I. Cover Page

Please fill in the gray areas on this form.

Date: 3/29/19

3rd Edition Writing Plan: Spring/2019
1st Edition submitted: Spring/2015

Department of Civil, Environmental, and Geo-Engineering

WEC Unit Name

Civil, Environmental, and Geo-Engineering

Department

Mihai Marasteanu

WEC Faculty Liaison (print name)

maras002@umn.edu

Email

Writing Plan ratified by faculty

Note: This section needs to be completed regardless of Writing Plan edition.

Date: 3/29/2019

If Vote: 21 / 29

Process by which Writing Plan was ratified within unit (vote, consensus, other- please explain):

Faculty members voted at the beginning of the P&T meeting on March 29. There were 21 positive votes and 1 abstain vote. One faculty member is on sabbatical leave and one is on leave. Two faculty were traveling and three faculty members did not submit a vote.
II. Unit Profile: Civil, Environmental, and Geo-Engineering

*Please fill in the gray areas on this form.*

### Number of Tenured and Tenure-Track Faculty:

<p>| | | |</p>
<table>
<thead>
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<tr>
<td></td>
<td>17</td>
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<td>6</td>
<td>Associate Professors</td>
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<tr>
<td></td>
<td>6</td>
<td>Assistant Professors</td>
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<td><strong>29</strong></td>
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</table>

**Comments about Faculty/Instructors:**

**Number of Tenured and Tenure-Track Faculty:**

- **17** Professors
- **6** Associate Professors
- **6** Assistant Professors
- **29** Total

### Major(s)

*Please list each major your unit offers:*

<table>
<thead>
<tr>
<th>Major</th>
<th>Total # students enrolled in major as of Spring/2019</th>
<th>Total # students graduating with major as of AY 18-19</th>
</tr>
</thead>
<tbody>
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<td>Geo-engineering</td>
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### WEC Process

<table>
<thead>
<tr>
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<th>Date</th>
<th># Participated</th>
<th># Invited</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discuss rating results</td>
<td>Fall 2018</td>
<td>25 /</td>
<td>29</td>
</tr>
<tr>
<td>Faculty workshop</td>
<td>Spring 2017</td>
<td>8 / 30</td>
<td></td>
</tr>
</tbody>
</table>
III. Signature Page

Signatures needed regardless of Writing Plan edition. Please fill in the gray areas on this form.

If this page is submitted as a hard copy, and electronic signatures were obtained, please include a print out of the electronic signature chain here.

WEC Faculty Liaison

Mihai O. Marasteanu  
WEC Faculty Liaison (print name)

[Signature]

Professor
Title
03/29/2019
Date

Department Head/Chair

Joseph F. Labuz  
Print Name

[Signature]

MSE/ Kersten Professor and Head
Title
29 March 2019
Date

Associate Dean

Paul J. Strykowski  
Print Name

[Signature]

Professor and Associate Dean, CSE
Title
01 April 2019
Date
IV. Writing Plan Narrative, 3rd Edition

Introductory Summary:
Briefly describe the reason(s) this unit (department, school, college) became involved in the WEC project, the key findings that resulted from the process of developing this plan, and the implementation activities that are proposed in this Writing Plan, with particular attention to the following questions: what is new in this 3rd edition of the Writing Plan? What, if any, key changes have been made to the 2nd edition? What key implementation activities are proposed in this edition of the Writing Plan? (1 page maximum)

CEGE’s involvement in the WEC project was triggered by the desire to improve the writing abilities of CEGE students. For years, faculty in the department had numerous conversations on how to improve these abilities but a lack of resources and time prevented significant improvement in this direction. We plan to use WEC to clarify and connect writing expectations for the courses offered in the department.

The main goals of the second edition of the Writing Plan were to increase the use of the criteria menu to provide consistent feedback to students on writing, develop instructional support through consultations and/or workshops, and develop and expand the departmental writing guide and library of student writing samples.

The agreed-upon writing criteria were used to create language that could be used in course syllabi. Starting with fall 2017 semester, all faculty have added in their syllabi information about CEGE expectations about writing abilities and the specific writing abilities emphasized in each course. A workshop was held with faculty in March 2017 on integrating the WEC criteria into grading rubrics. An example of a master grading rubric based on abilities was made available to all faculty and a number of instructors have started to use rubrics in their courses. Examples are shown in Appendix A.

