence contemporary social dynamics and identity formation.

CONCEPTS

- The Four Domains of Power
  - Knowledge and Subjectivity
  - Gender and Sexuality
  - Economy
  - Authority
- Race as a “social classification”
- Eurocentrism
- Modernity and Coloniality

Historical Context

- Provide an overview of colonialism's impact on global power relations, labor, and social hierarchies.
- Highlight the role of race and class in the colonial matrix and how these categories have evolved.

Group Activity:

- Divide the class into small groups and assign each group a specific aspect of the colonial matrix of power, such as:
  - Racial classifications and their implications
  - The role of labor in the colonial matrix
  - Gender dynamics within colonial contexts
  - Knowledge production and epistemic violence
- Each group will discuss their assigned topic and create a visual representation (e.g., a mind map or chart) illustrating their understanding of how it relates to Quijano’s concept.

Class Presentations

- Each group presents their visual representation and findings, allowing for questions and discussions after each presentation.
- Encourage students to draw connections between the group topics and the broader concept of the colonial matrix of power.

Reflection Paper Assignment:

Reflection Paper Prompt:

Write a brief reflection on one way you see the colonial matrix of power operating in today's society.

Paper Logistics:

- Times New Roman Font.
- 12 Point Font.
- 1’ Margins.
- Double Spaced.
- Include a title page and reference page.
- Written content must be 2-3 pages in length.
- Include 2 in-text citations from the Quijano reading.

Rubric

	Exemplary	Good	Acceptable	Unacceptable
Knowledge of subject matter	Balanced presentation of relevant and legitimate information that clearly supports the central purpose and shows a thoughtful, in-depth analysis of a significant topic.	Information provides reasonable support for central purpose and displays evidence of a basic analysis of a significant topic. Reader gains some insight.	Information supports a central purpose at times. Analysis is basic or general. Reader gains few insights.	Central purpose is not clearly identified. Analysis is vague or not evident. Reader is confused or may be misinformed. Paper has fewer pages than specified in the assignment.
Grammar and punctuation	The writing is free or almost free of errors.	There are occasional errors, but they don't represent a major distraction or obscure meaning.	The writing has many errors, and the reader is distracted by them.	There are so many errors that meaning is obscured. The reader is confused and stops reading.
Effective communication style	The writer's central purpose is readily apparent to the reader.	The writing has a clear purpose, but may sometimes digress from it.	The central purpose is not consistently clear throughout the paper.	The purpose is generally clear.
Effective citation and formatting	APA format and citations are used accurately and consistently in the paper and on the "references" page.	APA format and citations are used with minor errors.	There are frequent errors in APA format and citations.	Format of the document is not recognizable as APA nor are citations.
Feel	The writing is compelling. It hooks the reader and sustains interest throughout.	The writing is generally engaging, but has some dry spots. In general, it is focused and keep's the reader's attention.	The writing is dull and unengaging. Though the paper has some interesting parts, the reader finds it difficult to maintain interest.	The writing has little personality. The reader quickly loses interest and stops reading.

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- Include a title page and reference page.
- Written content must be 2-3 pages in length.
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Rubric

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Grammar and punctuation	The writing is free or almost free of errors.	There are occasional errors, but they don't represent a major distraction or obscure meaning.	The writing has many errors, and the reader is distracted by them.	There are so many errors that meaning is obscured. The reader is confused and stops reading.
Effective communication style	The writer's central purpose is readily apparent to the reader.	The writing has a clear purpose, but may sometimes digress from it.	The central purpose is not consistently clear throughout the paper.	The purpose is generally clear.
Effective citation and formatting	APA format and citations are used accurately and consistently in the paper and on the "references" page.	APA format and citations are used with minor errors.	There are frequent errors in APA format and citations.	Format of the document is not recognizable as APA nor are citations.
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NEW MEXICO
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DEPARTMENT

Fostering Student Success from Cradle to Career

Michelle Lujan Grisham, Govenor
Stephanie M. Rodriguez, Cabinet Secretary
Patricia Trujillo, Deputy Secretary

General Education Request Application

Application Number	5634
Institution	CNM
Applicant(s)	kferris@cnm.edu
Status	NMHED_REVIEW
Submitted	2025-12-19 08:31 AM (US/Mountain)

Gened Request Form

Contact Information

Chief Academic Officer Name
Amardeep Kahlon

Chief Academic Officer Email
akahlon@cnm.edu

Registrar Name
Noemi Hernandez

Registrar Email
nhernandez81@cnm.edu

Course's Academic Department
Math, Science & Engineering

Is this a Application a Re-Submission
no

Institutional Course Information

Prefix
FSTE

Number
2110

Title
Food Science I

Number of credits
4

Was this course previously part of the New Mexico General Education curriculum?
Yes

Is this application for your entire system (ENMU, NMSU, & UNM)?
No

Co-requisite Course

Prefix
na

Number
na

Title
na

New Mexico Common Course Information

Prefix
FSTE

Number
2110

Title
Food Science I

A. Content Area and Essential Skills

To which area should this course be added?
Science

Selected Areas
Critical Thinking, Quantitative Reasoning, Personal & Social Responsibility

Section B. Learning Outcomes

List all common course student learning outcomes for the course.

1. Explain basic scientific principles involved in the preparation of high-quality food products.
2. Utilize scientific inquiry in the experimental investigation of factors influencing the chemical, physical and sensory
properties of food products.
3. Apply basic scientific principles, procedures, techniques and standards in the preparation of all types of high-quality
food products.
4. Use basic methods of quantitative analysis to critically evaluate quality characteristics of food.
5. Use sensory science techniques and terminology to critically evaluate acceptability and quality characteristics of
food.
6. Describe high quality characteristics of a variety of food products using appropriate terminology.
7. Apply principles of sanitation and safety to food preparation.

List all institution-specific Student Learning Outcomes that are common to all course sections offered at the institutions regardless of instructor.

na

Section C. Narrative

In the boxes provided, write a short (~300 words) narrative explaining how the course weaves the essential skills associated with the content area throughout the course. Explain what students are going to do to develop the essential skills and how you will assess their learning. The narrative should be written with a general audience in mind and avoid discipline specific jargon as much as possible.

Critical Thinking. Problem Setting; Evidence Acquisition; Evidence Evaluation; and Reasoning /Conclusion. In this box, provide a narrative that explains how the proposed course addresses all of the components of critical thinking.

Problem Setting: Throughout the course, students engage in lessons and laboratory activities that center on real-world questions about how food composition, preparation methods, and environmental factors affect quality, safety, and nutrition. Each lab presents a new problem to solve—for example, determining how ingredient substitutions or temperature variations influence the texture or nutrient retention of a food product. Students learn to define these problems clearly, identify relevant scientific variables, and connect them to broader food science principles.

Evidence Acquisition: Students acquire evidence through both theoretical study and experimental practice. In lectures, they explore scientific literature, foundational theories, and the chemistry and physics underlying food preparation. In laboratory sessions, they collect empirical data through measurement, observation, and sensory evaluation. This hands-on evidence gathering helps students connect abstract principles to practical application, developing the habit of grounding claims in reliable data. Students develop hypotheses during some lab activities, applying the scientific method to analyze how variables such as ingredient types and ratios, heat transfer, or preparation techniques will affect outcomes.

Evidence Evaluation: After collecting data, students critically analyze their findings, evaluating sources of error, comparing outcomes to expected results, and interpreting sensory and quantitative data. They assess the reliability and validity of their evidence, drawing on scientific reasoning to explain differences and refine their understanding of food systems. Group discussions and lab practice further strengthen students' ability to critique methods and results.

Reasoning and Conclusion: Students synthesize their experimental results and theoretical knowledge to draw reasoned conclusions about food quality, preparation, and safety. They use evidence to justify best practices, articulate scientific explanations, and make informed decisions about improving food products.

Quantitative Reasoning. Communication/Representation of Quantitative Information; Analysis of Quantitative Arguments; and Application of Quantitative Models. In this box, provide a narrative that explains how the proposed course addresses all of the components of quantitative reasoning.

Communication/Representation of Quantitative Information: Food evaluations in this course are both quantitative and sensory. Students collect data on temperature, weight, volume, and nutrient changes during food preparation and express this information verbally, numerically, and graphically in the laboratory. They use tables, charts, and graphs to represent results, such as yield percentages or texture measurements, and communicate their findings in lab reports and group discussions.

Analysis of Quantitative Arguments: After collecting data, students critically analyze their findings, evaluating sources of error, comparing outcomes to expected results, and interpreting sensory and quantitative data. They assess the reliability and validity of their evidence, drawing on scientific reasoning to explain differences and refine their understanding of food systems. Group discussions and lab practice further strengthen students' ability to critique methods and results. Students compare results between different variables for the activities; this deepens evaluation and strengthens their ability to analyze complex real-world scenarios.

Application of Quantitative Models: In the course, students practice quantitative conversions during the Laboratory. Changes in temperature, ingredient weight, pH, percentage (%) of change (yield, weight gains /losses) are recorded in charts or graphs and discussed at the end of class. This includes a consistent practice of math fundamentals that strengthens mathematical fluency in food preparation contexts. Students synthesize their experimental results and theoretical knowledge to draw reasoned conclusions about the quality, preparation, and safety of food. They use evidence to justify best practices, articulate scientific explanations, and make informed decisions about improving food products.

Personal & Social Responsibility. Intercultural reasoning and intercultural competence; Sustainability and the natural and human worlds; Ethical reasoning; Collaboration skills, teamwork and value systems; and Civic discourse, civic knowledge and engagement – local and global In this box, provide a narrative that explains how the proposed course addresses 2 of the components of personal & social responsibility.

Intercultural reasoning and intercultural competence
Students in Food Science I come from diverse cultural and educational backgrounds, which enriches classroom and laboratory discussions about food, preparation methods, and dietary practices. The course intentionally creates opportunities for students to share and compare cultural perspectives on food traditions, ingredient choices, and cooking techniques. This exchange fosters intercultural reasoning by helping students recognize how culture influences perceptions of food quality, taste, and nutrition. Working collaboratively in the lab encourages students to navigate differences in communication styles, work habits, and value systems, promoting empathy and respect for diverse viewpoints. Through reflective discussions and group problem-solving, students learn to approach food science as both a scientific and cultural practice, gaining awareness of how global and local food systems are shaped by social, cultural, and ethical factors.
Collaboration skills, teamwork and value systems
Collaboration is at the heart of Food Science I. Laboratory sessions require students to work closely in small teams to plan, prepare, and evaluate food products. Each member contributes unique skills and perspectives, which encourages respect for different approaches and value systems related to food, culture, and science. Students learn to communicate clearly, delegate tasks, resolve conflicts, and make collective decisions—all

essential aspects of effective teamwork. Group discussions following each lab help students compare observations and reach consensus on results, strengthening both critical thinking and mutual respect. These interactions foster a sense of shared responsibility and appreciation for how individual values influence group dynamics and ethical food practices. By collaborating on common goals in a professional, safety-conscious setting, students develop not only practical teamwork skills but also a deeper understanding of cooperation, respect, and accountability as core values in both scientific and community contexts. Team-based lab work reinforces responsibility, dependability, and accountability, mirroring expectations found in food science industries and community service settings.

