

Core Course Assessment Plan, 2019-20
Element 2: Mathematics

Please complete all sections; do not delete section information. Submit to Pilot when complete.

SECTION 1: GENERAL INFORMATION

Course Dept. Prefix: EGR Course #: 1010

Semester when assessment will occur: Spring Summer Fall Year: 2019 or 2020

Course Title: Introductory Mathematics for Engineering Applications

Section Types and number of sections offered in 2019-20. Complete all that apply.

 4 Dayton face-to-face (Includes 1 CCP section) 2 Lake face-to-face

 2 Dayton online (Includes 1 CCP co-teach section) Lake online

 1 Dayton Honors Lake Honors

Attributes: X Integrative Writing in Core
 Multicultural Competency in Core
 Service Learning in Core

Dept. Core Assessment Lead: Dr. Craig Baudendistel craig.baudendistel@wright.edu
Name email

List at least two assessors; this may include course instructor only if there are multiple sections and multiple instructors of the course. Note - The instructor may not assess his/her students' papers.

- Dr. Craig Baudendistel
- MME Continuous Quality and Improvement Committee
- 1 Lake Campus assessor if possible
-

SECTION 2: ASSESSMENT PLAN

It is preferable to have the assessment plan for all sections of a course. If not feasible, please complete an assessment plan for separate sections.

Course Outcomes. Check here if Outcomes have been modified.

The course must address all 5 outcomes but must assess a minimum of 1 outcome. Highlight in yellow the outcome(s) you will assess. If you have modified the outcomes, please insert here in place of standard outcomes.

1. Identify the various elements of a mathematical or statistical model;
2. Determine the values of specific components of a mathematical/statistical model or relationships among various components;
3. **Apply a mathematical/statistical model to a real-world problem;**
4. Interpret and draw conclusions from graphical, tabular, and other numerical or statistical representations of data; and
5. **Summarize and justify analyses of mathematical/statistical models for problems, expressing solutions using an appropriate combination of words, symbols, tables or graphs.**

Assignments. Select one of the options below for assessment of one or more outcomes

Written assignment(s) that addresses/address outcome(s). Include outcome #, title and description for each assignment.

Outcome #: 3 Title: Semester Cumulative Final Exam

Description of assignment: Handwritten, with calculator; students must show work, calculations, and any necessary graphs.

Essay question(s). Provide the question(s) and outcome(s) below.

- 1. Outcome #: _____ Essay Question: _____
- 2. Outcome #: _____ Essay Question: _____
- 3. Outcome #: _____ Essay Question: _____

Pilot asynchronous written discussion that addresses outcome(s). Provide the outcome # and question(s).

- 1. Outcome #: _____ Discussion Question: _____
- 2. Outcome #: _____ Discussion Question: _____
- 3. Outcome #: _____ Discussion Question: _____

Multiple Choice or T/F Marker questions – 3 to 4 questions per outcome. List the outcome and question numbers. A rubric is not used for Marker questions. "All the above" should not be used as the correct answer more than once. **Courses that are IW or SRV/SRVI must use written assignments for those attributes.** Complete the benchmark: We expect _____% of students to answer _____% of the question(s) correctly.

- 1. Outcome #: _____
 - a) Question: _____
 - b) Question: _____
 - c) Question: _____
 - d) Question: _____
- 2. Outcome #: _____
 - a) Question: _____
 - b) Question: _____
 - c) Question: _____
 - d) Question: _____
- 3. Outcome #: _____
 - a) Question: _____
 - b) Question: _____
 - c) Question: _____
 - d) Question: _____

Collecting and submitting the student assignment(s)

Will upload assignment(s) to Pilot Will give access to assignment(s) on Pilot

Other: _____

Student workers will copy the assignment before any grading begins and scan a separate pdf of every students' assignment. The student worker will then create a zip file of the separate, ungraded exams to be sent to Carl Brun for entry into Aqua Watermark

Rubric Selection (A, B). Select the items you feel best match your assignment(s) in the rubric(s) on the next pages. Please highlight in yellow. **If this course has an IW attribute, please also see section B.**

A. Element 2 Rubric. Select the item(s) you will use in your rubric by highlighting in yellow the item(s). You may select one or more of them. As there is overlap, choose the items that best fit the assignment you select for assessment. The items below are taken from the Association of American Colleges and Universities (AACU) Value Rubrics for Math Literacy.

IF YOU ARE USING MARKER QUESTIONS FOR THE OUTCOME, DO NOT USE THIS RUBRIC.

