Mathematics and Data Science Assessment Report

2024-25

MICS: PLO Data, Math/DataSci, 2024-25

Learning Outcomes for Mathematics and Data Science:

1. Students will be able to demonstrate facility with analytical and algebraic concepts.
2. Students will be able to write proofs.
3. Students will be able to apply their mathematical knowledge and critical thinking to solve problems.
4. Students will be able to use technology to solve problems.
5. Students will be able to speak about their work with precision, clarity and organization.
6. Students will be able to write about their work with precision, clarity and organization.
7. Students will be able to identify, locate, evaluate, and effectively and responsibly use and cite information for the task at hand.
8. Students will collaborate effectively in teams.
9. Students will be able to understand and create arguments supported by quantitative evidence.
10. Students will understand the professional, ethical and social issues and responsibilities with the implementation and use of technology.

Assessment Data Mathematical, Information and Computer Sciences

Learning Outcome: Students will be able to demonstrate facility with analytical and algebraic concepts.

Outcome Measure: Annual**:** A signature assignment in MTH2074 Multivariate Calculus.

Previous: ETS Major Field Test in Mathematics: Algebra and Calculus subscores (This has been discontinued).

Criteria for Success: 80% of the students will score above 2.5 on the relevant rubric.

Previous: The department subscore will be at the 50th percentile or higher.

Longitudinal Data:

	Percent of Students at 2.5 or Higher		
	Fall 2022	Fall 2023	Fall 2024
Students will be able to solve problems using the algebraic properties of vectors	73%	88%	82%
Students will be able to solve multivariable calculus problems using analytical techniques	67%	69%	71%
Students will be able to solve multivariable calculus problems involving algebraic, geometric and analytical techniques	100%	73%	65%

Previous: ETS MFT Data

Algebra:

Year	Percentile
2010-11	90
2011-12	85
2012-13	72
2013-14	49
2014-15	*
2015-16	42
2016-17	8
2017-18	*
2018-19	32
2019-20	N/A
2020-21	N/A
2021-22	N/A

Calculus:

Year	Percentile
2010-11	70
2011-12	99
2012-13	38
2013-14	72
2014-15	*
2015-16	16
2016-17	13
2017-18	*
2018-19	57
2019-20	N/A
2020-21	N/A
2021-22	N/A

*Insufficient students for score to be calculated.
Note the ETS changed the Mathematics test in 2012-13.

Conclusions Drawn from Data: ETS: Before the change in the exam in 2013, the students were meeting our expectations, since the exam changed they did not. The review of the exam indicated that it no longer met our needs. The department developed a signature assignment for MTH2074 Multivariate Calculus and pilot tested it in the 2022-23 academic year. Since then this is the assessment tool that we have been using. The students are coming close to meeting our benchmarks (the difference is often a matter of 1-2 students).

Changes to be Made Based on Data: We will continue to monitor data and will look at the assessment questions in the 2025-26 academic year to see if we can identify why students are missing our benchmark.

Rubric Used:
ETS: None. The scores are computed by ETS.

The MTH2074 rubric is given below.

MTH2074 Rubric

	Unsatisfactory (0)	Low Satisfactory (1)	Satisfactory (2)	High Satisfactory (3)	Outstanding (4)
Students will be able to solve problems using the algebraic properties of vectors	Completely Incorrect	Missed more than one key step or concept	Missed one key step or concept	Made a minor error	Completely correct
Students will be able to solve multivariable calculus problems using analytical techniques	Completely Incorrect	Missed more than one key step or concept	Missed one key step or concept	Made a minor error	Completely correct
Students will be able to solve multivariable calculus problems involving algebraic, geometric and analytical techniques	Completely Incorrect	Missed more than one key step or concept	Missed one key step or concept	Made a minor error	Completely correct

Assessment Data Mathematical, Information and Computer Sciences

Learning Outcome: Students will be able to write proofs.

Outcome Measure: Annual - MTH3012 Signature Assignment.
Alternating Years - MTH4024 and MTH4044 Signature Assignment.

Criteria for Success: 80% of the students to score a 2.5 or higher (on a scale of 1-4) in each of the four areas:

- Statement of the problem
- Logic
- Symbolism
- Justification

Longitudinal Data:

	MTH3012 Percentage of Class at 2.5 or Higher							
	2018	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Statement of Problem	100%	100%	100%	100%	100%	100%	100%	100%
Logic	100%	100%	100%	100%	100%	83%	80%	80%
Symbolism	100%	100%	100%	100%	100%	100%	100%	100%
Justification	100%	100%	100%	67%	50%	83%	90%	60%

	MTH4024 Percentage at 2.5 or higher					
	2013	**2015**	**2017**	**2019**	**2021**	**2023**
Statement of Problem	92%	100%	90%	83%	100%	100%
Logic	92%	89%	90%	83%	100%	67%
Symbolism	100%	100%	90%	100%	100%	100%
Justification	77%	67%	60%	100%	100%	83%

	MTH4044 Percentage at 2.5 or higher						
	2012	**2014**	**2016**	**2018**	**2020**	**2022**	**2024**
Statement of Problem	92%	100%	83%	100%	67%	60%	100%
Logic	92%	100%	0%	100%	100%	40%	100%
Symbolism	100%	100%	67%	100%	100%	80%	100%
Justification	77%	100%	67%	100%	100%	60%	100%

Conclusions Drawn from Data: The students are generally meeting our benchmarks. Some of the variation comes from small sample sizes. The Fall 2022 MTH4044 question used for assessment was not well posed and that may have been part of the reason that students were not as successful as is typical.