To obtain a reasonable idea of progression of student writing abilities throughout the three CEGE programs, we focused on one beginning class (CEGE 3101, Computer Applications), one intermediate class (CEGE 3402w, Civil Engineering Materials), and one senior-level class (CEGE 4102W, Capstone Design). These courses included the grading criteria in the syllabus, and the assignments were evaluated based on the departmental writing guidelines. The RA analyzed the results (see Appendix B). The results indicated that, as expected, significant improvements were made during the earlier courses in the program, while in the Capstone class the results were mixed and appear to indicate that the students in Spring 2017 came in better prepared than the students in Fall 2016. This could be a result of greater attention to writing due to WEC program.

A considerable amount of the RA’s time was spent on finalizing the CEGE Guidelines for Writing Lab Reports. Three CEGE required courses have laboratory components and the requirements were different from one course to another. Presently, all three courses use the same guidelines for laboratory reports. The guidelines are included in Appendix C.

In the 3rd edition, work will continue to further develop the CEGE Departmental Guide for Writing Lab Reports and the library of writing samples.

The most recent report from the CEGE Rating of upper-division writing of graduating majors (which included internal and external raters, see Appendix D) showed improvement in all 12 criteria from 2015 to 2018. This improvement is attributable to the attention that has been put on writing throughout the department. Departmental leadership
support and encourage participation, faculty are beginning to implement the criteria and rubrics, and students are becoming aware of the importance of writing and specific communication expectations. Graduating seniors in 2018 experienced multiple courses which emphasized writing instruction.

From the August 2018 Rating of upper-division writing of graduating majors (see Appendix D), the following abilities were identified as in greatest need of improvement: #6 Is consistently written in tone, voice, and style appropriate to specified audience, and #10 Effectively incorporate mathematical equations and formulas into prose. A focus of the 3rd CEGE Writing Plan will be to identify where (courses) and how (methods) that could best support students’ abilities on these writing tasks. One valuable addition would be developing a workshop to support TAs that work with the WI courses. Although we have encouraged TAs to participate in TWW courses, the courses are often scheduled too early in the term. The WEC team would like to explore the possibility of a teaching with writing workshop that is tailored to teaching CEGE WI courses and delivered within a more compatible timeline.

A new effort in the third plan will be to collect writing samples and assignments from a new Project Management course that has recently gained a WI designation.

We would like to schedule a how-to-teach-with-writing training for TAs within CEGE using expertise of instructors from The Writing Center and the Center for Teaching and Learning.

Section 1: DISCIPLINE-SPECIFIC WRITING CHARACTERISTICS
What characterizes academic and professional communication in this discipline?

☒ There have not been substantial revisions to this section of the Writing Plan.
☐ There have been substantial revisions to this section of the Writing Plan. (Discuss these explicitly.)

The information presented in the second-edition Plan is presented below.

Based on the results of the survey and faculty discussions in the first two faculty meetings, the following discipline specific writing characteristics were identified.

Logically-prepared and presented
- Logical structure in overall organization
- Paragraphs and sentences arranged logically by showing linearity of ideas
- Orderly and logical at level of writing mechanics (e.g., by providing transitional phrases connecting one part in the sequence to another)

Clear and efficient
- Precise, coherent, and focused; sentences are crisp, succinct, yet communicate all that is needed
- Short but sufficient; descriptive but complete
- Apt for requirements and expectations of the specific writing task
- Thoughtful and attentive to given instructions
- Comprehensively responds to all that was asked
Grammatically and mechanically sound
- Avoids grammatical errors and misspellings
- Provides adequate citations to references and sources whenever needed
- Uses units for quantities properly and consistently
- Features some visual appeal and is visually legible (uniformity, spacing, shapes, etc.)

Effectively integrates different types of writing
- Clearly integrates math and prose
- Distinguishes descriptive or qualitative writing
- Clearly highlights quantitative results whenever present
- Integrates figures and drawings properly and clearly into writing
- Provides verbal explanations of formulas, whenever needed

Focused and purposeful
- Articulates how writing is a contribution to human knowledge
- Synthesizes concepts into bigger ideas
- Includes clear presentation of different parts of presentation (e.g., description of assumptions, evaluations, definition of hypothesis, presentation of conclusions)
- Displays proper adjustments for audiences of different writing tasks
- Makes logic effectively transparent to audience
- Meets requirements for reproducibility and is effectively sharable

Intentional in writing choices
- Captures the most important concepts
- Features important observations with appropriate prominence
- Encourages singular, intended interpretation
- Helps reader understand what was done, how it was done, and for what reason
- Demonstrates clear thinking and understanding

Section 2: DESIRED WRITING ABILITIES
With which writing abilities should students in this unit’s major(s) graduate?