	Capstone 4	3	Milestones 2	Benchmark 1
Interpretation <i>Ability to explain information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words)</i>	Provides accurate explanations of information presented in mathematical forms. Makes appropriate inferences based on that information. <i>For example, accurately explains the trend data shown in a graph and makes reasonable predictions regarding what the data suggest about future events.</i>	Provides accurate explanations of information presented in mathematical forms. <i>For instance, accurately explains the trend data shown in a graph.</i>	Provides somewhat accurate explanations of information presented in mathematical forms, but occasionally makes minor errors related to computations or units. <i>For instance, accurately explains trend data shown in a graph, but may miscalculate the slope of the trend line.</i>	Attempts to explain information presented in mathematical forms, but draws incorrect conclusions about what the information means. <i>For example, attempts to explain the trend data shown in a graph, but will frequently misinterpret the nature of that trend, perhaps by confusing positive and negative trends.</i>
Representation <i>Ability to convert relevant information into various mathematical forms (e.g., equations, graphs, diagrams, tables, words)</i>	Skillfully converts relevant information into an insightful mathematical portrayal in a way that contributes to a further or deeper understanding.	Competently converts relevant information into an appropriate and desired mathematical portrayal.	Completes conversion of information but resulting mathematical portrayal is only partially appropriate or accurate.	Completes conversion of information but resulting mathematical portrayal is inappropriate or inaccurate.
Calculation	Calculations attempted are essentially all successful and sufficiently comprehensive to solve the problem. Calculations are also presented elegantly (clearly, concisely, etc.)	Calculations attempted are essentially all successful and sufficiently comprehensive to solve the problem.	Calculations attempted are either unsuccessful or represent only a portion of the calculations required to comprehensively solve the problem.	Calculations are attempted but are both unsuccessful and are not comprehensive.

	Capstone 4	Milestones		Benchmark 1
		3	2	
Application / Analysis <i>Ability to make judgments and draw appropriate conclusions based on the quantitative analysis of data, while recognizing the limits of this analysis</i>	Uses the quantitative analysis of data as the basis for deep and thoughtful judgments, drawing insightful, carefully qualified conclusions from this work.	Uses the quantitative analysis of data as the basis for competent judgments, drawing reasonable and appropriately qualified conclusions from this work.	Uses the quantitative analysis of data as the basis for workmanlike (without inspiration or nuance, ordinary) judgments, drawing plausible conclusions from this work.	Uses the quantitative analysis of data as the basis for tentative, basic judgments, although is hesitant or uncertain about drawing conclusions from this work.
Assumptions <i>Ability to make and evaluate important assumptions in estimation, modeling, and data analysis</i>	Explicitly describes assumptions and provides compelling rationale for why each assumption is appropriate. Shows awareness that confidence in final conclusions is limited by the accuracy of the assumptions.	Explicitly describes assumptions and provides compelling rationale for why assumptions are appropriate.	Explicitly describes assumptions.	Attempts to describe assumptions.
Communication <i>Expressing quantitative evidence in support of the argument or purpose of the work (in terms of what evidence is used and how it is formatted, presented, and contextualized)</i>	Uses quantitative information in connection with the argument or purpose of the work, presents it in an effective format, and explicates it with consistently high quality.	Uses quantitative information in connection with the argument or purpose of the work, though data may be presented in a less than completely effective format or some parts of the explication may be uneven.	Uses quantitative information, but does not effectively connect it to the argument or purpose of the work.	Presents an argument for which quantitative evidence is pertinent, but does not provide adequate explicit numerical support. (May use quasi-quantitative words such as "many," "few," "increasing," "small," and the like in place of actual quantities.)

Assignments. Select **one** of the options below for assessment of one or more outcomes

Written assignment(s) that addresses/address outcome(s). Include outcome #, title and description for each assignment.

Outcome #: 5 Title: Laboratory Abstract #7

Description of assignment: Students write a 250 word abstract describing the experiment, setup, data collection, and results/conclusions.

Essay question(s). Provide the question(s) and outcome(s) below.

- 1. Outcome #: _____ Essay Question: _____
- 2. Outcome #: _____ Essay Question: _____
- 3. Outcome #: _____ Essay Question: _____

Pilot asynchronous written discussion that addresses outcome(s). Provide the outcome # and question(s).

- 1. Outcome #: _____ Discussion Question: _____
- 2. Outcome #: _____ Discussion Question: _____
- 3. Outcome #: _____ Discussion Question: _____

Multiple Choice or T/F Marker questions – 3 to 4 questions per outcome. List the outcome and question numbers. A rubric is not used for Marker questions. "All the above" should not be used as the correct answer more than once. **Courses that are IW or SRV/SRVI must use written assignments for those attributes.** Complete the benchmark: We expect _____% of students to answer _____% of the question(s) correctly.