Changes to be Made Based on Data: We continue to emphasize the need for strong justification of every step in a proof and to more clearly reinforce that in assignments in all proof writing classes. Since making those changes, we seem to be seeing fewer weak justifications in proofs in the later classes (MTH4024 and MTH4044).

Proof Writing Rubric (MTH3012, MTH4024, MTH4044)

	Unsatisfactory	Low Satisfactory	High Satisfactory	Outstanding
Statement of the Problem	Can not determine what is given and what needs to be proved	Misses one part of the hypothesis or the conclusion	Makes one minor error in identifying the hypothesis or the conclusion	Understands what is given and what is to be proved
Logic	Proof has major flaws that make it invalid	Proof misses more than one major element	Proof has the main flow of the logic correct but misses one major element	Statements flow logically from one to another
Symbolism	There are many errors in the use of symbolic notation	There are more than two errors in symbolic notation	There are two or fewer minor errors in symbolic notation (e.g. missing parentheses)	All symbols are used correctly
Justification	There are several errors in the justification	There is one major mistake in the justification or more than two minor errors	There are two or fewer minor errors in the justification for the steps	Every logical step has the appropriate reason (theorem, definition, lemma, etc.)

Assessment Data Mathematical, Information and Computer Sciences

Learning Outcome: Students will be able to apply their mathematical knowledge and critical thinking to solve problems (Mathematics).

Outcome Measure: Signature assignment in MTH2033 Linear Algebra (Annual)

Previous:
ETS Major Field Test in Mathematics: Applied subscore (Annual).
ETS Proficiency Profile – Reading/Critical Thinking (Annual).

Criteria for Success: 80% of the students will be at a 2.5 or higher on the rubric.

Previous:
ETS MFT: The department subscore will be at the 50th percentile or higher.
ETS Proficiency Profile: 85% of the students will be marginal or proficient at Level 2

Longitudinal Data:

	Percentage of Students at 2.5 or Higher		
	2022-23	2023-24	2024-25
Computing Eigenvalues	71%	100%	75%
Understanding Mutually Orthogonal	71%	100%	88%

Previous: ETS MFT

Year	*Percentile*
2015-16	*55*
2016-17	*55*
2017-18	*
2018-19	*32*

** Insufficient students for score to be calculated.*
The department discontinued use of the ETS MFT in 2019-20.

	Percentage of Students Marginal or Proficient								
ETS Proficiency Profile	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
ETS Proficiency Profile Level 2 Critical Thinking	92%	100%	84%	92%	76%	79%	80%	88%	79%

The department discontinued the use of the ETS Proficiency Profile in the fall of 2022.

Conclusions Drawn from Data: The students consistently met our expectations using the ETS PP. We became concerned about the consistency of the questions in the ETS MFT and resulted in the department discontinuing the use of that measure. In spring of 2023 we pilot tested the new assessment in MTH2033. The students nearly met our benchmark; if one more student had been successful, we would have crossed the threshold. In 2024, the students met our benchmark and in 2025, missing the benchmark was a matter of a single student.

Changes to be Made Based on Data: None at this time. We will continue to monitor the use of our new assessment.

Rubric Used:
See the next page.

MTH2033 Signature Assignment Rubric

Students will be able to apply their mathematical knowledge and critical thinking to solve problems (CC:CT)

	Unsatisfactory (1)	Low Satisfactory (2)	High Satisfactory (3)	Outstanding (4)
Computing Eigenvectors	More than one major error including completely incorrect.	Made a major error	Made a minor error	Completely correct
Understanding mutually orthogonal	More than one major error including completely incorrect.	Made a major error	Made a minor error	Completely correct

Assessment Data Mathematical, Information and Computer Sciences

Learning Outcome: Students will be comfortable using technology to solve problems.

Outcome Measure: Annual: MTH3083 Signature Assignment.

Criteria for Success: MTH3083: 80% of the students should have an average score of at least 2.5 in each of the major areas.

Longitudinal Data:

	MTH3083 Percentage of Students at 2.5 or Higher							
	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Students will be able to use technology to solve problems	100%	100%	100%					
Computational Correctness				100%	60%	80%	58%	N/A
Graphical Tool				86%	100%	80%	N/A	N/A
Interpretation				86%	60%	60%	42%	N/A

Note that the assignment and rubric were changed in 2019-20. We did not teach this class in 2024-25 due to low enrollment.

Conclusions Drawn from Data: MTH3083: Students have been able to satisfactorily analyze data using technology. The last three years have been slightly below our benchmark but if one or two more students had scored slightly higher the benchmark would have been met. We have had some inconsistency in the assessment, and we are still working to address that (note that the 2023-24 assessment missed on aspect (Graphical Tool).

Changes to be Made Based on Data: MTH3083: The signature assignment was updated to better measure students' facility with the current technology that we are using in the course. That change can be seen in the data. We have had some inconsistency in the assessment question in the last three years and we need to regularize the question used. This is part of the department's 2025-26 work to create a central depository for all needed items for every class (e.g. assessment questions, ethics modules, etc.).