Section D. Assessment Plan

Link to Institution's General Education Assessment Plan

https://www.cnm.edu/depts/academic-affairs/saac/gen-ed-assessment-plan

Application History

Type	username	Text	Timestamp
Submittal	kferris@cnm.edu	Submitted by kferris@cnm.edu	2025-12-19 08:31 AM (US/Mountain)
Authorization	kferris@cnm.edu	kferris@cnm.edu has authorized the application for submittal	2025-12-18 11:47 AM (US/Mountain)
Created	kferris@cnm.edu	Application started by kferris@cnm.edu	2025-12-18 11:04 AM (US/Mountain)

Name:

FSTE-2110

LAB Sheet #2- Chemistry and Food Preparation LAB

Define Key Terms:

1. Calibrate
2. Dry-heat preparation
3. Moist-heat preparation
4. Fold

Pre-Lab Questions:

- Read the topic introduction and instructions for Unit 2- Lab Manual
- Answer questions from page 19: questions 1-5
- Develop a **Hypothesis**: Which sheet pan material will provide the best results for a good quality cookie?

List of LAB Procedures- Activities

Activities:

A. Commonly used measurements (10 minutes, individually)

B. Measuring techniques for flour (5 minutes)

C. Measuring techniques for sugar (5 minutes)

E. Measuring techniques for liquids (5 minutes)

F. Effect of pan surface characteristics on energy transfer (20 minutes)

G. Effect of container shape on Energy transfer (15 minutes)

*Clean stations and return materials to their designated place.

Recipe: Chocolate chip cookies

Post-Lab questions:

- Pages 41-42: questions: 2, 5, 6, 10, & 11

2. Which method of measuring flour gives results closest to the standard weight of all-purpose

flour?

5. Why is granulated sugar easier to measure precisely than flour?

6. Why is granulated sugar easier to measure more precisely than brown sugar?

10. Account for the color differences observed in the baked cookies. (Discuss your hypothesis)

11. Which cookie sheet would you choose when baking cookies? Why?

Name:

FSTE-2110

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2. Dry-heat preparation
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NEW MEXICO
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Fostering Student Success from Cradle to Career

Michelle Lujan Grisham, Govenor
Stephanie M. Rodriguez, Cabinet Secretary
Patricia Trujillo, Deputy Secretary

General Education Request Application

Application Number	5638
Institution	NTU
Applicant(s)	pboahene@navajotech.edu
Status	NMHED_REVIEW
Submitted	2025-12-21 02:52 PM (US/Mountain)

Gened Request Form

Contact Information

Chief Academic Officer Name
Colleen Bowman

Chief Academic Officer Email
cbowman@navajotech.edu

Registrar Name
Jason Wright

Registrar Email
jasonwright@navajotech.edu

Course's Academic Department
Science

Is this a Application a Re-Submission
no

Institutional Course Information

Prefix
CHEM

Number
2135

Title
Organic Chemistry II

Number of credits
3

Was this course previously part of the New Mexico General Education curriculum?
No

Is this application for your entire system (ENMU, NMSU, & UNM)?
No

Co-requisite Course

Prefix
CHEM

Number
2130

Title
Organic Chemistry 1

New Mexico Common Course Information

Prefix
CHEM

Number
2135

Title
Organic Chemistry II

A. Content Area and Essential Skills

To which area should this course be added?
Science

Selected Areas
Critical Thinking, Quantitative Reasoning, Personal & Social Responsibility

Section B. Learning Outcomes

List all common course student learning outcomes for the course.

1. Identify functional groups and other key features of different organic compounds.
2. Correctly name organic compounds using the proper nomenclature (IUPAC and common names).
3. Analyze relationships among molecular structure, chemical reactivity, physical and spectral properties.
4. Understand chemical reactivity and reaction mechanisms relating, but not limited to dienes, arenes, alcohols, ethers, amines, phenols, and carbonyl compounds, i.e. aldehydes, ketones, carboxylic acids and derivatives.
5. Write out correctly the mechanisms of electrophilic aromatic substitution, formation and hydrolysis of acetals and ketals, formation and hydrolysis of imines and enamines, conjugate addition of nucleophiles to ,-unsaturated carbonyl compounds, Fischer esterification and hydrolysis of esters under both acidic and basic conditions, transesterification under acidic and basic conditions, amide hydrolysis under acidic and basic conditions, the aldol reaction and condensation, and the Claisen condensation/Dieckmann cyclization for examples that are different than those studied in class.
6. Relate structures to spectral properties, interpreting IR, 13C and 1H NMR.
7. Describe the 6-7 step synthesis of a simple organic molecule using reactions learned in this class.
8. Convert the Fischer projection of a carbohydrate to its corresponding Haworth projection, or convert the Haworth projection of a carbohydrate to its Fischer projection.
9. Recognize derivatives of carbonic and phosphoric acids, alkaloids, carbohydrates, peptides, steroids, prostaglandins, aglycones, carbohydrate anomers, reducing sugars, waxes, fats, and oils.

List all institution-specific Student Learning Outcomes that are common to all course sections offered at the institutions regardless of instructor.

N/A

Section C. Narrative

In the boxes provided, write a short (~300 words) narrative explaining how the course weaves the essential skills associated with the content area throughout the course. Explain what students are going to do to develop the essential skills and how you will assess their learning. The narrative should be written with a general audience in mind and avoid discipline specific jargon as much as possible.

Critical Thinking. Problem Setting; Evidence Acquisition; Evidence Evaluation; and Reasoning /Conclusion. In this box, provide a narrative that explains how the proposed course addresses all of the components of critical thinking.

Problem Setting
Students define and analyze complex organic chemistry problems by examining the structure and reactivity of alcohols, aromatic compounds, and carbonyl groups. They frame questions such as predicting reaction pathways, selecting appropriate reagents, and identifying likely mechanisms based on resonance and electronic effects. Students design theoretical multistep syntheses and outline solution strategies during lectures and problem-solving sessions. Instructors assess problem-setting skills through homework, quizzes, and exam questions that require students to clearly identify the problem, select relevant concepts, and set up logical solution approaches.

Evidence Acquisition
Students acquire evidence by interpreting theoretical and spectral data, including IR, UV/Vis, mass spectrometry, and ^{1}H/^{13}C NMR. They use molecular models and literature examples to visualize structures,

explore mechanistic possibilities, and connect data patterns to molecular features. Instructors assess evidence acquisition through problem sets, quizzes, and exams that require accurate data interpretation, correct identification of functional groups, and appropriate use of analytical information.

Evidence Evaluation
Students evaluate evidence by comparing predicted products, proposed mechanisms, and spectral interpretations with literature values and established examples. They analyze spectral features, assess consistency across data sources, and consider alternative mechanistic explanations. Instructors assess evidence evaluation through exam questions and data-analysis problems that require justification of interpretations, elimination of incorrect alternatives, and explanation of discrepancies.

Reasoning and Conclusion
Students integrate evidence and chemical theory to justify reaction outcomes, mechanisms, and structural assignments. They explain their reasoning clearly in written work and class discussions, using multiple lines of evidence to support conclusions. Instructors assess reasoning through cumulative exams, quizzes, and problem-solving assignments that emphasize logical coherence, accuracy, and strength of evidence-based conclusions.

Quantitative Reasoning. Communication/Representation of Quantitative Information; Analysis of Quantitative Arguments; and Application of Quantitative Models. In this box, provide a narrative that explains how the proposed course addresses all of the components of quantitative reasoning.

Communication and Representation of Quantitative Information
Students communicate quantitative information by constructing and interpreting spectra, graphs, tables, reaction schemes, and written explanations. They report values such as NMR integration ratios, IR stretching frequencies, UV/Vis absorbance values, mass spectral fragments, and calculated theoretical yields with clarity and accuracy. Instructors assess this skill through problem sets, spectral interpretation exercises, and exam questions that evaluate the correct representation, labeling, and explanation of quantitative data.

Analysis of Quantitative Arguments
Students analyze numerical and spectroscopic data to evaluate reaction efficiency, compare mechanistic pathways, and interpret trends in chemical behavior. They examine NMR chemical shifts and splitting patterns, IR carbonyl stretching frequencies, aromatic stabilization trends, and other quantitative features to test whether predictions align with expected outcomes. Instructors assess this skill through data-analysis problems and exams that require students to evaluate evidence, judge the reliability of measurements, and justify conclusions using quantitative arguments.

Application of Quantitative Methods
Students apply quantitative methods to calculate theoretical yields, analyze electrophilic and nucleophilic reactivity, predict substitution patterns, and interpret spectral data numerically. They use quantitative relationships to explain reaction energetics, resonance effects, acidity and basicity trends, and carbonyl reaction behavior. Instructors assess this skill through graded assignments, problem sets, and exams that require accurate calculations, correct application of formulas or models, and interpretation of numerical results.

Instructors evaluate students' quantitative reasoning through assignments, problem sets, spectral interpretation exercises, and examinations. These assessments measure students' ability to use numerical and spectroscopic data to support scientific claims, demonstrate accurate calculations, and apply quantitative evidence to organic chemistry theory and mechanistic reasoning.

Personal & Social Responsibility. Intercultural reasoning and intercultural competence; Sustainability and the natural and human worlds; Ethical reasoning; Collaboration skills, teamwork and value systems; and Civic discourse, civic knowledge and engagement – local and global In this box, provide a narrative that explains how the proposed course addresses 2 of the components of personal & social responsibility.

Ethical Reasoning:
Students practice responsible scientific thinking by accurately recording and analyzing data in problem sets, exams, and theoretical exercises. They critically evaluate sources of information, avoid misrepresentation, and reflect on the broader ethical implications of chemical decisions and interpretations. Instructors assess ethical reasoning through graded assignments, exam responses, and written reflections, emphasizing students' ability to justify decisions with honesty, accuracy, and awareness of potential consequences.

Collaboration Skills, Teamwork, and Value Systems:
Students engage in collaborative problem-solving during lectures, group assignments, and case-study discussions. They communicate ideas clearly, critique reasoning constructively, and jointly develop solutions to mechanistic problems and synthesis exercises. These activities foster professionalism, accountability, and respect for diverse perspectives. Instructors assess collaboration through group assignments, participation in discussions, and peer-informed evaluations that measure engagement, contribution, and the quality of collective reasoning.

Section D. Assessment Plan

Link to Institution's General Education Assessment Plan

https://www.navajotech.edu/academics/general-education/

Application History

Type	username	Text	Timestamp
Submittal	pboahene@navajotech.edu	Submitted by pboahene@navajotech.edu	2025-12-21 02:52 PM (US/Mountain)
Authorization	pboahene@navajotech.edu	pboahene@navajotech.edu has authorized the application for submittal	2025-12-21 02:52 PM (US/Mountain)
Created	pboahene@navajotech.edu	Application started by pboahene@navajotech.edu	2025-12-21 02:39 PM (US/Mountain)

Assignment: Organic Chemistry II – CHEM-2135

Read and strictly follow all instructions below:

Note: This sheet contains only questions. Do not write answers on this sheet. Use separate physical pages for your hand-written assignment.

Instructions:

- All assignments must be hand-written on separate physical pages.
- Include steps, observations, and conclusions for every task or question.
- Last date of submission: 2 weeks for date of posting. There will not be any individual reminders.
- Clearly write your name, date, and class on the assignment.
- Assignments must be submitted in physical form. Not online, via email, or on Blackboard.

Assignment: NMR Spectroscopy Analysis of Organic Compounds

Objective:
To analyze ^{1}H and ^{13}C NMR spectra of various organic compounds and identify structural features, functional groups, and chemical environments based on chemical shifts, splitting patterns, and integration.

Instructions:

1. **List of Organic Compounds:**
   Analyze the NMR spectra for the following compounds: Methanol (CH_3OH), Acetone (CH_3COCH_3), Benzaldehyde (C_6H_5CHO), Aniline ($C_6H_5NH_2$), Acetic acid (CH_3COOH), Ethyl acetate ($CH_3COOCH_2CH_3$)

2. **Analysis Steps:**
   For each compound:

- Identify major signals in the ^{1}H and ^{13}C NMR spectra.