☒ There have not been substantial revisions to this section of the Writing Plan.
☐ There have been substantial revisions to this section of the Writing Plan. (Discuss these explicitly.)
Section 3: INTEGRATION OF WRITING INTO UNIT’S UNDERGRADUATE CURRICULUM
How is writing instruction currently positioned in this unit’s undergraduate curriculum (or curricula)? What, if any, course sequencing issues impede an intentional integration of relevant, developmentally appropriate writing instruction?

☒ There have not been substantial revisions to this section of the Writing Plan.
☐ There have been substantial revisions to this section of the Writing Plan. (Discuss these explicitly.)

Section 4: ASSESSMENT OF STUDENT WRITING
What concerns, if any, have unit faculty and undergraduate students voiced about grading practices?

Please include a menu of criteria extrapolated from the list of Desired Writing Abilities provided in Section 2 of this plan. (This menu can be offered to faculty/instructors for selective adaptation and will function as a starting point in the WEC’s longitudinal rating process.).

☒ There have not been substantial revisions to this section of the Writing Plan.
☐ There have been substantial revisions to this section of the Writing Plan. (Discuss these explicitly.)

Relevant information included in the second version is presented below.

CEGE’s curricular matrix, shown in Figure 1, was developed from a combination of data collected from past ABET documentation and an online survey completed by the current instructors of the required civil, environmental, and geo-engineering coursework. The data compiled consisted of the types of assignments used in the various courses, e.g., laboratory reports, topic summaries, oral presentations, etc. As such, a correspondence was developed between these assignment types and the faculty generated list of student writing abilities and grading criteria; see Table 1. It is important to mention that this correspondence table is expected to undergo future revision. Together, Figure 1 and Table 1 demonstrate the extent to which the student writing abilities are addressed within the curriculum.

Based on the results from the curricular matrix, it was concluded that the majority of the criteria are being addressed within the coursework. The two writing abilities that appear to be least addressed include (i) #2 recognizes and uses audience specific writing conventions, and (ii) #12 critically evaluates own work. Moving forward, we expect these results may shift somewhat as the correspondence table is updated.
FIGURE 1. CEGE’s curricular matrix developed from ABET documentation and an online survey

<table>
<thead>
<tr>
<th>Civil, Environmental, and Geo- Engineering Writing-Enriched Curriculum Matrix</th>
<th>Required CEGE Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEGE 3101 – Computer Applications I</td>
<td>CEGE 3201 – Transportation Engineering</td>
</tr>
<tr>
<td>CEGE 3102 – Uncertainty &amp; Decision Analysis</td>
<td>CEGE 3401 – Linear Structural Analysis</td>
</tr>
<tr>
<td>CEGE 3201 – Transportation Engineering</td>
<td>CEGE 3402W – Construction Materials</td>
</tr>
<tr>
<td>CEGE 3401 – Linear Structural Analysis</td>
<td>CEGE 3501 – Environmental Engineering</td>
</tr>
<tr>
<td>CEGE 3402W – Construction Materials</td>
<td>CEGE 3502 – Fluid Mechanics</td>
</tr>
<tr>
<td>CEGE 3501 – Environmental Engineering</td>
<td>CEGE 4102W – Capstone Design</td>
</tr>
<tr>
<td>CEGE 3502 – Fluid Mechanics</td>
<td>CEGE 4121 – Computer Applications II</td>
</tr>
<tr>
<td>CEGE 4102W – Capstone Design</td>
<td>CEGE 4201 – Soil Mechanics</td>
</tr>
<tr>
<td>CEGE 4201 – Soil Mechanics</td>
<td>CEGE 4301 – Soil Mechanics II</td>
</tr>
<tr>
<td>CEGE 4201 – Soil Mechanics</td>
<td>CEGE 4311 – Rock Mechanics</td>
</tr>
<tr>
<td>CEGE 4301 – Soil Mechanics II</td>
<td>CEGE 4351 – Groundwater Mechanics</td>
</tr>
<tr>
<td>CEGE 4311 – Rock Mechanics</td>
<td>CEGE 4401 – Steel &amp; Concrete Design</td>
</tr>
<tr>
<td>CEGE 4351 – Groundwater Mechanics</td>
<td>CEGE 4401 – Steel &amp; Concrete Design</td>
</tr>
<tr>
<td>CEGE 4401 – Steel &amp; Concrete Design</td>
<td>CEGE 4501 – Hydrologic Design</td>
</tr>
<tr>
<td>CEGE 4501 – Hydrologic Design</td>
<td>CEGE 4502 – Water &amp; Wastewater Treatment</td>
</tr>
</tbody>
</table>