- 1. Outcome #: _____
 - a) Question: _____
 - b) Question: _____
 - c) Question: _____
 - d) Question: _____
- 2. Outcome #: _____
 - a) Question: _____
 - b) Question: _____
 - c) Question: _____
 - d) Question: _____
- 3. Outcome #: _____
 - a) Question: _____
 - b) Question: _____
 - c) Question: _____
 - d) Question: _____

Collecting and submitting the student assignment(s)

Will upload assignment(s) to Pilot Will give access to assignment(s) on Pilot

Other: _____

B. If this is an IW course, you will use the items on this page. You may select one or more of them. Please highlight in yellow.

Item	Mastery 4	Partial Mastery 3	Progressing 2	Emerging 1
Includes considerations of audience, purpose, and the circumstances surrounding the writing task(s).	Demonstrates a thorough understanding of context, audience, and purpose that is responsive to the assigned task(s) and focuses all elements of the work.	Demonstrates adequate consideration of context, audience, and purpose and a clear focus on the assigned task(s) (e.g., the task aligns with audience, purpose, and context).	Demonstrates awareness of context, audience, purpose, and to the assigned tasks(s) (e.g., begins to show awareness of audience's perceptions and assumptions).	Demonstrates minimal attention to context, audience, purpose, and to the assigned tasks(s) (e.g., expectation of instructor or self as audience).
Content Development	Uses appropriate, relevant, and compelling content to illustrate mastery of the subject, conveying the writer's understanding, and shaping the whole work.	Uses appropriate, relevant, and compelling content to explore ideas within the context of the discipline and shape the whole work.	Uses appropriate and relevant content to develop and explore ideas through most of the work.	Uses appropriate and relevant content to develop simple ideas in some parts of the work.
Formal and informal rules inherent in the expectations for writing in particular forms and/or academic fields (please see glossary).	Demonstrates detailed attention to and successful execution of a wide range of conventions particular to a specific discipline and/or writing task (s) including organization, content, presentation, formatting, and stylistic choices	Demonstrates consistent use of important conventions particular to a specific discipline and/or writing task(s), including organization, content, presentation, and stylistic choices	Follows expectations appropriate to a specific discipline and/or writing task(s) for basic organization, content, and presentation	Attempts to use a consistent system for basic organization and presentation.
Sources and Evidence	Demonstrates skillful use of high-quality, credible, relevant sources to develop ideas that are appropriate for the discipline and genre of the writing	Demonstrates consistent use of credible, relevant sources to support ideas that are situated within the discipline and genre of the writing.	Demonstrates an attempt to use credible and/or relevant sources to support ideas that are appropriate for the discipline and genre of the writing.	Demonstrates an attempt to use sources to support ideas in the writing.
Control of Syntax and Mechanics	Uses graceful language that skillfully communicates meaning to readers with clarity and fluency, and is virtually error-free.	Uses straightforward language that generally conveys meaning to readers. The language in the portfolio has few errors.	Uses language that generally conveys meaning to readers with clarity, although writing may include some errors.	Uses language that sometimes impedes meaning because of errors in usage.

EGR 1010 Core Course Assessment Plan, 2019-2020
Element 2: Mathematics

Two course items will be used for assessment:

Cumulative Final Exam

The final exam consists of 5 problems, 20 pts each, that students must complete within two hours. Each question on the final exam for all sections beginning Summer 2019 – Spring 2020 will be recorded on Pilot with the corresponding numerical grade for each. Based on the numerical outcome of each question, the reviewer will rate Outcome 3, “Apply a mathematical/statistical model to a real-world problem”. It is expected that 70% of students earn 70% per question.

Instructions given to students: *This exam consists of 5 problems worth a total of 100 points. The only materials permitted are a calculator and a total of three (3) 8.5”x11” HANDWRITTEN crib sheets, which must be turned in with the exam. Be sure to show all your work, and to include physical units where appropriate. POINTS WILL BE DEDUCTED FOR MISSING UNITS.*

Please work out all problems on the following pages and box in your final answers.

Laboratory #7 Abstract

Students are required to write eight, 250 word abstracts for course completion. Reviewers will read approximately 1/3 of students’ abstract #7 and rate Outcome 5, “Summarize and justify analyses of mathematical/statistical models for problems, expressing solutions using an appropriate combination of words, symbols, tables or graphs” with the associated rubric.