MTH3083 Signature Assignment Rubric (Spring 2021)

	Unsatisfactory (1)	Low Satisfactory (2)	High Satisfactory (3)	Outstanding (4)
Computation correctness	More than one major error including completely incorrect.	Made a major error	Made a minor error	Completely correct
Use of graphical tool	Graph is not connected to the data	Poor choice of graph and not well-labeled	One of: Correct choice of graph Graph well-labeled	Graph is correct and is well-labeled
Interpretation	Explanation is not connected to the information	Explanation is partially correct and partially clear	Explanation is correct but not clear	Explanation is clear and correct

Criterion: 80% of students will score at or above 2.5.

Assessment Data Mathematical, Information and Computer Sciences

Learning Outcome: Students will be able to speak about their work with precision, clarity and organization (Oral Communication).

Outcome Measure: Annual: Each student will be required to give an oral presentation on a topic in their field as a part of their participation in the Senior Seminar. The audience for this talk will include department faculty, fellow students and possibly some alumni. The students will be given the evaluation criteria in advance of their presentation and will be rated by the faculty using a rubric with a scale of 4 (outstanding) to 1 (unsatisfactory) in the following areas:

- Command of background material
- Organization
- Oral presentation skills (added as part of the new rubric in the spring of 2010)
- Use of presentation tools
- Ability to field questions from the audience

Criteria for Success: 80% of the students should have an average score of at least 2.5 in each of the major areas in the department rubric.

Longitudinal Data:

	Percentage of Students at 2.5 or Higher							
Oral Presentation	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Background	100%	95%	100%	100%	95%	100%	100%	96%
Organization	94%	100%	100%	94%	100%	94%	100%	100%
Depth of Information								96%
Bibliography								96%
Oral Presentation Skills	100%	95%	100%	100%	100%	100%	100%	100%
Presentation Tools	100%	100%	100%	100%	100%	100%	100%	100%
Ability to Field Questions	100%	94%	94%	100%	100%	100%	100%	96%

Note that the rubric was changed in 2025.

Conclusions Drawn from Data: In general, the students have been performing reasonably well in the area of giving oral presentations. We attribute this to the fact that we intentionally have students presenting technical material in front of others starting in their freshman year. We changed the expectations for this presentation and the rubric in 2025. The main changes were to move some elements about depth of information and the use of references to the oral presentation.

Changes to be Made Based on Data: Over time we have increased our standards and expanded the rubric to increase clarity for students and to push them to speak at a professional level. We are still evaluating the impact of the change to the rubric in 2025.

Oral Presentation Rubric Through Fall 2024

Criteria	Outstanding	High Satisfactory	Low Satisfactory	Unsatisfactory
Command of background material	☐ Clearly knows material and key facts by memory	☐ Clearly knows key facts with a few memory slips	☐ Reads some information; knows some facts from memory	☐ Reads sentences from slides
	☐ Expands on PPT slides	☐ Some expansion on PPT slides	☐ No expansion on PPT slide content	☐ Dependent on notes
	☐ Content appropriate for audience	☐ Partial audience adaptation of content	☐ Little audience adaptation of content	☐ Lacks audience adaptation of content
Organization	☐ Clear and concise outline	☐ Clear outline	☐ Some sense of outline	☐ No clear outline
	☐ Relevant graphics and key text items on slides	☐ Too much information on slides (not concise)	☐ Too much detailed information on slides	☐ Slides are in paragraphs; too much detailed information on one slide
	☐ Presentation is between 10-15 minutes	☐ Presentation 1 minute outside of the range (10-15 minutes)	☐ Presentation 2 minutes outside of the range (10-15 minutes)	☐ Presentation 3 minutes outside of the range (10-15 minutes)
Oral presentation skills	☐ Clearly has practiced several times; smooth transitions	☐ Has practiced but transitions are not smooth	☐ Has practiced presentation but cannot verbally make transitions between slides	☐ Clearly did not practice presentation; Does not anticipate content of next slide
	☐ Engages audience in content multiple times and engagement is well connected to talk (questions, examples, etc.)	☐ Engages audience at least twice in content (questions, examples, etc.)	☐ Audience engagement at least once with content (questions, examples, etc.)	☐ No audience involvement
	☐ Free of disfluencies (ah, uhm)	☐ A few disfluencies (ah, umh, er)	☐ Many disfluencies (ah, umh, er)	☐ Disfluencies (ah, umh, er) detract from presentation
	☐ Is clearly heard in the room and uses inflection for emphasis	☐ Can be understood most of the time and uses some inflection	☐ Can sometimes be understood and uses little inflection	☐ Can not be heard and/or speaks in a monotone
	☐ Engages audience through eye contact	☐ Some engagement of audience through eye contact	☐ Infrequent eye contact	☐ Little audience awareness or eye contact
	☐ Engages audience through gestures	☐ Some engagement of audience through gestures	☐ Distracting gestures or mannerisms	☐ Frequent distracting gestures or mannerisms
Use of presentation tools	☐ PPT background is matched to content, legible font, seamless transitions	☐ Appropriate PPT slide backgrounds, transitions & font	☐ Distracting PPT slide backgrounds and transitions, font hard to read	☐ No attention given to PPT slide backgrounds and transitions, font illegible
	☐ Graphics imbedded and matched to topic, necessary hyperlinks work	☐ Most graphics imbedded and matched to topic, most necessary hyperlinks work	☐ Some inappropriate graphics or use of PPT embellishments, necessary hyperlinks don't work	☐ Distracting use of embellishments, graphics not connected to topic
Ability to field questions	☐ Able to answer questions clearly and without hesitation and prepared material to answer anticipated questions	☐ Can answer all questions with some hesitation	☐ Able to answer half of the questions with hesitation	☐ Unable to answer any questions