CEGE Writing Abilities

1. Shows evidence of appropriate pre-planning process and sufficient levels of knowledge.
2. Recognizes and uses audience specific writing conventions.
4. Organizes communications effectively.
5. Presents technical processes effectively.
6. Describes uncertainty of analysis.
7. Expresses complex data succinctly but comprehensively.
8. Clearly communicates abstract ideas or complicated phenomenon.
10. Writes with proper mechanics and formal presentation (grammar, proofreading, etc.).
11. Demonstrates proper scholarship and avoids plagiarism.
12. Critically evaluates own work.

FIGURE 1. CURRICULAR MATRIX FOR DEPARTMENT

<table>
<thead>
<tr>
<th>CEGE Course</th>
<th>Example assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>3101 – Computer Applications I</td>
<td>Computer programming, data analysis, project reports including figures &amp; tables, and audience specific consultation letters.</td>
</tr>
<tr>
<td>3102 – Uncertainty &amp; Decision Analysis</td>
<td>Data analysis, problem sets including formulations, and literature reviews.</td>
</tr>
<tr>
<td>3201 – Transportation Engineering</td>
<td>Data analysis, problem sets including figures &amp; formulations, and literature reviews.</td>
</tr>
<tr>
<td>3301 – Soil Mechanics I</td>
<td>Problem sets including explanations and laboratory reports.</td>
</tr>
<tr>
<td>3401 – Linear Structural Analysis</td>
<td>Problem sets including explanations, laboratory reports, and audience specific consultation letters.</td>
</tr>
<tr>
<td>3402W – Construction Materials</td>
<td>Multiple draft lab reports and literature reviews; presentations.</td>
</tr>
<tr>
<td>3501 – Environmental Engineering</td>
<td>Problem sets including explanations and formulations.</td>
</tr>
<tr>
<td>3502 – Fluid Mechanics</td>
<td>Problem sets including explanations and laboratory reports.</td>
</tr>
<tr>
<td>4102W – Capstone Design</td>
<td>Literature reviews, multiple draft design reports, audience specific consultation letters, and oral presentations.</td>
</tr>
<tr>
<td>4121 – Computer Applications II</td>
<td>Computer programming, data analysis, multiple draft project summaries, and audience specific consultation letters.</td>
</tr>
<tr>
<td>4301 – Soil Mechanics II</td>
<td>Lab reports, audience specific consultation letters.</td>
</tr>
<tr>
<td>4311 – Rock Mechanics</td>
<td>Lab reports, consultation letters, and oral presentations.</td>
</tr>
</tbody>
</table>
No specific changes are suggested related to course sequencing or course offerings in order to ensure that students experience a specific sequence of writing instruction in the CEGE curriculum. Instead, most faculty favor having existing courses work more intentionally with writing instruction. The focus will continue to be on optimizing effective writing instruction and student learning of writing skills within the existing curriculum. Attention will be focused toward lessening a possible gap between faculty perceptions of instruction and students’ demonstrated assimilation of writing abilities.

Section 5: SUMMARY OF IMPLEMENTATION PLANS, including REQUESTED SUPPORT and RELATION TO PREVIOUS IMPLEMENTATION ACTIVITIES, and SUSTAINABILITY PLANS
What does the unit plan to implement during the period covered by this plan? What forms of instructional support does this unit request to help implement proposed changes? What are the expected outcomes of named support?

How do the implementation plans of the 3rd edition Writing Plan relate to implementation activities from the 2nd and 1st edition Writing Plans? What has been successful? What was not successful? How do implementation plans build on what was learned from the first year of implementation? How do implementation plans anticipate the ongoing application of this final edition Writing Plan?

How will the unit move toward ownership of the implementation process after the end of eligibility for WEC funding? When needed, what will be sources of funding and resource support? How will ongoing evaluation and improvement of the Writing Plan take place?