Rubric:

- 1) Exactly 250 words
- 2) No personal pronoun use
- 3) No more than 2-3 grammar and spelling mistakes
- 4) Problem Statement (Clearly identify the problem being solved in 1-2 sentences.)
- 5) Motivation (Clearly state one or two reasons for conducting this experiment in 1-2 sentences.)
- 6) Approach (Clearly describe the steps performed, data collected, and equipment used in 3-4 sentences.)
- 7) Results (Clearly describe what measurements were taken in 1-2 sentences.)
- 8) Conclusion (Clearly compare calculated and measured values in 1-2 sentences.)

Faculty Senate CORE Oversight Committee

Assessment Plan Review

Element: 2

Course: EGR 1010

Review 1

Item	Complete / NA / Revision Requested	Comments
Learning Outcomes for Element 2 Mathematics	Complete	
Assignments matched to Element 2 LOs	Revisions Requested	<p>Include the Cumulative Final Exam Question and the Laboratory Abstract #7 Instructions given to Students.</p> <p>For the measurement using the Cumulative Final Exam, will you be reporting how many students answered the question correctly AND/OR using a Rubric when scoring this Question? If you are reporting how many students answered the question correctly, then complete the sentence, “We expect ____% of students to answer ____% of the question(s) correctly” portion.</p> <p>Under “Collecting and submitting the student assignments (bottom of p. 2)”, add “Student workers will copy the assignment before any grading begins and scan a separate pdf of every students’ assignment. The student worker will then create a zip file of the separate, ungraded exams to be sent to Carl Brun for entry into Aqua Watermark”.</p>
Rubric for LOs	Complete	
Rubric for IW Attribute	Complete	
Assigned Approved Reviewers	Revision Requested	Coordinate with Lake Campus the assessment of this course, including the possibility of at least 1 assessor from Lake Campus.
Other	Revision Requested	On Page 1, Courses must be assessed in 2019-2020 academic year; Fall 2020 is not within that range.

Review Status: Revision Requested

Committee Chair Signature _____ MH:bfm _____ Date 5/1/2019

The next section is for the University Core Oversight Committee (UCOC) Review only.

UCOC Review

Item	Complete/NA	Revision Requested	Comments
Learning Outcomes for Global Traditions	XX		
Rubric for LOs	XX		
Rubric for MC Attribute	N/A		
Rubric for IW Attribute	XX		
Rubric for SRV/SRVI Attribute	N/A		
Assigned Departmental Reviewers	XX		

Committee Review Completed XX

Committee Chair Signature Ann M. Bowling Date 12/2019

EGR 1010 Core Course Assessment Plan, Sum 2019- Sp 2020
Element 2: Mathematics

Outcome 3: Apply a mathematical/statistical model to a real-world problem.

This course will provide an overview of the salient math topics most heavily used in the core sophomore-level engineering courses. These include algebraic manipulation of engineering equations, trigonometry, vectors and complex numbers, sinusoids and harmonic signals, systems of equations and matrices, differentiation, integration, and differential equations. All math topics will be presented within the context of an engineering application and reinforced through extensive examples of their use in the core engineering courses.

A composite score of all course components will be used for assessment.

Overall Homework Grade

Homework is assigned weekly from a textbook and is worth 10% of the students' overall grade.

Overall Laboratory Grade

There are 8 hands on labs and 4 extended learning Matlab programming assignments worth 25% of the overall grade.

Exam 1 Grade

Covers the first 5 weeks of the course and worth 20% of the overall grade.

Exam 2 Grade

Covers weeks 6 through 10 of the course and worth 20% of the overall grade.

Final Exam Grade

Covers weeks 11 through 15 of the course and worth 25% of the overall grade.

It is expected that 70% of students pass the course with an overall grade of 70% or higher.

Results:

Raw data is contained in the attached Excel sheet. Overall results for Summer 2019-Spring 2020 are as follows:

All Students	
N=202	>= C
HW	85.6%
Labs	97.0%
E1	63.4%
E2	73.3%
FE	61.4%
Final Grade	77.2%

WSU Only	
163	>= C
HW	84.0%
Labs	96.9%
E1	55.8%
E2	68.7%
FE	54.0%
Final Grade	73.0%

Honors	
17	>= C
HW	94.4%
Labs	100.0%
E1	66.7%
E2	88.9%
FE	64.7%
Final Grade	88.2%

CCP Students	
39	>= C
HW	92.3%
Labs	97.4%
E1	94.9%
E2	92.3%
FE	92.3%
Final Grade	94.9%

III. Conclusions

A total of 223 students began EGR 1010 during the time period Sum 2019-Spring 2020. Of those 223 students, 202 completed the course. This cross section of students included 4 sections of WSU Dayton, 1 section of WSU Lake, and 2 sections of CCP.