MICS Expanded Oral Presentation Rubric Update January 2025

Criteria	Outstanding	High Satisfactory	Low Satisfactory	Unsatisfactory
Command of background material	☐ Clearly knows material and key facts by memory	☐ Clearly knows key facts with a few memory slips	☐ Reads some information; knows some facts from memory	☐ Reads sentences from slides
	☐ Expands on PPT slides	☐ Some expansion on PPT slides	☐ No expansion of PPT slide content	☐ Dependent on notes
	☐ Content appropriate for audience	☐ Partial audience adaptation of content	☐ Little audience adaptation of content	☐ Lacks audience adaptation of content
Organization	☐ Clear and concise outline	☐ Clear outline	☐ Some sense of outline	☐ No clear outline
	☐ Conveys a central theme with all ideas connected arrangement of ideas clearly related to topic	☐ Conveys a central idea or topic with some ideas connected to the topic	☐ Attempts to focus on an idea or topic with many ideas not connected to the topic	☐ Has little or no focus on central idea or topic
	☐ Relevant graphics and key text items on slides	☐ Too much information on slides (not concise)	☐ Too much detailed information on slides	☐ Slides are in paragraphs; too much detailed information on one slide
	☐ Presentation is between 10-15 minutes	☐ Presentation 1 minute outside of the range (10-15 minutes)	☐ Presentation 2 minutes outside of the range (10-15 minutes)	☐ Presentation 3 minutes outside of the range (10-15 minutes)
Depth of information	☐ Highly accurate and substantive content	☐ Content is accurate, though key concepts are missing	☐ Content is flawed, and/or a significant number of key concepts are missing	☐ Content is significantly flawed and/or content is trivial
	☐ Appropriately synthesizes information from multiple distinct sources	☐ Synthesis of information from at least three distinct sources	☐ Synthesis of information from at least two distinct sources	☐ Summary reporting of information without synthesis
	☐ Draws conclusions and personal insights from synthesis	☐ At least two personal insights or conclusions stated	☐ At least one personal insight or conclusion stated	☐ No personal insights
	☐ Provides evidence to support points	☐ Lacks support for some points	☐ Provides minimal support for points	☐ Ideas not supported
Bibliography and supporting documents	☐ Multiple references from distinct reputable sources	☐ Most references from distinct reputable sources	☐ Some references from reputable sources	☐ No bibliography or all references from untrusted sites on the internet
	☐ References cited in the body of the presentation	☐ Some citation of references in the body of the presentation	☐ Limited citation of references in the body of the presentation	☐ No citation of references in the body of the presentation

Oral presentation skills	☐ Clearly has practiced several times; smooth transitions	☐ Has practiced but transitions are not smooth	☐ Has practiced presentation but cannot verbally make transitions between slides	☐ Clearly did not practice presentation; Does not anticipate content of next slide
	☐ Engages audience in content multiple time and engagement is well connected to talk (questions, examples, etc.)	☐ Engages audience at least twice in content (questions, examples, etc.)	☐ Audience engagement at least once with content (questions, examples, etc.)	☐ No audience involvement
	☐ Free of disfluencies (ah, uhm)	☐ A few disfluencies (ah, umh, er)	☐ Many disfluencies (ah, umh, er)	☐ Disfluencies (ah, umh, er) detract from presentation
	☐ Is clearly heard in the room and makes an uses inflection for emphasis	☐ Can be understood most of the time and uses some inflection	☐ Can sometimes be understood and uses little inflection	☐ Can not be heard and/or speaks in a monotone
	☐ Engages audience through eye contact	☐ Some engagement of audience through eye contact	☐ Infrequent eye contact	☐ Little audience awareness or eye contact
	☐ Engages audience through gestures	☐ Some engagement of audience through gestures	☐ Distracting gestures or mannerisms	☐ Frequent distracting gestures or mannerisms
Use of presentation tools	☐ All are true: (1) PPT background is matched to content, (2) font is legible, (3) transitions are seamless, (4) graphics are embedded	☐ 3 of 4 are true: (1) PPT background is matched to content, (2) font is legible, (3) transitions are seamless, (4) graphics are embedded	☐ 2 of 4 are true: (1) PPT background is matched to content, (2) font is legible, (3) transitions are seamless, (4) graphics are embedded	☐ 1 or 0 are true: (1) PPT background is matched to content, (2) font is legible, (3) transitions are seamless, (4) graphics are embedded
Ability to field questions	☐ Able to answer questions clearly and without hesitation	☐ Can answer all questions with some hesitation	☐ Able to answer half of the questions with hesitation	☐ Unable to answer any questions

Assessment Data Mathematical, Information and Computer Sciences

Learning Outcome: Students will be able to write about their work with precision, clarity and organization (Written Communication).

Outcome Measure: Annual: Each student will be required to write a paper on a topic in their field as a part of their participation in the Senior Seminar. The audience for this talk will include department faculty, fellow students and possibly some alumni. The students will be given the evaluation criteria in advance of their presentation and will be rated by the faculty using a rubric with a scale of 4 (outstanding) to 1 (unsatisfactory) in the following areas:

- Bibliography and other supporting documentation
- Organization
- Grammar and spelling
- Depth of information
- Clarity of writing

Criteria for Success: 80% of the students should have an average score of at least 2.5 in each of the major areas in the department rubric.