- Assign chemical shifts to protons or carbons in specific functional groups (e.g., –OH, $–CH_3$, $–CH_2–$, –C=O, aromatic H/C).
- Discuss splitting patterns (singlet, doublet, triplet, etc.) and what they indicate about neighboring protons.
- Determine relative integration values to confirm proton count in each environment.
- Compare your assignments with expected literature chemical shift ranges.

3. **Factors Affecting NMR Signals:**
   For each compound, briefly explain:

- Hydrogen bonding effects (e.g., shifts in –OH or –NH protons)
- Conjugation and aromatic effects on chemical shifts
- Electronegativity of neighboring atoms or functional groups
- Symmetry and molecular environment influences on signal number and multiplicity
- Any other relevant structural influences on chemical shift or splitting

4. **Table Organization:**

Compound	**^{1}H NMR Signals (δ ppm)**	**^{13}C NMR Signals (δ ppm)**	**Splitting Pattern**	**Integration**	**Assignment / Reasoning**
Methanol					
Acetone					
Benzaldehyde					
Aniline					
Acetic acid					
Ethyl acetate					

Example (For Guidance Only): Compound: Methanol (CH_3OH)

- ^{1}H NMR Signals: δ 3.3 ppm (–OH), δ 1.2 ppm ($–CH_3$)

- ^{13}C NMR Signals: δ 50 ppm (–CH_3)
- Splitting Pattern: Singlet for –CH_3; broad singlet for –OH
- Integration: 3H for –CH_3; 1H for –OH
- Assignment / Reasoning: –OH proton appears broad due to hydrogen bonding; –CH_3 appears as singlet because there are no neighboring protons; ^{13}C shift consistent with alcohol carbon.

Instructions Reminder:

- Show all observations clearly, including peak assignments.
- Include reasoning and conclusions for each compound.
- Assignments must be hand-written on separate pages.

End of Assignment

Assignment: Organic Chemistry II – CHEM-2135

Read and strictly follow all instructions below:

Note: This sheet contains only questions. Do not write answers on this sheet. Use separate physical pages for your hand-written assignment.

Instructions:

- All assignments must be hand-written on separate physical pages.
- Include steps, observations, and conclusions for every task or question.
- Last date of submission: 2 weeks for date of posting. There will not be any individual reminders.
- Clearly write your name, date, and class on the assignment.
- Assignments must be submitted in physical form. Not online, via email, or on Blackboard.

Assignment: NMR Spectroscopy Analysis of Organic Compounds

Objective:
To analyze ^{1}H and ^{13}C NMR spectra of various organic compounds and identify structural features, functional groups, and chemical environments based on chemical shifts, splitting patterns, and integration.

Instructions:

1. **List of Organic Compounds:**
   Analyze the NMR spectra for the following compounds: Methanol (CH_3OH), Acetone (CH_3COCH_3), Benzaldehyde (C_6H_5CHO), Aniline ($C_6H_5NH_2$), Acetic acid (CH_3COOH), Ethyl acetate ($CH_3COOCH_2CH_3$)

2. **Analysis Steps:**
   For each compound:

- Identify major signals in the ^{1}H and ^{13}C NMR spectra.

- Assign chemical shifts to protons or carbons in specific functional groups (e.g., –OH, $–CH_3$, $–CH_2–$, –C=O, aromatic H/C).
- Discuss splitting patterns (singlet, doublet, triplet, etc.) and what they indicate about neighboring protons.
- Determine relative integration values to confirm proton count in each environment.
- Compare your assignments with expected literature chemical shift ranges.

3. **Factors Affecting NMR Signals:**
   For each compound, briefly explain:

- Hydrogen bonding effects (e.g., shifts in –OH or –NH protons)
- Conjugation and aromatic effects on chemical shifts
- Electronegativity of neighboring atoms or functional groups
- Symmetry and molecular environment influences on signal number and multiplicity
- Any other relevant structural influences on chemical shift or splitting

4. **Table Organization:**

Compound	**^{1}H NMR Signals (δ ppm)**	**^{13}C NMR Signals (δ ppm)**	**Splitting Pattern**	**Integration**	**Assignment / Reasoning**
Methanol					
Acetone					
Benzaldehyde					
Aniline					
Acetic acid					
Ethyl acetate					

Example (For Guidance Only): Compound: Methanol (CH_3OH)

- ^{1}H NMR Signals: δ 3.3 ppm (–OH), δ 1.2 ppm ($–CH_3$)

- ^{13}C NMR Signals: δ 50 ppm ($–CH_3$)
- Splitting Pattern: Singlet for $–CH_3$; broad singlet for –OH
- Integration: 3H for $–CH_3$; 1H for –OH
- Assignment / Reasoning: –OH proton appears broad due to hydrogen bonding; $–CH_3$ appears as singlet because there are no neighboring protons; ^{13}C shift consistent with alcohol carbon.

Instructions Reminder:

- Show all observations clearly, including peak assignments.
- Include reasoning and conclusions for each compound.
- Assignments must be hand-written on separate pages.

End of Assignment

NEW MEXICO
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Fostering Student Success from Cradle to Career

Michelle Lujan Grisham, Govenor
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Patricia Trujillo, Deputy Secretary

General Education Request Application

Application Number	5639
Institution	NTU
Applicant(s)	pboahene@navajotech.edu
Status	NMHED_REVIEW
Submitted	2025-12-21 03:03 PM (US/Mountain)

Gened Request Form

Contact Information

Chief Academic Officer Name
Colleen Bowman

Chief Academic Officer Email
cbowman@navajotech.edu

Registrar Name
Jason Wright

Registrar Email
jasonwright@navajotech.edu

Course's Academic Department
Science

Is this a Application a Re-Submission
no

Institutional Course Information

Prefix
CHEM

Number
2135L

Title
Organic Chemistry II Laboratory

Number of credits
1

Was this course previously part of the New Mexico General Education curriculum?
No

Is this application for your entire system (ENMU, NMSU, & UNM)?
No

Co-requisite Course

Prefix
CHEM

Number
2130L

Title
Organic Chemistry 1 Laboratory

New Mexico Common Course Information

Prefix
CHEM

Number
2135L

Title
Organic Chemistry II Laboratory

A. Content Area and Essential Skills

To which area should this course be added?
Science

Selected Areas
Critical Thinking, Quantitative Reasoning, Personal & Social Responsibility

Section B. Learning Outcomes

List all common course student learning outcomes for the course.

1. Appreciate, understand, and conduct experiments safely in the laboratory, being aware of the possible consequences of not adhering to appropriate safety guidelines.
2. Practice and demonstrate skill in the use of molecular drawing and modeling software.
3. Conduct laboratory scale separations to include, but not be limited to distillation, filtration, extraction, recrystallization and chromatography.
4. Conduct characterization experiments using the following techniques: melting points, solubility tests, IR spectroscopy, MS, TLC, and GC.
5. Synthesize, purify, and characterize simple organic compounds.
6. Apply theory and practice in the interpretation of spectroscopic data including, but not limited to FTIR, MS, 1H NMR, 13C NMR and UV/VIS.
7. Assess and account for sources of error in data collection and analysis.
8. Present experimental results in laboratory reports of appropriate length, style and depth, or through other modes as required.

List all institution-specific Student Learning Outcomes that are common to all course sections offered at the institutions regardless of instructor.

N/A

Section C. Narrative

In the boxes provided, write a short (~300 words) narrative explaining how the course weaves the essential skills associated with the content area throughout the course. Explain what students are going to do to develop the essential skills and how you will assess their learning. The narrative should be written with a general audience in mind and avoid discipline specific jargon as much as possible.

Critical Thinking. Problem Setting; Evidence Acquisition; Evidence Evaluation; and Reasoning /Conclusion. In this box, provide a narrative that explains how the proposed course addresses all of the components of critical thinking.

Problem Setting:
Students define experimental problems, plan reaction pathways, and design procedures to explore alcohols, aromatic compounds, and carbonyl chemistry. They select reagents, anticipate reaction outcomes, and choose appropriate purification and analytical techniques such as TLC, IR, and melting point analysis. Instructors assess learning through pre-lab assignments, experimental planning worksheets, and observation of students' ability to connect lecture concepts to practical experimental design.

Evidence Acquisition:
Students gather evidence by performing syntheses, purifying products, and collecting quantitative and qualitative data using techniques including TLC, distillation, recrystallization, IR, UV/VIS, NMR, and mass spectrometry. They also use molecular modeling and drawing software to visualize structures and predict reaction outcomes. Instructors evaluate lab notebooks, collected data, and submitted spectra for accuracy, completeness, and adherence to proper laboratory techniques.

Evidence Evaluation:
Students analyze experimental results by comparing measured data with literature values and predicted outcomes. They interpret spectra, assess product purity, evaluate yields, and identify sources of error. Students

refine techniques and adjust procedures based on their evaluations. Instructors assess lab reports and data analysis sections, focusing on critical evaluation, logical interpretation, and accuracy in connecting experimental results to chemical theory.

Reasoning / Conclusion:
Students integrate experimental evidence to explain reaction outcomes, justify mechanisms, and assign molecular structures. They present conclusions in lab reports, oral presentations, and class discussions, supporting arguments with collected data. Instructors assess reasoning by evaluating the clarity, logic, and evidence-based justification of students' conclusions, reinforcing scientific thinking and problem-solving in a laboratory context.

Quantitative Reasoning. Communication/Representation of Quantitative Information; Analysis of Quantitative Arguments; and Application of Quantitative Models. In this box, provide a narrative that explains how the proposed course addresses all of the components of quantitative reasoning.

Communication and Representation of Quantitative Information:
Students represent experimental and quantitative data using spectra, graphs, tables, calculations, and written summaries. They record values such as melting points, retention times, IR frequencies, NMR chemical shifts, mass fragments, and percent yields with clarity and precision. Instructors assess learning through lab notebooks, reports, and submitted data tables, focusing on accuracy, organization, and the clear communication of experimental results.

Analysis of Quantitative Arguments:
Students critically evaluate numerical and spectroscopic data to assess reaction efficiency, compare purification outcomes, and interpret trends in chemical behavior. They examine patterns in NMR, IR, and UV/VIS spectra, analyze integration ratios, and assess consistency with predicted reaction mechanisms. Instructors assess this skill by reviewing lab reports, spectral analyses, and problem sets, emphasizing logical interpretation, identification of inconsistencies, and the ability to support conclusions with data.

Application of Quantitative Methods:
Students apply quantitative techniques to calculate theoretical and percent yields, analyze reaction selectivity, evaluate nucleophilic and electrophilic reactivity, and interpret spectroscopic data numerically. They use quantitative models to understand reaction energetics, resonance effects, acidity/basicity trends, and carbonyl reaction pathways. Instructors assess this through lab reports, data analysis exercises, and written assignments, measuring students' ability to integrate numerical reasoning with experimental evidence.

Personal & Social Responsibility. Intercultural reasoning and intercultural competence; Sustainability and the natural and human worlds; Ethical reasoning; Collaboration skills, teamwork and value systems; and Civic discourse, civic knowledge and engagement – local and global In this box, provide a narrative that explains how the proposed course addresses 2 of the components of personal & social responsibility.

Collaboration Skills and Teamwork:
Students actively collaborate in the laboratory, sharing responsibilities such as heating, purifying, measuring, and analyzing samples. They communicate effectively, respect team members, and take accountability for assigned tasks. Collaboration extends to jointly troubleshooting experiments and interpreting results, fostering teamwork, problem-solving, and professional scientific skills. Instructors assess learning through peer evaluations, observation of team interactions, participation rubrics, and the quality of group lab reports.

Sustainability and the Natural and Human Worlds:
Students practice environmentally responsible laboratory techniques by minimizing chemical waste, selecting safer reagents, and considering the ecological impact of solvents and compounds. Laboratory activities include discussions on real-world applications—such as pharmaceuticals, fuels, and materials—to

link organic chemistry techniques to environmental sustainability, public health, and societal impacts. Instructors assess understanding through lab reports, sustainability reflections, safety quizzes, and participation in discussions, ensuring students demonstrate environmentally conscious decision-making alongside technical competence.