The data in the tables above indicate an overall pass rate (with a 70% or higher) for all sections of EGR 1010. While some individual course items have a lower than 70% pass rate (with a 70% or higher), the composite score is higher. (Benchmark met)

- CCP students score exceptionally well on all course components
- Honors students score exceptionally well on task related items such as HW and labs and higher than other sub-groups on exams

The course item with the lowest 70% or better pass rate is the final exam. As such, a detailed analysis of the questions on the final exam for the same time period is shown below.

Q1	74.9
Q2	51.9
Q3	67.8
Q4	71.6
Q5	62.8
*excludes Sum19	

- Student performance on Q1 and Q4 were *above* 70% pass rate (with a 70% or higher)
- Student performance on Q3 and Q5 were slightly *below* the 70% pass rate (with a 70% or higher)
- The lowest student performance occurred on Q2.

IV. Actions Taken

This analysis provides feedback to the course coordinator to adjust material coverage in the course. This information was shared with two Department level committees; the Undergraduate Curriculum Committee (UCC) and the Continuous Quality Improvement Committee (CQI or ABET). No major course adjustments are necessary. More practice through homework or in class examples for select problems may be warranted.

Outcome 5: Summarize and justify the analyses of mathematical or statistical models for problems, expressing solutions using an appropriate combination of words, symbols, tables, or graphs.

A composite score of all laboratory Abstract grades will be used for assessment.

Integrated Writing: EGR 1010 is designated as an Integrated Writing (IW) Wright State Core course, and consequently includes a writing component. Students will be expected to produce writing that

- Demonstrates their understanding of course content,
- Is appropriate for the audience and purpose of a particular writing task,
- Demonstrates the degree of mastery of disciplinary writing conventions appropriate to the course (including documentation conventions), and
- Shows competency in standard edited American English.

The writing component consists of eight 250-word laboratory abstracts, which correspond to the eight laboratory assignments. Each single-paragraph abstract must summarize the objective, motivation, approach, results and conclusions. Guidelines on how to write an abstract (including a sample abstract) will be posted on the course web page. The abstracts will be graded for form, style, correctness, and overall writing proficiency, and will constitute a portion of the total laboratory grade. Students will receive graded feedback on each laboratory abstract, allowed time to

fix and resubmit the assignment until correct, which will allow for continuous improvement throughout the course. Mastery based grading is used in order to ensure that the IW component is satisfied. As such, completion of ALL abstracts is required for a passing grade in the course.

Rubric:

- 1) *Exactly 250 words*
- 2) *No personal pronoun use*
- 3) *No more than 2-3 grammar and spelling mistakes*
- 4) *Problem Statement (Clearly identify the problem being solved in 1-2 sentences.)*
- 5) *Motivation (Clearly state one or two reasons for conducting this experiment in 1-2 sentences.)*
- 6) *Approach (Clearly describe the steps performed, data collected, and equipment used in 3-4 sentences.)*
- 7) *Results (Clearly describe what measurements were taken in 1-2 sentences.)*
- 8) *Conclusion (Clearly compare calculated and measured values in 1-2 sentences.)*

Students must pass all 8 rubric items satisfactorily to receive master credit.

Results:

Pass rates for the writing portion of the course are shown below.

All Students	87.0%
WSU Only	84.8%
Honors	83.30%
Dayton Only	85.0%
Lake Only	83.90%
CCP Only	97.4%

	Rewrites	
	None	2 or more
A1	71.3%	26.5%
A8	94.2%	0.897%

III. Conclusions

Since students are required to fix and resubmit abstracts, pass rates are all above 83% for all sub-groups. Those choosing not to resubmit do not receive a course grade.

Additionally, the percentage of students passing and meeting all items on the rubric on the first try increased in all groups from Abstract #1 compared to Abstract #8.

The mastery-based approach here has resulted in a measurable improvement in abstract writing from the first assignment to the last.

IV. Actions Taken

This analysis provides feedback to the course coordinator to adjust material coverage in the course. This information was shared with two Department level committees; the Undergraduate Curriculum Committee (UCC) and the Continuous Quality Improvement Committee (CQI or ABET). No major course adjustments are necessary. The writing intensive portion of this class is working well.

V. No changes to the overall UCOC assessment process are recommended.

UCOC Report Review

Item	Complete/NA	Revision Requested	Comments
Identified Outcome Assessed	XX		
Identified Procedure for Assessment	XX		
Summary of Results	XX		
Results Shared with Instructor, Dept Curriculum Committee, etc.	XX		
Plan for Improvements	XX		

Committee Review Completed XXX

Committee Chair Signature Dr. Anne M. Bowling Date 2/11/2022