Longitudinal Data:

	Percentage of Students at 2.5 or Higher							
Written Report	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Bibliography and Support	76%	89%	81%	88%	58%	81%	69%	70%
Organization	94%	100%	100%	100%	100%	88%	85%	93%
Grammar and Spelling	88%	94%	94%	94%	89%	88%	92%	56%
Depth of Information	76%	83%	94%	94%	95%	94%	62%	
Clarity of Writing	88%	94%	88%	100%	89%	94%	85%	85%

Note that the assignment and rubric where changed in 2025.

Conclusions Drawn from Data: In general, the students have been performing reasonably well in writing technical reports. We saw some weakness in both references/support and depth of the information in the papers this year. However, the sample size was 13, so the “miss” of the benchmark is the performance of 2-3 students. We made significant changes in the prompt during the 2024-25 academic year. The assignment was changed to having the students write a shorter paper and also to describe the use of AI in the preparation of both their oral presentation and their paper.

Changes to be Made Based on Data: Over time we have increased our standards and expanded the rubric to increase clarity for students and to push them to write at a professional level. The current rubric has been in use for the last 11 years. We have instituted more formal faculty reviews of their draft papers and are trying to give more specific feedback, particularly about the use of references and that seems to be helping with the quality of the papers. In the 2024-25 year the significant changes in the prompt were probably part of the reason that the scores were lower. We did not have student work through our usual three phases to write the paper (outline, draft and final paper) and not having those steps clearly led to weakness in the area of grammar and spelling. We will be modifying both the prompt and the drafting process in the 2025-26 academic year.

MICS Written Presentation Rubric Through Fall 2024

Criteria	Outstanding	High Satisfactory	Low Satisfactory	Unsatisfactory
Bibliography and supporting documents	☐ Multiple references from distinct reputable sources ☐ References cited in the body of the document	☐ Most references from distinct reputable sources ☐ Some citation of references in the body of the document	☐ Some references from reputable sources ☐ Limited citation of references in the body of the document	☐ No bibliography or all references from untrusted sites on the internet ☐ No citation of references in the body of the document
Organization	☐ Conveys a central theme with all ideas connected, arrangement of ideas clearly related to topic ☐ Clear introduction, body (with sections), and conclusion includes summary and closure ☐ Includes both an abstract and table of contents	☐ Conveys a central idea or topic with some ideas connected to the topic ☐ Includes introduction, body and conclusion ☐ Includes abstract and table of contents (one partial and one complete)	☐ Attempts to focus on an idea or topic with many ideas not connected to the topic ☐ Introduction, body, conclusion detectable but not clear ☐ Includes partial abstract and partial table of contents	☐ Has little or no focus on central idea or topic ☐ Introduction, body or conclusion absent ☐ No abstract or table of contents
Grammar and spelling	☐ No use of first-person tense ☐ No grammatical or spelling errors	☐ Few uses of the first-person tense ☐ Few grammatical and spelling errors	☐ Several uses of the first-person tense ☐ Some grammatical and spelling errors	☐ Written in first-person tense ☐ Many grammatical and spelling errors
Depth of information	☐ Highly accurate and substantive content ☐ Appropriately synthesizes information from multiple distinct sources ☐ Draws conclusions and personal insights from synthesis ☐ Has the minimum number of pages including penalty pages; subject coverage is excellent	☐ Content is accurate, though key concepts are missing ☐ Synthesis of information from at least three distinct sources ☐ At least two personal insights or conclusions stated ☐ Has the minimum number of pages including penalty pages; subject coverage is good	☐ Content is flawed, and/or a significant number of key concepts are missing ☐ Synthesis of information from at least two distinct sources ☐ At least one personal insight or conclusion stated ☐ Has the minimum number of pages including penalty pages; subject coverage is adequate	☐ Content is significantly flawed and/or content is trivial ☐ Summary reporting of information without synthesis ☐ No personal insights ☐ Does not have the minimum number of pages including penalty pages
Clarity of writing	☐ Sentences flow ☐ Smooth transitions between paragraphs ☐ Any and all terms and acronyms are defined ☐ Provides evidence to support points	☐ Good sentence structure ☐ Adequate transitions between paragraphs ☐ Most terms and acronyms are defined ☐ Lacks support for some points	☐ Occasional poor sentence structure ☐ Transitions between paragraphs unclear ☐ Some terms and acronyms are defined ☐ Provides minimal support for points	☐ Frequent poor sentence structure ☐ Lacked transitions between paragraphs ☐ Many terms and acronyms are undefined ☐ Ideas not supported