Section D. Assessment Plan

Link to Institution's General Education Assessment Plan

https://www.navajotech.edu/academics/general-education/

Application History

Type	username	Text	Timestamp
Submittal	pboahene@navajotech.edu	Submitted by pboahene@navajotech.edu	2025-12-21 03:03 PM (US/Mountain)
Authorization	pboahene@navajotech.edu	pboahene@navajotech.edu has authorized the application for submittal	2025-12-21 03:03 PM (US/Mountain)
Created	pboahene@navajotech.edu	Application started by pboahene@navajotech.edu	2025-12-21 02:54 PM (US/Mountain)

Assignment: CHEM-2135L, Organic Chemistry II Laboratory

Note: This sheet contains only questions. Write all answers on separate physical pages.

General Instructions:

- All assignments must be hand-written on separate pages.
- Include experimental steps, observations, and conclusions for each task.
- Clearly write your name, date, and class on each page.
- Submission deadline: 2 weeks from date of posting. No individual reminders will be given.
- Submit assignments in physical form only. No email, online, or Blackboard submissions.

Assignment: Infrared (IR) Spectroscopy Analysis of Organic Compounds

Objective:
To analyze the IR spectra of selected organic compounds and identify functional groups based on characteristic absorption bands. This assignment emphasizes careful observation, functional group assignment, and reasoning about structural influences.

1. Compounds to Analyze: Methanol (CH_3OH), Acetone (CH_3COCH_3), Benzaldehyde (C_6H_5CHO), Aniline ($C_6H_5NH_2$), Carboxylic acid (CH_3COOH), Ethyl acetate ($CH_3COOCH_2CH_3$)

2. Analysis Steps for Each Compound:

1. Identify major IR peaks (stretching or bending vibrations).
2. Assign each peak to the corresponding functional group (O–H, C=O, C–H, N–H, C–O, etc.).
3. Discuss peak intensity and shape (broad vs. sharp) and what it indicates about bonding or structure.
4. Compare your assignments with expected absorption ranges.

3. Structural Factors Affecting IR Absorptions:
For each compound, briefly explain how:

- Hydrogen bonding affects peak broadening or shifts.
- Conjugation effects influence C=O or C=C stretching frequencies.
- Symmetry and molecular environment impact peak presence or intensity.
- Any other structural influences on peak position.

4. Data Table (to be filled by students):

Compound	**Major IR Peaks (cm^{-1})**	**Functional Group**	**Peak Shape / Intensity**	**Reasoning / Structural Influence**
Methanol				
Acetone				
Benzaldehyde				
Aniline				
Carboxylic acid				
Ethyl acetate				

5. Example for Guidance
Compound: Methanol (CH_3OH)

- Major Peaks: 3300 cm^{-1} (O–H), 2950 cm^{-1} (C–H), 1050 cm^{-1} (C–O)
- Functional Groups: –OH, –CH_3, –C–O–
- Peak Shape / Intensity: Broad O–H peak due to hydrogen bonding; sharp C–H peak; medium C–O peak
- Reasoning: Hydrogen bonding broadens O–H stretch; C–O peak in fingerprint region; C–H stretches indicate methyl group

Instructions Reminder:

- Show all observations clearly, including peak assignments.
- Include reasoning and conclusions for each compound.
- Use separate physical pages for answers.

End of Assignment

<u>Assignment: CHEM-2135L, Organic Chemistry II Laboratory</u>

Note: This sheet contains only questions. Write all answers on separate physical pages.

General Instructions:

- All assignments must be hand-written on separate pages.
- Include experimental steps, observations, and conclusions for each task.
- Clearly write your name, date, and class on each page.
- Submission deadline: 2 weeks from date of posting. No individual reminders will be given.
- Submit assignments in physical form only. No email, online, or Blackboard submissions.

Assignment: Infrared (IR) Spectroscopy Analysis of Organic Compounds

Objective:
To analyze the IR spectra of selected organic compounds and identify functional groups based on characteristic absorption bands. This assignment emphasizes careful observation, functional group assignment, and reasoning about structural influences.

1. Compounds to Analyze: Methanol (CH_3OH), Acetone (CH_3COCH_3), Benzaldehyde (C_6H_5CHO), Aniline ($C_6H_5NH_2$), Carboxylic acid (CH_3COOH), Ethyl acetate ($CH_3COOCH_2CH_3$)

2. Analysis Steps for Each Compound:

1. Identify major IR peaks (stretching or bending vibrations).
2. Assign each peak to the corresponding functional group (O–H, C=O, C–H, N–H, C–O, etc.).
3. Discuss peak intensity and shape (broad vs. sharp) and what it indicates about bonding or structure.
4. Compare your assignments with expected absorption ranges.

3. Structural Factors Affecting IR Absorptions:

For each compound, briefly explain how:

- Hydrogen bonding affects peak broadening or shifts.
- Conjugation effects influence C=O or C=C stretching frequencies.
- Symmetry and molecular environment impact peak presence or intensity.
- Any other structural influences on peak position.

4. Data Table (to be filled by students):

Compound	**Major IR Peaks (cm^{-1})**	**Functional Group**	**Peak Shape / Intensity**	**Reasoning / Structural Influence**
Methanol				
Acetone				
Benzaldehyde				
Aniline				
Carboxylic acid				
Ethyl acetate				

5. Example for Guidance

Compound: Methanol (CH_3OH)

- Major Peaks: 3300 cm^{-1} (O–H), 2950 cm^{-1} (C–H), 1050 cm^{-1} (C–O)
- Functional Groups: –OH, $–CH_3$, –C–O–
- Peak Shape / Intensity: Broad O–H peak due to hydrogen bonding; sharp C–H peak; medium C–O peak
- Reasoning: Hydrogen bonding broadens O–H stretch; C–O peak in fingerprint region; C–H stretches indicate methyl group

Instructions Reminder:

- Show all observations clearly, including peak assignments.
- Include reasoning and conclusions for each compound.
- Use separate physical pages for answers.

End of Assignment

General Education Request Application

Application Number	5641
Institution	NTU
Applicant(s)	pboahene@navajotech.edu
Status	NMHED_REVIEW
Submitted	2025-12-21 03:25 PM (US/Mountain)

Gened Request Form

Contact Information

Chief Academic Officer Name
Colleen Bowman

Chief Academic Officer Email
cbowman@navajotech.edu

Registrar Name
Jason Wright

Registrar Email
jasonwright@navajotech.edu

Course's Academic Department
Science

Is this a Application a Re-Submission
no

Institutional Course Information

Prefix
CHEM

Number
1225C

Title
General Chemistry II Lecture and Laboratory for STEM Majors

Number of credits
4

Was this course previously part of the New Mexico General Education curriculum?
No

Is this application for your entire system (ENMU, NMSU, & UNM)?
No

Co-requisite Course

Prefix
CHEM

Number
1120C

Title
Introduction to Chemistry Lecture and Laboratory

New Mexico Common Course Information

Prefix
CHEM

Number
1225C

Title
General Chemistry II Lecture and Laboratory for STEM Majors

A. Content Area and Essential Skills

To which area should this course be added?
Science

Selected Areas
Critical Thinking, Quantitative Reasoning, Personal & Social Responsibility

Section B. Learning Outcomes

List all common course student learning outcomes for the course.

1. Describe the process of scientific inquiry.
2. Solve problems scientifically.
3. Communicate scientific information.
4. Apply quantitative analysis to scientific problems.
5. Apply scientific thinking to real world problems.

List all institution-specific Student Learning Outcomes that are common to all course sections offered at the institutions regardless of instructor.

N/A

Section C. Narrative

In the boxes provided, write a short (~300 words) narrative explaining how the course weaves the essential skills associated with the content area throughout the course. Explain what students are going to do to develop the essential skills and how you will assess their learning. The narrative should be written with a general audience in mind and avoid discipline specific jargon as much as possible.

Critical Thinking. Problem Setting; Evidence Acquisition; Evidence Evaluation; and Reasoning /Conclusion. In this box, provide a narrative that explains how the proposed course addresses all of the components of critical thinking.

Problem Setting:
Students integrate principles of electrochemistry, nuclear chemistry, acid–base reactions, chemical kinetics, and equilibrium to determine which questions to ask and which evidence to collect. In lectures, students frame theoretical problems, such as predicting cell potentials, modeling reaction rates, interpreting nuclear decay, and assessing equilibrium shifts. In laboratories, they design experiments, select appropriate measurements, control variables, and identify data that reveal reaction mechanisms or energy changes. Instructors assess problem-setting skills through written assignments, in-class exercises, and lab planning exercises, focusing on clarity in defining problems and relevance of the approach.

Evidence Acquisition:
Students systematically gather quantitative and qualitative data in the laboratory, including electrode potentials, current and voltage measurements, reaction rates, pH, temperature, and equilibrium concentrations, while noting observable chemical and physical changes. In lectures and exercises, they analyze theoretical and experimental data, compare trends, and calculate key quantities such as rate laws, equilibrium constants, half-lives, and cell potentials. Instructors assess evidence acquisition through graded lab reports, problem sets, and data interpretation tasks, emphasizing accuracy, completeness, and appropriate use of units and methods.

Evidence Evaluation:
Students critically evaluate data quality, examining measurement precision, reproducibility, and consistency with chemical principles. They compare calculated values with theoretical predictions, identify sources of error, and refine experimental design or assumptions as needed. Instructors assess evaluation skills through written analyses, discussion contributions, and problem-solving exercises, focusing on students' ability to justify conclusions, recognize uncertainties, and distinguish reliable results from experimental artifacts.

Reasoning and Conclusion:
Students integrate experimental and theoretical evidence to construct logical, evidence-based explanations of chemical behavior. They apply quantitative reasoning to predict system responses, explain observed trends, and assess consistency with models across electrochemistry, kinetics, equilibrium, nuclear, and acid–base systems. Instructors assess reasoning through lab reports, exams, and class discussions, emphasizing coherent, well-supported arguments and clear communication of complex chemical phenomena.

Quantitative Reasoning. Communication/Representation of Quantitative Information; Analysis of Quantitative Arguments; and Application of Quantitative Models. In this box, provide a narrative that explains how the proposed course addresses all of the components of quantitative reasoning.

Communication and Representation of Quantitative Information:
Students organize and present quantitative chemical data using tables, graphs, equations, and calculations. They express relationships among variables through rate laws, equilibrium expressions, electrochemical equations, pH calculations, and nuclear decay models, applying correct units and significant figures. Students explain numerical results in written and verbal formats, linking calculations and visual representations to chemical interpretations. Instructors assess this skill through lab reports, problem sets, presentations, and in-class exercises, focusing on clarity, accuracy, and effective communication of quantitative evidence.

Analysis of Quantitative Arguments:
Students critically evaluate numerical data, mathematical relationships, and chemical models to determine whether conclusions are scientifically supported. They analyze calculations involving equilibrium constants, reaction rates, pH, electrochemical potentials, and nuclear decay, checking for internal consistency, correct unit usage, and reasonable magnitudes. Students compare alternative approaches, evaluate assumptions, and interpret how variable changes affect system behavior. Instructors assess this skill through written analyses, problem-solving exercises, and discussion participation, emphasizing students' ability to identify strong, evidence-based arguments and distinguish them from flawed reasoning.