Updates on the key implementation activities proposed in the first and second editions

1. Use the criteria menu in order to provide consistent feedback to students on writing
   a. Update: Faculty are including the writing criteria on syllabi, some are using grading rubrics that include writing and they are reporting a positive experience with the use of matrices, which was new to some of them. Other faculty commented that they have been talking more about writing in their classes as a result of the WEC discussions.

2. Develop instructional support (consultations/workshops)
   a. Update: Workshop was delivered on March 24, 2017 before a faculty meeting. Topics discussed included 1) time efficient ways to incorporate writing assignments into their classes and 2) best practices for peer review of writing.

3. Develop a departmental writing guide and a library of templates and well-written student samples
   Update: A departmental writing guide for lab reports has been developed and is being used in three undergraduate core courses that have laboratory components: Civil Engineering Materials (CEGE 3402W), Fluid Mechanics (CEGE 3502), and Environmental Engineering Laboratory (CEGE 3541). The document is refined each term based on feedback solicited or offered by faculty. Samples of student writing have been collected and are available to faculty in a Google Drive folder.
In addition, the following new priorities are proposed for this third edition of the CEGE WEC plan:

- The new Project Management course is in the process of gaining a WI designation. Writing samples and assignments will be collected from this course in 2019.
- In-class writing assignments, given at the very beginning and at the very end of the course have been collected in CEGE 3402W for the past two semesters. The assignments will be used to better evaluate the progression of writing abilities in this class. We would like to use TA time to analyze or compare these pre- and post-assignments for specific examples of terminology use.

We plan to schedule a how-to-teach-with-writing training for TAs within CEGE. We would like to draw on the expertise of instructors from The Writing Center or the Center for Teaching and Learning. Although we have encouraged TAs to attend trainings offered, many are not hired until after these classes start. Scheduling one class later that is tailored for CEGE TAs, that is, focused on CEGE identified writing criteria, would be beneficial.

Section 6: PROCESS USED TO CREATE THIS WRITING PLAN
How, and to what degree, were a substantial number of stakeholders in this unit (faculty members, instructors, affiliates, teaching assistants, undergraduates, others) engaged in providing, revising, and approving the content of this Writing Plan?

This third edition of the CEGE writing plan was developed by the faculty liaison and the CEGE writing specialist, in collaboration with the WEC consultant, and in consultation with CEGE faculty.

The CEGE “Rating upper-division writing of graduation majors” was presented. Faculty were pleased with the progress and offered no specific comments on the results of the ratings of upper division writing.

The review/update of the Writing Plan was discussed with faculty at the October 26, 2018, faculty meeting. A revised third edition was sent to faculty for review in March 2019. The revised draft, based on comments from faculty, was approved at a meeting on Friday, March 29, 2019.
V. WEC Research Assistant (RA) Request Form

This form is required if RA funding is requested. If no RA funding is requested please check the box below.

☐ No RA funding requested.
☒ RA funding requested.

RAs assist faculty liaisons in the WEC Writing Plan implementation process. The specific duties of the RA are determined in coordination with the unit liaison and the WEC consultant, but should generally meet the following criteria: they are manageable in the time allotted, they are sufficient to their funding, and they have concrete goals and expectations (see below).

RA funding requests are made by appointment percent time (e.g., 25% FTE, 10% FTE, etc.). Appointment times can be split between two or more RAs when applicable (e.g., two 12.5% appointments for a total of 25% FTE request). Total funds (including fringe benefits when applicable) need to be calculated in advance by the liaison, usually in coordination with administrative personnel.

Please note that, outside of duties determined by the liaison, WEC RAs may be required to participate in specific WEC activities, such as meetings, Canvas discussion boards, and surveys.

RA Name (Use TBD for vacancies): TBD
RA Contact Information: email , phone
Period of appointment (Semester/Year to Semester/Year): Fall 2019, Spring 2020, Fall 2020.
RA appointment percent time: Fall 2019 25%, Spring 2020 25%, Fall 2020 12.5%

Define in detail the tasks that the RA will be completing within the funding period:

The RA will work closely with Dr. Mihai Marasteanu, faculty liaison for the CEGE WEC program, and with the instructor of the Project Management course. The RA will assist the instructor of the new Writing Intensive course, Project Management, in fall 2019 and spring 2020, as follows:

• bring faculty attention to available resources for teaching writing and teaching with writing in engineering courses
• assist faculty in developing their desired writing assignments and rubrics based on the grading criteria menu
• collect samples of student writing
• conduct student feedback survey and aggregate data, similar to previous surveys