MICS Short Writing Rubric Updated Spring 2025

Criteria	Outstanding	High Satisfactory	Low Satisfactory	Unsatisfactory
Bibliography and supporting documents	☐ Multiple references from distinct reputable sources	☐ Most references from distinct reputable sources	☐ Some references from reputable sources	☐ No bibliography or all references from untrusted sites on the internet
	☐ References cited in the body of the document	☐ Some citation of references in the body of the document	☐ Limited citation of references in the body of the document	☐ No citation of references in the body of the document
Organization	☐ Conveys a central theme with all ideas connected and the arrangement of ideas clearly related to topic	☐ Conveys a central idea or topic with some ideas connected to the topic	☐ Attempts to focus on an idea or topic with many ideas not connected to the topic	☐ Has little or no focus on central idea or topic
	☐ Clear introduction, body (with three or four sections), and conclusion includes summary and closure	☐ Includes introduction, body (with three or four sections), and conclusion	☐ Introduction, body, conclusion detectable but not clear	☐ Introduction, body or conclusion absent
	☐ Clear explanation of the use of AI in the presentation and paper.	☐ Some discussion of the use of AI in at least one of the paper or presentation.	☐ Indicates that AI was used but can not describe how it was used.	☐ No discussion of the use of AI.
Grammar and spelling	☐ No use of first-person tense	☐ Few uses of the first-person tense	☐ Several uses of the first-person tense	☐ Written in first-person tense
	☐ No grammatical or spelling errors	☐ Few grammatical and spelling errors	☐ Some grammatical and spelling errors	☐ Many grammatical and spelling errors
Clarity of Writing	☐ The sentences have good structure.	☐ A few sentences have poor structure.	☐ The sentences frequently have poor structure.	☐ The sentence structure makes it difficult to understand the content of the paper.
	☐ Smooth transitions between paragraphs and sections.	☐ Adequate transitions between paragraphs and sections.	☐ Transitions between paragraphs and/or sections unclear.	☐ Lacked transitions between paragraphs and/or sections.
	☐ Provides evidence to support points	☐ Lacks support for some points	☐ Provides minimal support for points	☐ Ideas not supported
	☐ Any and all terms and acronyms are defined	☐ Most terms and acronyms are defined	☐ Some terms and acronyms are defined	☐ Many terms and acronyms are undefined

Assessment Data Mathematical, Information and Computer Sciences

Learning Outcome: Students will be able to identify, locate, evaluate, and effectively and responsibly use and cite information for the task at hand (Information Literacy).

Outcome Measure: Annual: Each student will be required to write a paper on a topic in their field as a part of their participation in the Senior Seminar. The audience for this talk will include department faculty, fellow students and possibly some alumni. The students will be given the evaluation criteria in advance and their paper will be rated by the faculty using a rubric with a scale of 4 (outstanding) to 1 (unsatisfactory) in the following areas:

- References: Multiple references from distinct reputable sources
- Citation: References cited in the body of the document
- Synthesis: Appropriately synthesizes information from multiple distinct sources

Criteria for Success: 80% of the students should have an average score of at least 2.5 in each of the major areas.

Longitudinal Data:

	Percentage of Students at 2.5 or Higher							
Information Literacy	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
References (Paper)	71%	89%	81%	94%	74%	81%	69%	92%
Citation (Paper)	76%	89%	81%	88%	74%	75%	69%	72%
Synthesis	82%	78%	81%	94%	95%	81%	92%	96%
References (Talk)								96%
Citation (Talk)								85%

Conclusions Drawn from Data: The students are generally meeting our expectations. This is still one of the areas with which the students have some challenges particularly with citation. In 2025 we expanded the information literacy assessment to also gather data on the depth of information and the use of references in the students' oral presentations. This is because we reduced the length of the required paper and because we are trying to find new ways to assess students given the proliferation of the use of AI.

Changes to be Made Based on Data: We found that we needed to be very specific about our expectations for the use and citation of information in both papers and their talk. We continue to work with students in giving them clear feedback about the need to do a better job with references in technical papers. We are still evaluating the efficacy of the paper and talk changes that we made the senior seminar held in the spring of 2025.

Rubric:
2024 and before: the data was taken from the Written Rubric (above)
2025: the data was taken from both the Oral presentation and the Short Paper Rubrics (above).

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Learning Outcome: Students will collaborate effectively in teams.

Outcome Measure: Alternating year: MTH3052 Signature Assignment – evaluation of group while working on a project.

Criteria for Success: 80% of the students should have an average score of at least 2.5 in each of the major areas.

Longitudinal Data:

	MTH3052 Percent of students with average at least 2.5					
	Spring 2015	Spring 2017	Spring 2019	Spring 2021	Spring 2023	Spring 2025
Contributes to team meetings	86%	100%	100%	100%	100%	100%
Encourages team members	93%	100%	100%	100%	100%	100%
Contributes individually outside of team meetings	93%	100%	100%	100%	100%	100%
Attitude	100%	100%	100%	100%	100%	100%
Fosters constructive team climate	100%	100%	100%	100%	100%	100%
Responds to conflict	100%	100%	100%	100%	100%	100%

Conclusions Drawn from Data: The students are performing well as members of teams. This class will not be taught again until the spring of 2027.

Changes to be Made Based on Data: Continue to make use of group activities throughout the curriculum.

MICS Teamwork Rubric

Definition

Teamwork is behaviors under the control of individual team members (effort they put into team tasks, their manner of interacting with others on team, and the quantity and quality of contributions they make to team discussions).

Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet unsatisfactory (cell one) level performance.

The purpose of this is to evaluate individual team members. Although no team member will ever see your evaluation of them, please take it seriously.