Application of Quantitative Methods:
Students apply quantitative chemical models to predict, explain, and validate behavior in electrochemical, acid–base, nuclear, kinetic, and equilibrium systems. They use rate laws, equilibrium and solubility constants, Nernst equations, pH and buffer calculations, and radioactive decay models to connect experimental data with theoretical frameworks. By applying these models to lab experiments and problem-solving exercises, students evaluate model accuracy, recognize limitations, and refine assumptions. Instructors assess application through lab reports, assignments, and applied exercises, focusing on students' ability to use quantitative models effectively to interpret and predict chemical phenomena

Personal & Social Responsibility. Intercultural reasoning and intercultural competence; Sustainability and the natural and human worlds; Ethical reasoning; Collaboration skills, teamwork and value systems; and Civic discourse, civic knowledge and engagement – local and global In this box, provide a narrative that explains how the proposed course addresses 2 of the components of personal & social responsibility.

Collaboration Skills, Teamwork, and Value Systems:
Students actively collaborate in teams to plan and execute experiments, divide responsibilities equitably, and communicate clearly while analyzing results. They troubleshoot procedures together, provide constructive feedback, and engage in shared problem-solving, fostering accountability, respect, and professional scientific behavior.

Sustainability and the Natural and Human Worlds:
Students practice environmentally responsible chemistry by handling chemicals safely, minimizing waste, selecting safer reagents when feasible, and following established laboratory safety protocols. They reflect on the broader societal and environmental impact of chemical processes and consider how their experimental choices relate to sustainability, public health, and environmental stewardship.

Instructors assess these skills through lab reports, group project evaluations, participation rubrics, and safety quizzes, focusing on effective teamwork, responsible conduct, and environmentally conscious decision-making.

Section D. Assessment Plan

Link to Institution's General Education Assessment Plan

https://www.navajotech.edu/academics/general-education/

Application History

Type	username	Text	Timestamp
Submittal	pboahene@navajotech.edu	Submitted by pboahene@navajotech.edu	2025-12-21 03:25 PM (US/Mountain)
Authorization	pboahene@navajotech.edu	pboahene@navajotech.edu has authorized the application for submittal	2025-12-21 03:25 PM (US/Mountain)
Created	pboahene@navajotech.edu	Application started by pboahene@navajotech.edu	2025-12-21 03:16 PM (US/Mountain)

Assignment: Principle of Chemistry II, CHEM1225C

Read and strictly follow all instructions below:

Note: This sheet is only for questions. Do not write answers on this sheet. Use separate physical pages for your handwritten assignment.

Instructions:

- All assignments must be handwritten on separate physical pages.
- Include steps, observations, calculations, and conclusions for every task or question.
- Last date of submission: 1 week from the date of posting. There will not be any individual reminders.
- Clearly write your name, date, and class on the assignment.
- Assignments may be submitted in person (or) through Blackboard.

Title: *Quantitative Analysis of Electrochemical Cell Potential*

Purpose

In this assignment, you will analyze how ion concentration affects the voltage of an electrochemical cell. Using provided data and electrochemical theory, you will apply quantitative models to calculate cell potentials, evaluate evidence, and draw chemically sound conclusions.

Learning Objectives

By completing this assignment, you will be able to:

- Identify oxidation and reduction processes in an electrochemical cell
- Use standard reduction potentials to predict cell voltage
- Apply the Nernst equation to non-standard conditions
- Analyze quantitative data to support chemical arguments

- Communicate results using equations, graphs, and written explanations

Background

Electrochemical cells generate electrical energy from redox reactions. The cell potential depends on the identities of the half-reactions and the concentrations of the ions involved. Under non-standard conditions, the Nernst equation relates cell potential to reaction quotient values. Quantitative analysis of electrochemical data allows chemists to predict spontaneity and system behavior.

Given Information

Consider a Zn–Cu galvanic cell:

- $Zn^{2+}(aq) + 2e^{-} \rightarrow Zn(s)$ $E° = –0.76$ V
- $Cu^{2+}(aq) + 2e^{-} \rightarrow Cu(s)$ $E° = +0.34$ V
-

Measured cell potentials were obtained at different Cu^{2+} concentrations while Zn^{2+} concentration remained constant at 1.0 M.

Cu^{2+} Concentration (M)	**Measured Cell Potential (V)**
1.0	1.10
0.10	1.07
0.010	1.04
0.001	1.01

Instructions

Part 1: Electrochemical Reasoning

- Identify the anode and cathode in the Zn–Cu cell.
- Write the balanced overall redox reaction.
- Calculate the standard cell potential (E°cell).

Part 2: Quantitative Model Application

- Write the Nernst equation for the Zn–Cu cell at 25 °C.
- Calculate the theoretical cell potential for each Cu^{2+} concentration.
- Show all calculations clearly, including units and significant figures.

Part 3: Data Representation

- Create a table comparing measured and calculated cell potentials.
- Plot cell potential versus log(Cu^{2+} concentration).
- Describe the relationship shown in the graph.

Part 4: Analysis of Quantitative Arguments

- Compare theoretical and measured values of cell potential.
- Evaluate whether the data support the Nernst equation.
- Identify possible sources of deviation between predicted and measured values.

Part 5: Evidence Evaluation

Discuss the reliability of the data by addressing:

- Trends in the measurements
- Consistency with electrochemical theory
- Limitations of the model or assumptions used

Part 6: Reasoning and Conclusion

Using quantitative evidence and electrochemical principles, explain how ion concentration affects cell potential. State whether the data support the conclusions and justify your reasoning clearly.

Submission Requirements

- Calculations must be shown clearly and neatly
- Graphs must be labeled with axes and units
- Written responses must be concise and chemically accurate
- Submit as a single PDF or document file in-person (or) through Blackboard

Key Skills Emphasized

- Application of quantitative electrochemical chemical models
- Analysis of numerical evidence
- Scientific reasoning and communication

Assignment: Principle of Chemistry II, CHEM1225C

Read and strictly follow all instructions below:

Note: This sheet is only for questions. Do not write answers on this sheet. Use separate physical pages for your handwritten assignment.

Instructions:

- All assignments must be handwritten on separate physical pages.
- Include steps, observations, calculations, and conclusions for every task or question.
- Last date of submission: 1 week from the date of posting. There will not be any individual reminders.
- Clearly write your name, date, and class on the assignment.
- Assignments may be submitted in person (or) through Blackboard.

Title: *Quantitative Analysis of Electrochemical Cell Potential*

Purpose

In this assignment, you will analyze how ion concentration affects the voltage of an electrochemical cell. Using provided data and electrochemical theory, you will apply quantitative models to calculate cell potentials, evaluate evidence, and draw chemically sound conclusions.

Learning Objectives

By completing this assignment, you will be able to:

- Identify oxidation and reduction processes in an electrochemical cell
- Use standard reduction potentials to predict cell voltage
- Apply the Nernst equation to non-standard conditions
- Analyze quantitative data to support chemical arguments

- Communicate results using equations, graphs, and written explanations

Background

Electrochemical cells generate electrical energy from redox reactions. The cell potential depends on the identities of the half-reactions and the concentrations of the ions involved. Under non-standard conditions, the Nernst equation relates cell potential to reaction quotient values. Quantitative analysis of electrochemical data allows chemists to predict spontaneity and system behavior.

Given Information

Consider a Zn–Cu galvanic cell:

- $Zn^{2+}(aq) + 2e^{-} \rightarrow Zn(s)$ $E° = –0.76$ V
- $Cu^{2+}(aq) + 2e^{-} \rightarrow Cu(s)$ $E° = +0.34$ V
-

Measured cell potentials were obtained at different Cu^{2+} concentrations while Zn^{2+} concentration remained constant at 1.0 M.

Cu^{2+} Concentration (M)	Measured Cell Potential (V)
1.0	1.10
0.10	1.07
0.010	1.04
0.001	1.01

Instructions

Part 1: Electrochemical Reasoning

- Identify the anode and cathode in the Zn–Cu cell.
- Write the balanced overall redox reaction.
- Calculate the standard cell potential (E°cell).

Part 2: Quantitative Model Application

- Write the Nernst equation for the Zn–Cu cell at 25 °C.
- Calculate the theoretical cell potential for each Cu^{2+} concentration.
- Show all calculations clearly, including units and significant figures.

Part 3: Data Representation

- Create a table comparing measured and calculated cell potentials.
- Plot cell potential versus log(Cu^{2+} concentration).
- Describe the relationship shown in the graph.

Part 4: Analysis of Quantitative Arguments

- Compare theoretical and measured values of cell potential.
- Evaluate whether the data support the Nernst equation.
- Identify possible sources of deviation between predicted and measured values.

Part 5: Evidence Evaluation

Discuss the reliability of the data by addressing:

- Trends in the measurements
- Consistency with electrochemical theory
- Limitations of the model or assumptions used

Part 6: Reasoning and Conclusion

Using quantitative evidence and electrochemical principles, explain how ion concentration affects cell potential. State whether the data support the conclusions and justify your reasoning clearly.

Submission Requirements

- Calculations must be shown clearly and neatly
- Graphs must be labeled with axes and units
- Written responses must be concise and chemically accurate
- Submit as a single PDF or document file in-person (or) through Blackboard

Key Skills Emphasized

- Application of quantitative electrochemical chemical models
- Analysis of numerical evidence
- Scientific reasoning and communication

NEW MEXICO
HIGHER EDUCATION
DEPARTMENT

Fostering Student Success from Cradle to Career

Michelle Lujan Grisham, Govenor
Stephanie M. Rodriguez, Cabinet Secretary
Patricia Trujillo, Deputy Secretary

General Education Request Application

Application Number	5646
Institution	NTU
Applicant(s)	pboahene@navajotech.edu
Status	NMHED_REVIEW
Submitted	2025-12-21 04:55 PM (US/Mountain)

Gened Request Form

Contact Information

Chief Academic Officer Name
Colleen Bowman

Chief Academic Officer Email
cbowman@navajotech.edu

Registrar Name
Jason Wright

Registrar Email
jasonwright@navajotech.edu

Course's Academic Department
Science

Is this a Application a Re-Submission
no

Institutional Course Information

Prefix
PHYS

Number
1115C

Title
Survey of Physics with Lab

Number of credits
4

Was this course previously part of the New Mexico General Education curriculum?
No

Is this application for your entire system (ENMU, NMSU, & UNM)?
No

Co-requisite Course

Prefix
N/A

Number
N/A

Title
N/A

New Mexico Common Course Information

Prefix
PHYS

Number
1115C

Title
Survey of Physics with Lab

A. Content Area and Essential Skills

To which area should this course be added?
Science

Selected Areas
Critical Thinking, Quantitative Reasoning, Personal & Social Responsibility

Section B. Learning Outcomes

List all common course student learning outcomes for the course.

Upon completion of this course, the student will be able to:
1. Apply concepts of classical mechanics (such as velocity, acceleration, force, inertia, momentum, torque, work, energy) to simple static and dynamic systems.
2. Apply concepts of thermodynamics (such as heat, temperature, internal energy, entropy) to simple processes.
3. Apply concepts of electricity and magnetism (such as fields, potential, charge conservation, static and dynamic induction) to simple circuits, motors, and other simple contrivances.
4. Apply simple geometric and wave optics in simple situations.
5. Test ideas using modern laboratory equipment.
6. Estimate experimental uncertainties.
7. Use computers to analyze and report laboratory results.
8. Draw appropriate conclusions from quantitative scientific observations.
9. Accurately and clearly communicate the results of scientific experiments.

List all institution-specific Student Learning Outcomes that are common to all course sections offered at the institutions regardless of instructor.

N/A

Section C. Narrative

In the boxes provided, write a short (~300 words) narrative explaining how the course weaves the essential skills associated with the content area throughout the course. Explain what students are going to do to develop the essential skills and how you will assess their learning. The narrative should be written with a general audience in mind and avoid discipline specific jargon as much as possible.