The RA will also perform the following activities during fall 2019, spring 2020, and fall 2020:

• analyze in-class writing assignments collected in CEGE 3402W for the past 2 semesters to assess progression of writing over the course. We will be looking for specific examples of use of technical terminology. Text analysis software may be needed for this assessment.
• gather data from all faculty on the use of grading criteria menu and departmental writing guidelines for lab reports
• draft a report on the implementations to be presented by the liaison to the whole faculty at the end of each semester
Describe how frequently the RA will check in with the liaison:

The RA will have in-person meetings on a bi-weekly basis with the faculty liaison and with the CEGE writing specialist, Dr. Merry Rendahl. Discussions will focus on progress on analyzing the pre- and post- writings from 3402W, research on courses and techniques to support development of skills #4, #6, and #10 in 4102/4104W, and collection of samples from the Project Management course.

Describe in detail the RA’s check-in process (e.g., email, phone, in-person, etc.):

The RA will work closely with Dr. Mihai Marasteanu, faculty liaison for the CEGE WEC program writing plan, who will provide guidance on how to utilize the information collected most effectively in terms of actual teaching and engineering practices.
APPENDICES

Appendix A: Examples of Rubrics including CEGE identified Writing Skills, pdf attached

A-1 CEGE3402 Lab Report Grading Rubric
A-2 CEGE4253 Homework Grading Rubric
A-3 CEGE4102/4104 Report Grading Rubric
CEGE 3402W Lab Report Grading Rubric

When communicating about engineering problems, the entire message is important, not only the numbers. In this course, homework assignments will be graded according to the following criteria.

Each individual problem will be graded on these criteria, although not every one will apply every time. The number of points for each criteria may vary across problems. The maximum number of points will be awarded if the solutions are correct, adequately explained, and properly formatted. In some cases, specific additional criteria may be added; in that case the criteria will be communicated with the assignment.

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<th>Strong</th>
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</thead>
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<td></td>
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<tr>
<td>Criteria Number</td>
<td>Weak</td>
<td>Strong</td>
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<tr>
<td>Results section</td>
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<tr>
<td>Clearly communicate results without interpretation</td>
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<tr>
<td>Interpretation accuracy</td>
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<tr>
<td>Write well-organized conclusions</td>
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<td>Use proper terminology and metrics</td>
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<td>Provide all equations</td>
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<td>Reports all units correctly</td>
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<td>Define all variables</td>
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<tr>
<td>Organize communication effectively</td>
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<tr>
<td>Figures, tables, and sketches</td>
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<tr>
<td>Present results clearly and neatly</td>
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<td>Provide labels and captions for figures</td>
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<td>Label figure axes and table (curriculum headers)</td>
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<td>Solution(s) are technically correct</td>
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Discussion

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<td>Evaluate data critically</td>
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<tr>
<td>Present data in a logical order</td>
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<tr>
<td>Express ideas clearly and concisely</td>
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<tr>
<td>Provide proper support and reasoning for all points</td>
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<tr>
<td>Write well-organized conclusions and formal presentation</td>
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Grand total 100
## Homework #1
CEGE4253-Fall 2017

<table>
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<tr>
<td>Includes name, assignment number and date on the first page</td>
<td>Correct results for all 80 sequences presented in a well organized table</td>
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<tr>
<td>1. Determine the resilient modulus for all the sixteen sequences.</td>
<td>Chart with correct axes and legend, that clearly presents data</td>
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</tr>
<tr>
<td>2. Plot resilient modulus vs. mean stress.</td>
<td>Logical and well supported comments with no grammatical errors</td>
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<tr>
<td>2. Comment and discuss.</td>
<td>Chart with correct axes and legend, that clearly presents data</td>
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</tr>
<tr>
<td>3. Plot resilient modulus vs. deviatoric stress</td>
<td>Shows and summarizes all calculations</td>
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<tr>
<td>3. Find the material constants K1, K2, K3 and K4</td>
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<td>Comment and discuss any problems encountered</td>
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<tr>
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<td>Description of Problem/Project/Site/Scope</td>
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<tr>
<td>Description/Summary of the Critical Aspects &amp; Components of the Project</td>
<td>(Background/site info) Each key aspect of the project is well described including the use of supporting information; Accurate; Complete</td>
<td></td>
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<tr>
<td>Design Options or Design Methodology</td>
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<td>1 Poor</td>
<td>Weight</td>
<td>TOT</td>
<td>Max Poss</td>
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<td>Final Conclusion or Recommendation</td>
<td>Analysis of the critical aspects of the project to arrive at conclusions or recommendations (e.g., economics, performance, safety); shows good engineering judgment</td>
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<td>Supporting information (in body of report and Appendices)</td>
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<td>Visuals (tables, figures)</td>
<td>Accurate development and effective use of visual information (tables and figures).</td>
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<tr>
<td>Overall readability / style</td>
<td>Clear; concise; appropriate tone; meets audience needs; follows expected conventions; minimal use of jargon; appropriate use of acronyms; easy to read</td>
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<td>Organization</td>
<td>Argument develops in logical order; Appropriate and helpful use of headings and subheadings</td>
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<tr>
<td>Grammar &amp; usage</td>
<td>Adept use of language enhances message; Free of errors</td>
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<td></td>
<td></td>
<td></td>
<td>X2</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Format</td>
<td>Follows Report Guidance Document standards for this course; Tables and Figures are readable; labeled clearly and correctly; Sources noted; Referenced in text.</td>
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</table>
Appendix B Survey Results