Directions:

- **Do not put your own name anywhere on this form, the evaluations are to be anonymous.**
- **Please write the name of the person you are evaluating here**....._____
- **Please fill out one copy of this form for every person who was on your team, including one for yourself.**
- **For each row, place a checkmark in the box that best describes your teammate's performance.**

	Outstanding	High Satisfactory	Low Satisfactory	Unsatisfactory
Contributes to team meetings	☐ Helps the team move forward by articulating the merits of alternative ideas or proposals.	☐ Offers new suggestions to advance the work of the group.	☐ Shares ideas but does not advance the work of the group.	☐ Sits quietly in team meetings and does not contribute.
Encourages members of the team	☐ Actively seeks to find opportunities to encourage all members of the team.	☐ Offers encouragement to all members of the team.	☐ Offers words of encouragement to friends.	☐ Does not offer word of encouragement to anyone.
Individual contributions outside of team meetings	☐ Completes all assigned tasks by deadline; work accomplished is thorough. Proactively helps other team members complete their assigned tasks.	☐ Completes all assigned tasks by deadline; work accomplished is thorough.	☐ Completes all assigned tasks by deadline.	☐ Does not complete all assigned tasks by deadline.
Attitude	☐ Demonstrates (comments, facial expressions, etc.) a negative attitude **rarely** and helps others to become more positive.	☐ Demonstrates (comments, facial expressions, etc.) a negative attitude **rarely**.	☐ Demonstrates (comments, facial expressions, etc.) a negative attitude **less** often than a positive attitude.	☐ Demonstrates (comments, facial expressions, etc.) a negative attitude **more** often than a positive attitude.

Fosters constructive team climate	☐ Supports a constructive team climate by doing **all** of the following: • Treats team members respectfully by being polite and constructive in communication. • Uses positive vocal or written tone, facial expressions, and/or body language to convey a positive attitude about the team and its work. • Motivates teammates by expressing confidence about the importance of the task and the team's ability to accomplish it.	☐ Supports a constructive team climate by doing any **two** of the following: • Treats team members respectfully by being polite and constructive in communication. • Uses positive vocal or written tone, facial expressions, and/or body language to convey a positive attitude about the team and its work. • Motivates teammates by expressing confidence about the importance of the task and the team's ability to accomplish it.	☐ Supports a constructive team climate by doing any **one** of the following: • Treats team members respectfully by being polite and constructive in communication. • Uses positive vocal or written tone, facial expressions, and/or body language to convey a positive attitude about the team and its work. • Motivates teammates by expressing confidence about the importance of the task and the team's ability to accomplish it.	☐ Supports a constructive team climate by doing **none** of the following: • Treats team members respectfully by being polite and constructive in communication. • Uses positive vocal or written tone, facial expressions, and/or body language to convey a positive attitude about the team and its work. • Motivates teammates by expressing confidence about the importance of the task and the team's ability to accomplish it.
Responds to conflict	☐ Identifies and acknowledges conflict and acknowledges that relationships can be damaged. Seeks to restore relationships.	☐ Identifies and acknowledges conflict and acknowledges that relationships can be damaged.	☐ Identifies and acknowledges conflict but will not acknowledge that relationships can be damaged.	☐ Will not acknowledge that conflict has occurred or that relationships can be damaged.

Assessment Data Mathematical, Information and Computer Sciences

Learning Outcome: Students will be able to understand and create arguments supported by quantitative evidence (Quantitative Reasoning).

Outcome Measure: Annual: MTH3083 Mathematical Probability and Statistics Signature Assignment (Mathematics and Data Science Majors). Annual: ISS4014 Database and Web Signature Assignment (Computer Science, Information Systems and Data Science Majors).

Previous: Annual: Each student will participate in the ETS Proficiency Profile exam.

Criteria for Success: 80% of the students will score a 2 or higher on the 5-point rubric for MTH3083 and 2.5 or higher on the 4-point rubric for ISS4014

Previous: 90% of the students will be Marginal or Proficient at Level 2.

Longitudinal Data:

ISS4014:

	Percentage of Class at 2.5 or Higher						
	2013-14	2015-16	2017-18	2019-20	2021-22	2023-24	2024-25
Relevant Information Chosen	100%	88%	89%	88%	76%	88%	80%
Query Correctness	100%	48%	41%	83%	82%	79%	80%

This class became annual in 2024.

MTH3083:

	MTH3083 Percentage of the Class with Average Score of 2 or Higher	
	2022-23	2023-24
Students will be able to formulate a mathematical model from a verbal description of a problem.	100%	75%
Students will be able to construct solutions to problems using computational techniques.	100%	67%
Students will be able to interpret visual data.	20%	50%

Due to low enrollment, this class was not taught in 2024-25.

Previous:

	Percentage of Students Marginal or Proficient									
ETS Proficiency Profile	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
ETS Proficiency Profile Level 2 Mathematics	100%	100%	100%	100%	92%	82%	95%	93%	81%	90%

Conclusions Drawn from Data: Students are in general meeting our criteria. The variation often comes down to a single student because of small sample sizes. The Spring of 2021 was during COVID and students were exhausted by the time that they took the ETS exam, so this may explain the lower score for that year. In spring of 2023 we pilot tested the new assessment in MTH3083 and the results were mixed. We repeated it in 2024 and still have mixed results and we did not teach the class in 2025.

Changes to be Made Based on Data: We do not believe that the ETS exam was accurately measuring student quantitative ability in the department disciplines. In the 2022-23 academic year we began measuring quantitative reasoning in the following classes:
Computer Science, Information Systems and Data: ISS4014 Data Base Systems and Web Integration. We are making use of an ongoing assessment so have past values that have been inserted here. For Mathematics and Data Science: MTH3083 Mathematical Probability and Statistics. We are monitoring the new assessment to see what adjustments we need to make in either the assessment or the curriculum.