Critical Thinking. Problem Setting; Evidence Acquisition; Evidence Evaluation; and Reasoning /Conclusion. In this box, provide a narrative that explains how the proposed course addresses all of the components of critical thinking.

Problem Setting:
Students begin each laboratory investigation or applied physics activity by clearly defining a scientific problem or question related to core physics concepts such as motion, forces, energy, and electricity. In their lab reports, students state the purpose of experiments, formulate testable hypotheses, identify independent and dependent variables, and outline specific experimental objectives. In-class conceptual problems, Blackboard quizzes, and WebAssign exercises reinforce students' ability to frame and refine physics-based questions. Assessment includes evaluation of lab reports, problem-solving exercises, and quiz responses, with rubrics emphasizing clarity, relevance, and completeness of problem framing.
Evidence Acquisition:
Students gather both quantitative and qualitative data through hands-on experiments using laboratory equipment, sensors, and simulations. They practice proper measurement techniques, data logging, and adherence to experimental procedures to ensure accuracy and repeatability. Additional evidence is collected via structured observations, instructor demonstrations, and assigned readings. Learning is assessed through lab notebooks, data worksheets, and homework exercises, with grading focused on accuracy, completeness, and appropriate use of tools and methods.
Evidence Evaluation:
Students analyze collected data by performing calculations, generating graphs, estimating experimental

uncertainties, and comparing experimental results to theoretical predictions. They assess data credibility, reliability, and relevance, identify sources of error, and discuss limitations. Assessment occurs through lab report analysis, WebAssign problem sets, and Blackboard quizzes, with rubrics evaluating analytical depth, logical reasoning, and ability to critique evidence.
Reasoning and Conclusion:
Students synthesize findings to draw logical conclusions that connect evidence to the original problem or question. They justify interpretations with quantitative analysis, reflect on assumptions and experimental limitations, and clearly explain outcomes. Assessment includes lab reports, homework, quizzes, exams, and small-group mini-project presentations, using rubrics adapted from the NMHED Critical Thinking framework to measure evidence-based reasoning, clarity of conclusions, and integration of theoretical and experimental insights

Quantitative Reasoning. Communication/Representation of Quantitative Information; Analysis of Quantitative Arguments; and Application of Quantitative Models. In this box, provide a narrative that explains how the proposed course addresses all of the components of quantitative reasoning.

Communication and Representation of Quantitative Information:
Students develop skills in representing and communicating quantitative information symbolically, graphically, and verbally. In laboratory experiments, students record measurements, construct data tables, generate graphs, and apply correct units and significant figures to accurately convey results. Lab reports require clear presentation of findings using equations, graphs, and written explanations. Blackboard quizzes, WebAssign homework, and in-class exercises further reinforce students' ability to interpret and present quantitative information effectively. Assessment focuses on clarity, accuracy, and appropriateness of representations.

Analysis of Quantitative Arguments:
Students critically examine and evaluate quantitative arguments found in lectures, textbooks, laboratory data, and problem-solving activities. They analyze numerical results, graphical trends, and mathematical relationships to determine whether conclusions are logically supported by evidence. Through lab discussions, homework, quizzes, and exams, students assess the validity of quantitative reasoning presented by others and identify errors, underlying assumptions, or limitations in data or calculations. Rubrics evaluate students' ability to reason critically and interpret data accurately.

Application of Quantitative Models:
Students apply mathematical and physical models to investigate core physics phenomena, including motion, forces, energy, momentum, and electricity. Laboratory exercises require the use of quantitative models to predict experimental outcomes, analyze data, and compare results with theoretical expectations. Structured problem sets and contextual examples, such as evaluating energy transformations in real-world systems, further develop students' ability to apply quantitative models appropriately. Assessment emphasizes correct model application, interpretation of results, and justification of conclusions based on experimental evidence.

Student proficiency is evaluated using laboratory reports, WebAssign homework, Blackboard end-of-chapter quizzes, in-class problem-solving activities, and exams.

Personal & Social Responsibility. Intercultural reasoning and intercultural competence; Sustainability and the natural and human worlds; Ethical reasoning; Collaboration skills, teamwork and value systems; and Civic discourse, civic knowledge and engagement – local and global In this box, provide a narrative that explains how the proposed course addresses 2 of the components of personal & social responsibility.

Collaboration Skills, Teamwork, and Value Systems:
Students develop collaboration and teamwork skills through regular laboratory experiments, in-class problem-solving exercises, and a required small-group mini-project. Working in teams of three, students plan experiments, share responsibilities, collect and analyze data, and communicate results effectively. Laboratory

activities emphasize accountability, respectful communication, and ethical conduct in data collection and reporting. The mini-project requires students to collaboratively prepare and deliver an 8–10 minute presentation, demonstrating shared responsibility and coordinated efforts to meet group objectives. Assessment of teamwork and collaboration is conducted using a rubric adapted from the NMHED framework, evaluating participation, accountability, communication, and ethical collaboration.

Sustainability and the Natural and Human Worlds:
Students explore the connections between physical principles and real-world systems that impact both natural and human environments. Through laboratory experiments, applied problem-solving exercises, and group activities, students examine how concepts such as energy, motion, and efficiency relate to sustainability, resource use, and technology in daily life. Students are encouraged to consider how physics informs responsible decision-making in contexts like energy consumption, transportation, and technological applications in their communities.

Section D. Assessment Plan

Link to Institution's General Education Assessment Plan

https://www.navajotech.edu/academics/general-education/

Application History

Type	username	Text	Timestamp
Submittal	pboahene@navajotech.edu	Submitted by pboahene@navajotech.edu	2025-12-21 04:55 PM (US/Mountain)
Authorization	pboahene@navajotech.edu	pboahene@navajotech.edu has authorized the application for submittal	2025-12-21 04:55 PM (US/Mountain)
Created	pboahene@navajotech.edu	Application started by pboahene@navajotech.edu	2025-12-21 04:29 PM (US/Mountain)

PHYS 1115C – Survey of Physics with Lab
Laboratory Assessment: Free Fall Motion – Determination of the Acceleration Due to Gravity (g)
Essential Skill Assessed: Critical Thinking (NMHED)

Overview

In this laboratory assignment, you will perform a guided **Free Fall experiment** to determine the acceleration due to gravity, g. The purpose of this activity is to develop and demonstrate your **critical thinking skills** by clearly defining the scientific problem, collecting and analyzing data, evaluating evidence, and drawing well-reasoned conclusions. You will **submit an individual laboratory report** documenting your work.

Assessment Tasks

1. Laboratory Investigation

Follow the step-by-step procedure in the PHYS 1115C lab manual to complete the Free Fall experiment. You will measure the motion of a falling object to determine g.

---

2. Laboratory Report Requirements (Individual Submission)

Your report should include the following sections:

A. Problem Setting

- Clearly state the scientific question being investigated.
- Explain the purpose of the experiment in determining g.
- Identify the key physical quantities involved in the investigation.

B. Evidence Acquisition

- Describe how you collected experimental data according to the lab procedure.
- Present your data clearly using tables and/or graphs.
- Ensure measurements include correct units and significant figures.

C. Evidence Evaluation

- Analyze your data using appropriate calculations and graphs.
- Determine an experimental value for g.
- Evaluate the reliability and credibility of your measurements.
- Identify potential sources of error and limitations of your experiment.

D. Reasoning and Conclusion

- Interpret your results in relation to the original question.
- Compare your experimental value of $g$with the accepted value.
- Explain whether your results support the physical model of free fall.
- Justify your conclusions using your data and analysis.
- Reflect on how data quality and limitations may have affected your conclusions.

Essential Skill Alignment

You will demonstrate **critical thinking** by:

- Defining a clear scientific problem
- Collecting and organizing evidence
- Evaluating data credibility and reliability
- Drawing evidence-based, logical conclusions

Component	Emerging (1 pt)	Developing (2 pts)	Proficient (3 pts)
Problem Setting	Problem/question unclear; objectives missing or inappropriate	Problem stated but lacks clarity or context	Problem/question clearly defined; objectives and variables appropriate
Evidence Acquisition	Minimal evidence collected; poorly justified	Evidence addresses problem minimally; some justification	Evidence thoroughly addresses problem; appropriate and justified
Evidence Evaluation	Little evaluation; credibility not addressed	Some evaluation; limited awareness of assumptions	Thorough evaluation; credibility and assumptions addressed
Reasoning & Conclusion	Conclusions loosely connected to data; outcomes oversimplified	Conclusions logically tied to data; some outcomes identified	Conclusions well-supported, consider multiple viewpoints; outcomes clearly identified

Grading Scale:
12–11 points = A | 10–9 points = B | 8–7 points = C | 6–5 points = D | Below 5 = F

Submission Instructions:

- Submit your individual report via the course learning platform by the assigned deadline.
- Use clear tables, graphs, and proper units throughout.
- Ensure your report demonstrates logical reasoning, attention to detail, and reflection on experimental limitations.

PHYS 1115C – Survey of Physics with Lab
Laboratory Assessment: Free Fall Motion – Determination of the Acceleration Due to Gravity (g)
Essential Skill Assessed: Critical Thinking (NMHED)

Overview

In this laboratory assignment, you will perform a guided **Free Fall experiment** to determine the acceleration due to gravity, g. The purpose of this activity is to develop and demonstrate your **critical thinking skills** by clearly defining the scientific problem, collecting and analyzing data, evaluating evidence, and drawing well-reasoned conclusions. You will **submit an individual laboratory report** documenting your work.

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1. Laboratory Investigation

Follow the step-by-step procedure in the PHYS 1115C lab manual to complete the Free Fall experiment. You will measure the motion of a falling object to determine g.

---

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Your report should include the following sections:

A. Problem Setting

- Clearly state the scientific question being investigated.
- Explain the purpose of the experiment in determining g.
- Identify the key physical quantities involved in the investigation.

B. Evidence Acquisition

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- Present your data clearly using tables and/or graphs.
- Ensure measurements include correct units and significant figures.

C. Evidence Evaluation

- Analyze your data using appropriate calculations and graphs.
- Determine an experimental value for g.
- Evaluate the reliability and credibility of your measurements.
- Identify potential sources of error and limitations of your experiment.

D. Reasoning and Conclusion

- Interpret your results in relation to the original question.
- Compare your experimental value of g with the accepted value.
- Explain whether your results support the physical model of free fall.
- Justify your conclusions using your data and analysis.
- Reflect on how data quality and limitations may have affected your conclusions.

Essential Skill Alignment

You will demonstrate **critical thinking** by:

- Defining a clear scientific problem
- Collecting and organizing evidence
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Submission Instructions:

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- Use clear tables, graphs, and proper units throughout.
- Ensure your report demonstrates logical reasoning, attention to detail, and reflection on experimental limitations.

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HIGHER EDUCATION
DEPARTMENT

Fostering Student Success from Cradle to Career

Michelle Lujan Grisham, Govenor
Stephanie M. Rodriguez, Cabinet Secretary
Patricia Trujillo, Deputy Secretary

General Education Request Application

Application Number	5649
Institution	NTU
Applicant(s)	pboahene@navajotech.edu
Status	NMHED_REVIEW
Submitted	2025-12-22 06:13 PM (US/Mountain)

Gened Request Form

Contact Information

Chief Academic Officer Name
Colleen Bowman

Chief Academic Officer Email
cbowman@navajotech.edu

Registrar Name
Jason Wright

Registrar Email
jasonwright@navajotech.edu

Course's Academic Department
Science

Is this a Application a Re-Submission
no

Institutional Course Information

Prefix
PHYS

Number
1320C

Title
Calculus-based Physics II Lecture + Laboratory

Number of credits
4

Was this course previously part of the New Mexico General Education curriculum?
No

Is this application for your entire system (ENMU, NMSU, & UNM)?
No

Co-requisite Course

Prefix
N/A

Number
N/A

Title
N/A

New Mexico Common Course Information

Prefix
PHYS

Number
1320C

Title
Calculus-based Physics II Lecture + Laboratory

A. Content Area and Essential Skills

To which area should this course be added?
Science

Selected Areas
Critical Thinking, Quantitative Reasoning, Personal & Social Responsibility

Section B. Learning Outcomes

List all common course student learning outcomes for the course.

Lecture Outcomes
Upon completion of this course, the student will be able to:
1. Apply the concepts of electric charge, electric field and electric potential to solve problems.
2. Sketch the electric field in the vicinity of point, line, sheet, and spherical distributions of static electric charge.
3. Sketch the magnetic field in the vicinity of line, ring, sheet, and solenoid distributions of steady current.
4. Describe the relationship between electric field and electric potential.
5. Calculate the Lorentz force on a moving charge for simple geometries of the fields and use it to analyze the motion of charged particles.
6. Apply the integral forms of Maxwell's equations.
7. Calculate the energy of electromagnetic fields.
8. Analyze DC circuits

Lab Outcomes
Upon completion of this course, the student will be able to:
1. Develop a reasonable hypothesis.
2. Work effectively as part of a team.
3. Take measurements and record measured quantities to the appropriate precision.
4. Estimate error sources in experimental techniques.
5. Apply appropriate methods of analysis to raw data, including using graphical and statistical methods via computer-based tools.
6. Determine whether results and conclusions are reasonable.
7. Present experimental results in written form in appropriate style and depth.
8. Experience the relationship between theory and experiment.

List all institution-specific Student Learning Outcomes that are common to all course sections offered at the institutions regardless of instructor.

N/A

Section C. Narrative

In the boxes provided, write a short (~300 words) narrative explaining how the course weaves the essential skills associated with the content area throughout the course. Explain what students are going to do to develop the essential skills and how you will assess their learning. The narrative should be written with a general audience in mind and avoid discipline specific jargon as much as possible.

Critical Thinking. Problem Setting; Evidence Acquisition; Evidence Evaluation; and Reasoning /Conclusion. In this box, provide a narrative that explains how the proposed course addresses all of the components of critical thinking.

Problem Setting: In lecture, students frame and analyze problems involving electric fields generated by discrete and continuous charge distributions. In laboratory activities, students formulate investigable questions related to electric field behavior and measurement and clarify experimental objectives before data collection.
Evidence Acquisition:
Students acquire quantitative evidence by applying the definition of the electric field, using vector superposition, and employing calculus-based expressions derived from Coulomb's Law. In lectures and

WebAssign homework, students calculate electric field vectors using derivatives or integrals as appropriate. In laboratory settings, students collect experimental data using field probes or related instruments and record measurements accurately, using correct units and appropriate precision.

Evidence Evaluation:
Students evaluate evidence by examining assumptions, comparing analytical results with experimental or simulated data, and estimating uncertainty. They analyze discrepancies between theoretical predictions and measured values and assess whether computed electric fields are physically reasonable in both magnitude and direction.

Reasoning and Conclusion:
Students synthesize mathematical results, vector analysis, and physical interpretation to draw well-reasoned conclusions about electric field behavior. They justify conclusions using electrostatic principles, explain observed patterns, and articulate physical meaning in written laboratory reports and problem solutions.

Instructors assess critical thinking through in-class exams, WebAssign problem sets, quizzes, and individual laboratory reports.

Quantitative Reasoning. Communication/Representation of Quantitative Information; Analysis of Quantitative Arguments; and Application of Quantitative Models. In this box, provide a narrative that explains how the proposed course addresses all of the components of quantitative reasoning.

Communication and Representation of Quantitative Information:
Students represent quantitative information using vector notation, electric field diagrams, integrals, differential expressions, graphs, and written explanations. They label axes, use correct units and symbols, and clearly describe physical meaning in both problem solutions and laboratory reports.

Analysis of Quantitative Arguments:
Students analyze quantitative arguments by examining mathematical derivations, checking internal consistency of equations, and evaluating whether results logically follow from stated assumptions and established physical laws. They identify errors in reasoning, assess the validity of conclusions, and interpret quantitative relationships between charge distributions and resulting electric fields.

Application of Quantitative Models:
Students select and apply appropriate quantitative models, including Coulomb's Law, the principle of superposition, and integral expressions for electric fields. They use these models to solve problems involving point charges and continuous charge distributions and interpret results in terms of physical behavior and symmetry.

Instructors assess quantitative reasoning through problem-solving exams, WebAssign homework, quizzes, and laboratory data analysis.

Personal & Social Responsibility. Intercultural reasoning and intercultural competence; Sustainability and the natural and human worlds; Ethical reasoning; Collaboration skills, teamwork and value systems; and Civic discourse, civic knowledge and engagement – local and global In this box, provide a narrative that explains how the proposed course addresses 2 of the components of personal & social responsibility.

Collaboration Skills, Teamwork, and Value Systems:
Students collaborate in laboratory groups to plan experimental procedures, share responsibilities, collect and analyze data, follow safety protocols, and engage respectfully in scientific discussion. They demonstrate ethical conduct and accountability by contributing equitably to group work while submitting individual laboratory reports that reflect their own understanding and analysis.

Sustainability and the Natural and Human Worlds:
Students apply electric and magnetic field concepts to real-world systems such as energy transmission, electromagnetic technologies, and physical infrastructure. They analyze how physics principles inform responsible technology use, resource efficiency, and sustainable decision-making that affect human and natural systems.

Instructors assess personal and social responsibility through observation of laboratory participation, evaluation of collaborative practices, and reflective components in laboratory reports.

Section D. Assessment Plan

Link to Institution's General Education Assessment Plan

https://www.navajotech.edu/academics/general-education/

Application History

Type	username	Text	Timestamp
Submittal	pboahene@navajotech.edu	Submitted by pboahene@navajotech.edu	2025-12-22 06:13 PM (US/Mountain)
Authorization	pboahene@navajotech.edu	pboahene@navajotech.edu has authorized the application for submittal	2025-12-22 06:13 PM (US/Mountain)
Created	pboahene@navajotech.edu	Application started by pboahene@navajotech.edu	2025-12-22 05:57 PM (US/Mountain)

Sample Assessment

Name: ______________________________ **Date:** _________________________

Course: PHYS 1320C – Calculus-Based Physics II with Lab

Exam Title: In-Class Exam — Electric Fields

Time: 40 minutes **Total Points:** 12

Calculator: Scientific calculator permitted

Instructions

- Answer all four questions.
- Show all mathematical steps clearly.
- **Use calculus (derivatives or integrals) where appropriate.**
- Use correct vector notation.
- Clearly explain physical reasoning when asked.
- Include correct units.

Question 1 — Problem Setting (3 points)

Two-point charges are fixed in space: a charge $+Q$at the origin and a charge $-Q$at position $x = a$ on the x-axis.

a) Clearly state the physics question that must be answered to determine the electric field at a point Plocated on the x-axis between the charges.
b) Identify the known quantities and the unknown quantity.
c) State one assumption required to analyze this system using electrostatics.

Question 2 — Evidence Acquisition (3 points)

A uniformly charged rod of length L lies along the x-axis with constant linear charge density λ. A point P is located on the x-axis a distance $a$from the nearer end of the rod.

a) Write the differential expression $d\vec{E}$ for the electric field contribution at point Pdue to a charge element dqon the rod.
b) Set up the definite integral required to determine the total electric field at point P. Clearly define the limits of integration.

c) Evaluate the integral to obtain the magnitude of the electric field at point P, and state the direction of the field.

Question 3 — Evidence Evaluation (3 points)

A student claims that the magnitude of the electric field at point P is zero because the rod's charge is symmetrically distributed.

a) Using the expression obtained in Question 2, evaluate the electric field at point P.
b) Determine whether the student's claim is correct.
c) Justify your evaluation using both mathematical reasoning and the physical direction of the electric field.

Question 4 — Reasoning & Conclusion (3 points)

A positive test charge is placed at point P.

a) Determine the direction of the force acting on the test charge.
b) Explain the relationship between the electric field at point P and the force experienced by the charge.
c) State one physical conclusion about electric field behavior that follows from your reasoning.

End of Test

CRITICAL THINKING RUBRIC

Adapted from NMHED Critical Thinking rubric • Navajo Technical University

Student: Date:

OUTCOMES	SCALE			SUBTOTALS & COMMENTS
	Emerging (1 pts)	Developing (2 pts)	Proficient (3 pts)	
Problem Setting *(Delineate a problem or question appropriate to context)*	Problem or research question is unclear or poorly defined; objectives missing or inappropriate	Problem is stated but lacks clarity or full contextual relevance	**Problem/question is clearly defined; objectives and relevant variables are appropriate to the experimental context**	
Evidence Acquisition *(Identify and gather information/data necessary to address the problem)*	Some, but not sufficient, evidence is acquired from source(s) with minimal or no consideration of its appropriateness to the problem or question.	Evidence is taken from source(s) to minimally address the problem or question at hand, with some consideration of its appropriateness	**Evidence is taken from source(s) to sufficiently address the question or problem, with a thorough consideration of its appropriateness.**	
Evidence Evaluation *(Evaluate evidence for credibility, reliability, and relevance)*	Information taken from source(s) is minimally evaluated, but not enough to develop a well-rounded assertion of its credibility.	Information taken from source(s) is evaluated, providing some justified assertions of its credibility, but without sufficient awareness of the evaluation process itself (such as personal assumptions).	Information taken from source(s) is evaluated, providing some justified assertions of its credibility, and giving sufficient consideration of the evaluation process itself (such as personal assumptions).	
Reasoning & Conclusion *(Develop conclusions based on informed, well-reasoned evaluation)*	Conclusion(s) is/are given, but are inconsistently tied to some of the information discussed; related outcomes and solutions are	Conclusion(s) is/are logically tied to information (because information is chosen to fit the desired conclusion); some related outcomes (consequences and	**Conclusion(s) is/are logically tied to a range of information, including opposing viewpoints; related outcomes (consequences and implications) are**	

	oversimplified.	implications) are identified clearly.	**identified clearly.**	
TOTAL/COMMENTS				

Scale: 12-11 points = A; 10-9 points = B; 8-7 points = C; 6-5 points = D; less than 5 points = F

Sample Assessment

Name: ______________________________ **Date:** _________________________

Course: PHYS 1320C – Calculus-Based Physics II with Lab

Exam Title: In-Class Exam — Electric Fields

Time: 40 minutes **Total Points:** 12

Calculator: Scientific calculator permitted

Instructions

- Answer all four questions.
- Show all mathematical steps clearly.
- **Use calculus (derivatives or integrals) where appropriate.**
- Use correct vector notation.
- Clearly explain physical reasoning when asked.
- Include correct units.

Question 1 — Problem Setting (3 points)

Two-point charges are fixed in space: a charge $+Q$at the origin and a charge $-Q$at position $x = a$ on the x-axis.

a) Clearly state the physics question that must be answered to determine the electric field at a point Plocated on the x-axis between the charges.
b) Identify the known quantities and the unknown quantity.
c) State one assumption required to analyze this system using electrostatics.

Question 2 — Evidence Acquisition (3 points)

A uniformly charged rod of length L lies along the x-axis with constant linear charge density λ. A point P is located on the x-axis a distance $a$from the nearer end of the rod.

a) Write the differential expression $d\vec{E}$ for the electric field contribution at point Pdue to a charge element dqon the rod.
b) Set up the definite integral required to determine the total electric field at point P. Clearly define the limits of integration.

c) Evaluate the integral to obtain the magnitude of the electric field at point P, and state the direction of the field.