Rubrics:

ETS Proficiency Profile (no rubric involved)
ISS4014: Rubric below
MTH3083: Rubric below

ISS4014 Rubric Used

	Unsatisfactory (1)	Satisfactory (2)	Good (3)	Excellent (4)
Recognition of relevant information	3 errors (an error is defined as missing a relevant database field or listing an irrelevant field)	2 errors (an error is defined as missing a relevant database field or listing an irrelevant field)	1 error (an error is defined as missing a relevant database field or listing an irrelevant field)	All relevant database fields are listed and no irrelevant fields are listed for both queries
Query correctness	3 mistakes in the 2 queries	2 mistakes in the 2 queries	1 mistake in the 2 queries	No mistakes in the two queries

MTH3083 Rubric

	Unsatisfactory (0)	Low Satisfactory (1)	Satisfactory (2)	High Satisfactory (3)	Outstanding (4)
Students will be able to formulate a mathematical model from a verbal description of a problem.	Completely incorrect	Missed more than one key step or concept	Missed one key step or concept	Made a minor error	Completely correct
Students will be able to construct solutions to problems using computational techniques.	Completely incorrect	Missed more than one key step or concept	Missed one key step or concept	Made a minor error	Completely correct
Students will be able to interpret visual data.	Completely incorrect	Missed more than one key step or concept	Missed one key step or concept	Made a minor error	Completely correct

Assessment Data Mathematical, Information and Computer Sciences

Learning Outcome: Students will understand the professional, ethical and social issues and responsibilities with the implementation and use of technology.

Outcome Measure: Signature assignment in MTH3083 Mathematical Probability and Statistics, MTH4072 Internship in Data Science, MTH4152 Data Science Project II and MTH4133 Service Learning in Mathematics.

Criteria for Success: 80% of the students should have an average score of at least 2.5 in each of the major areas.

Longitudinal Data:

	MTH3083 Percentage of students at 2.5 or higher		
	2021-22	2022-23	2023-24
Explain the problem with the graph	60%	100%	92%
Explain how to make the graph truthful	60%	100%	83%

Due to low enrollment, this class was not taught in 2024-25.

	MTH4072 Percent of Students at 2.5 or Higher
	2024-25
Can identify an ethical issue in a problem or scenario.	100%
Can apply an ethical framework to ethical issue (virtue, utilitarianism, deontology, analogies) to scenario.	100%
Can make and support plausible ethical decision(s).	100%

	MTH4151 Percent of Students at 2.5 or Higher	
	2023-24	2024-25
Can identify an ethical issue in a problem or scenario.	50%	100%
Can apply an ethical framework to ethical issue (virtue, utilitarianism, deontology, analogies) to scenario.	50%	100%
Can make and support plausible ethical decision(s).	50%	100%

MICS: PLO Data, Math/DataSci, 2024-25

	CSC-ISS-MTH4133 Percent of Students at or Above 2.5		
	2022-23	2023-24	2024-25
Can identify an ethical issue in a problem or scenario.	73%	82%	100%
Can apply an ethical framework to ethical issue (virtue, utilitarianism, deontology, analogies) to scenario.	67%	73%	81%
Can make and support plausible ethical decision(s).	100%	91%	94%

Conclusions Drawn from Data: We are seeing improvement in scores as we are including ethics modules in many classes in the curriculum and are becoming more familiar with the ideas and they ways that we are assessing their knowledge of the ideas. In cases where we miss the benchmark (e.g. MTH4151), it is generally due to small sample size.

Changes to be Made Based on Data: We continue to construct a set of modules that are or will be embedded in several MICS classes and the intent that students will have multiple exposures to ethics-related issues and case studies. Our hope is that this scaffolding will ultimately support well-developed ethical responses in the classes where we gather assessment data.

MTH3083 Ethics Rubric

	Unsatisfactory (1)	Low Satisfactory (2)	High Satisfactory (3)	Outstanding (4)
Explain the Problem with the Graph	Indicates that there is no problem with the graph	Identifies a problem that does not exist	Identifies the error	Correctly and clearly identifies the key error
Explain How to Make the Graph Truthful	Explanation is not connected to the information	Explanation is partially correct and partially clear	Explanation is one of clear or correct	Explanation is both clear and correct

MICS: PLO Data, Math/DataSci, 2024-25

Learning Outcome:

For Engineering: Students will demonstrate an ability to recognize ethical and professional responsibilities and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

Courses evaluated: EGR 1023, EGR 2014/ PHY 3004, EGR 3023, EGR 4072

For MICS: Student will understand the professional, ethical and social issues and responsibilities with implementation and use of technology.

Courses evaluated: MTH 3083, MTH 4072, MTH 4151, CSC/ISS/ MTH4133, CSC3023, ISS 3042, ISS 4012

	Unsatisfactory (1)	Satisfactory (2)	Good (3)	Excellent (4)
Can identify an ethical issue in a problem or scenario. (Ethical Issue Recognition)	Student is unable to identify the core ethical issue of the scenario.	Student identifies a concern of the scenario, but not a core ethical issue.	Student identifies a core ethical issue, but not a secondary concern.	Student identifies a core ethical issue along with secondary concerns
Can apply an ethical framework to ethical issue (virtue, utilitarianism, deontology, analogies) to scenario. (Application of Ethical perspectives/concepts)	Student is unable to state an ethical framework.	Student states an ethical framework and makes an attempt to apply to the scenario.	Student states an ethical framework and is mostly correct in applying it to the scenario.	Student states an ethical framework and can correctly apply it to the scenario.
Can make and support plausible ethical decision(s). (Informed judgement)	Student is unable to form and support a plausible ethical decision.	Student forms a plausible ethical decision, however no support is given.	Student forms a plausible ethical decision and provide minimum support.	Student forms a plausible ethical decision and provide strong support.