Question 3 — Evidence Evaluation (3 points)

A student claims that the magnitude of the electric field at point P is zero because the rod's charge is symmetrically distributed.

a) Using the expression obtained in Question 2, evaluate the electric field at point P.
b) Determine whether the student's claim is correct.
c) Justify your evaluation using both mathematical reasoning and the physical direction of the electric field.

Question 4 — Reasoning & Conclusion (3 points)

A positive test charge is placed at point P.

a) Determine the direction of the force acting on the test charge.
b) Explain the relationship between the electric field at point P and the force experienced by the charge.
c) State one physical conclusion about electric field behavior that follows from your reasoning.

End of Test

CRITICAL THINKING RUBRIC

Adapted from NMHED Critical Thinking rubric • Navajo Technical University

Student: Date:

OUTCOMES	SCALE			SUBTOTALS & COMMENTS
	Emerging (1 pts)	Developing (2 pts)	Proficient (3 pts)	
Problem Setting *(Delineate a problem or question appropriate to context)*	Problem or research question is unclear or poorly defined; objectives missing or inappropriate	Problem is stated but lacks clarity or full contextual relevance	**Problem/question is clearly defined; objectives and relevant variables are appropriate to the experimental context**	
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	oversimplified.	implications) are identified clearly.	**identified clearly.**	
TOTAL/COMMENTS				

Scale: 12-11 points = A; 10-9 points = B; 8-7 points = C; 6-5 points = D; less than 5 points = F

NEW MEXICO
HIGHER EDUCATION
DEPARTMENT

Fostering Student Success from Cradle to Career

Michelle Lujan Grisham, Govenor
Stephanie M. Rodriguez, Cabinet Secretary
Patricia Trujillo, Deputy Secretary

General Education Request Application

Application Number	5650
Institution	NTU
Applicant(s)	pboahene@navajotech.edu
Status	NMHED_REVIEW
Submitted	2025-12-22 06:24 PM (US/Mountain)

Gened Request Form

Contact Information

Chief Academic Officer Name
Colleen Bowman

Chief Academic Officer Email
cbowman@navajotech.edu

Registrar Name
Jason Wright

Registrar Email
jasonwright@navajotech.edu

Course's Academic Department
Science

Is this a Application a Re-Submission
no

Institutional Course Information

Prefix
PHYS

Number
1310C

Title
Calculus-based Physics I Lecture + Laboratory

Number of credits
4

Was this course previously part of the New Mexico General Education curriculum?
No

Is this application for your entire system (ENMU, NMSU, & UNM)?
No

Co-requisite Course

Prefix

N/A

Number

N/A

Title

N/A

New Mexico Common Course Information

Prefix

PHYS

Number

1310C

Title

Calculus-based Physics I Lecture + Laboratory

A. Content Area and Essential Skills

To which area should this course be added?

Science

Selected Areas

Critical Thinking, Quantitative Reasoning, Personal & Social Responsibility

Section B. Learning Outcomes

List all common course student learning outcomes for the course.

Lecture Outcomes
1. Describe the relationships among position, velocity, and acceleration as functions of time.
2. Use the equations of kinematics to describe motion under constant acceleration.
3. Analyze linear motion using Newton's laws, force, and linear momentum.
4. Analyze rotational motion using torque and angular momentum.
5. Analyze motion using work and energy.

Lab Outcomes
1. Develop a reasonable hypothesis.
2. Work effectively as part of a team.
3. Take measurements and record measured quantities to the appropriate precision.
4. Estimate error sources in experimental techniques.
5. Apply appropriate methods of analysis to raw data, including using graphical and statistical methods via computer-based tools.
6. Determine whether results and conclusions are reasonable.
7. Present experimental results in written form in appropriate style and depth.
8. Experience the relationship between theory and experiment.

List all institution-specific Student Learning Outcomes that are common to all course sections offered at the institutions regardless of instructor.

N/A

Section C. Narrative

In the boxes provided, write a short (~300 words) narrative explaining how the course weaves the essential skills associated with the content area throughout the course. Explain what students are going to do to develop the essential skills and how you will assess their learning. The narrative should be written with a general audience in mind and avoid discipline specific jargon as much as possible.

Critical Thinking. Problem Setting; Evidence Acquisition; Evidence Evaluation; and Reasoning /Conclusion. In this box, provide a narrative that explains how the proposed course addresses all of the components of critical thinking.

Problem Setting:
Students define physics problems by clearly stating the question to be answered, identifying known and unknown quantities, articulating assumptions, and selecting appropriate physical principles such as kinematics, Newton's laws, work–energy, and momentum. In lecture, students explicitly frame problems before solving them by outlining variables and governing relationships. In laboratory activities, students formulate investigable questions, establish experimental objectives, and align procedures with the physical system under study.

Evidence Acquisition:
Students gather relevant information and data needed to address each problem. In lecture and homework, students extract key information from problem statements and apply calculus-based models to generate quantitative results. In laboratory settings, students collect experimental data using motion sensors, force probes, and rotational apparatus, and record measurements accurately with appropriate units and precision.

Evidence Evaluation:
Students evaluate evidence by estimating measurement uncertainty, identifying sources of experimental error, and assessing assumptions embedded in theoretical models. They compare experimental results with analytical predictions, analyze discrepancies between measured and calculated values, and determine whether results are physically reasonable.

Reasoning and Conclusion:
Students synthesize mathematical analysis, experimental evidence, and physical interpretation to develop well-reasoned conclusions. They justify solutions using Newtonian mechanics, explain model limitations, and clearly articulate the physical meaning of results in written laboratory reports and problem solutions.

Instructors assess critical thinking through problem-based exams, WebAssign homework, quizzes, and individual laboratory reports.

Quantitative Reasoning. Communication/Representation of Quantitative Information; Analysis of Quantitative Arguments; and Application of Quantitative Models. In this box, provide a narrative that explains how the proposed course addresses all of the components of quantitative reasoning.

Communication and Representation of Quantitative Information:
Students represent quantitative information symbolically, graphically, and in written form by using calculus-based equations, vector notation, free-body diagrams, graphs, and appropriate units. They construct clear diagrams, label axes and vectors, and explain the physical meaning of mathematical expressions in problem solutions and laboratory analyses.

Analysis of Quantitative Arguments:
Students interpret and critique quantitative arguments presented in textbooks, instructor examples, peer work, and experimental results. They evaluate mathematical logic, check the consistency of assumptions, and assess coherence between data, calculations, and conclusions. Students identify errors or unsupported claims and justify corrections using quantitative reasoning.

Application of Quantitative Models:
Students select and apply appropriate quantitative models, including kinematic equations, Newton's laws, work–energy theorems, and momentum conservation. They use these models to solve real-world and experimental problems and interpret results in terms of physical behavior and system constraints.
Instructors assess quantitative reasoning through problem-solving exams, WebAssign homework, quizzes, and laboratory analyses.

Personal & Social Responsibility. Intercultural reasoning and intercultural competence; Sustainability and the natural and human worlds; Ethical reasoning; Collaboration skills, teamwork and value systems; and Civic discourse, civic knowledge and engagement – local and global In this box, provide a narrative that explains how the proposed course addresses 2 of the components of personal & social responsibility.

Collaboration Skills, Teamwork, and Value Systems:
Students work collaboratively in laboratory groups to plan experimental procedures, share responsibilities, collect and analyze data, follow safety protocols, and engage respectfully in scientific discussion. They demonstrate ethical conduct and accountability by contributing equitably to group work while submitting individual laboratory reports that document their own analysis and understanding.

Sustainability and the Natural and Human Worlds:
Students apply mechanics principles—including energy, forces, and momentum—to real-world systems such as transportation, energy efficiency, structural stability, and community-relevant engineering applications. They analyze how physics concepts inform responsible technological choices, environmental stewardship,

and sustainable decision-making that affect both human and natural systems.

Instructors assess personal and social responsibility through observation of laboratory participation, evaluation of peer collaboration, adherence to ethical and safety practices, and reflective components included in laboratory reports.

Section D. Assessment Plan

Link to Institution's General Education Assessment Plan

https://www.navajotech.edu/academics/general-education/

Application History

Type	username	Text	Timestamp
Submittal	pboahene@navajotech.edu	Submitted by pboahene@navajotech.edu	2025-12-22 06:24 PM (US/Mountain)
Authorization	pboahene@navajotech.edu	pboahene@navajotech.edu has authorized the application for submittal	2025-12-22 06:24 PM (US/Mountain)
Created	pboahene@navajotech.edu	Application started by pboahene@navajotech.edu	2025-12-22 06:13 PM (US/Mountain)

Sample Assessment

Name: ____________________________ **Date:** ____________________

Course: PHYS 1310C – Calculus-Based Physics I with Lab

Exam Title: In-Class Test — Motion in One Dimension

Time: 35 minutes **Total Points:** 12 **Calculator:** Scientific calculator permitted

Instructions

- Answer all four questions.
- Show all mathematical steps clearly.
- Use calculus where appropriate.
- Clearly explain physical reasoning when asked.
- Include correct units.

Question 1 — Problem Setting (3 points)

A particle moves along the x-axis. Its position as a function of time is given by

$$x(t) = 4.0t^3 - 2.0t^2 + 6.0 \text{(SI units)}$$

a) Clearly state the physics question that must be answered to determine the particle's **instantaneous velocity** at $t = 2.0$ s.

b) Identify the known quantity(ies) and the unknown quantity.

c) State the physical principle or mathematical operation required to answer this question.

Question 2 — Evidence Acquisition (3 points)

Using the position function given in Question 1:

a) Write the mathematical expression that relates position and instantaneous velocity.

b) Determine the particle's instantaneous velocity at $t = 2.0$ s.

c) Show all calculus steps and include correct units.

Question 3 — Evidence Evaluation (3 points)

At $t = 2.0$ s, another student claims that the particle is **slowing down**.

a) Determine the particle's acceleration at $t = 2.0$ s.

b) Evaluate whether the student's claim is correct based on your result.

c) Briefly justify your evaluation using both mathematical and physical reasoning.

Question 4 — Reasoning & Conclusion (3 points)

Consider the motion of the particle over the time interval $1.0 \text{ s} \leq t \leq 3.0 \text{ s}$.

a) Explain how you would determine the particle's **average velocity** over this interval using the position function.

b) Compare the meaning of **average velocity** and **instantaneous velocity** in this context.

c) State one physical conclusion about the particle's motion that follows from your reasoning.

End of Test

CRITICAL THINKING RUBRIC

Adapted from NMHED Critical Thinking rubric • Navajo Technical University

Student: Date:

OUTCOMES	SCALE			SUBTOTALS & COMMENTS
	Emerging (1 pts)	Developing (2 pts)	Proficient (3 pts)	
Problem Setting *(Delineate a problem or question appropriate to context)*	Problem or research question is unclear or poorly defined; objectives missing or inappropriate	Problem is stated but lacks clarity or full contextual relevance	**Problem/question is clearly defined; objectives and relevant variables are appropriate to the experimental context**	
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TOTAL/COMMENTS				

Scale: 12-11 points = A; 10-9 points = B; 8-7 points = C; 6-5 points = D; less than 5 points = F

Sample Assessment

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Course: PHYS 1310C – Calculus-Based Physics I with Lab

Exam Title: In-Class Test — Motion in One Dimension

Time: 35 minutes **Total Points:** 12 **Calculator:** Scientific calculator permitted

Instructions

- Answer all four questions.
- Show all mathematical steps clearly.
- Use calculus where appropriate.
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- Include correct units.

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$$x(t) = 4.0t^3 - 2.0t^2 + 6.0 \text{(SI units)}$$

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a) Explain how you would determine the particle's **average velocity** over this interval using the position function.

b) Compare the meaning of **average velocity** and **instantaneous velocity** in this context.

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CRITICAL THINKING RUBRIC

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