CEGE 3101 Survey Responses
Fall 2016

Came in with | Somewhat improved | Greatly improved | Lack Confidence
---|---|---|---
1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12
CEGE 3402W Survey Responses
Spring 2017

CEGE 4102 Survey Responses
Fall 2016
CEGE 4102 Survey Responses
Spring 2017

Came in with Somewhat improved Greatly improved Lack Confidence
Appendix C CEGE Departmental Guidelines for Writing Lab Reports, pdf attached
CEGE Guidelines for Writing Lab Reports

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  Abstract or Executive Summary ....................................................................................................... 5
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  Methods........................................................................................................................................... 6
  Calculations...................................................................................................................................... 6
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**PURPOSE OF THIS GUIDE**

Laboratory reports communicate the details of an experiment (methods, results, and conclusions) to persons not directly involved in the experiment or lab test procedure. Audiences for lab reports related to civil, environmental, or geo-engineering questions can range from supervisors who are familiar with the details of the tests, to other scientists who might know the theory but not the details of your specific work, to investors or contractors, and even to untrained, public audiences, perhaps a homeowner.

This guide gives you a framework for writing lab reports within the immediate context of your CEGE course, but you should also strive to understand how communicating about your work fits into the larger culture of engineering. This handbook can help you communicate more effectively overall, which could give you an edge in the job market.

**Additional Sources**

NOTE: There are several sources for writing help. A couple are listed here if you want additional information on particular topics. Keep in mind, however, that organizations adopt different styles depending on the prevailing situations, so information in these sources might differ from what your professor has specified in the specific situation of your class.

The UMN Department of Mechanical Engineering has created a Student Writing Guide for Lab Reports. It is available in PDF format: [www.me.umn.edu/education/undergraduate/writing/MESWG-Lab.1.5.pdf](http://www.me.umn.edu/education/undergraduate/writing/MESWG-Lab.1.5.pdf)

LabWrite is an online source from North Carolina State University designed to help students improve their lab reports. [https://www.ncsu.edu/labwrite/index_labwrite.htm](https://www.ncsu.edu/labwrite/index_labwrite.htm)

**WRITING STYLE**

Writing style is dependent on discipline, audience, and document type. Writing in engineering is always done with a purpose in mind. Readers will use the information to do something. Lab reports are read to repeat an experiment, to evaluate the results of an experiment, to assess the author’s understanding and skill, or to apply the results in a practical situation. To communicate most clearly with your audience, it is important to find out who will read the lab report and how the information will be used.

Accuracy and clarity are key characteristics of engineering writing.

- Engineering reports must be accurate and clear.
- Engineering reports must be concise. People reading engineering reports are often looking for specific information. They want to get the information they need easily and efficiently. Your goal is to be comprehensive and brief.
- Engineering reports should be written objectively. Focus on the information, not the author. Engineering reports should not entail your subjective opinions, just the actions, the results, the findings, and the recommendations that follow from the experiment.
- Avoid use of first-person pronouns (for example, I or you). While first person may be acceptable in some types of writing, first-person pronouns should be avoided when writing lab reports. Focus on the experimental methods and the outcome, not on the researchers’ experience of going through the steps.
- Follow the prescribed subsections when writing a lab report. Do not write a chronological account of your experience in the lab.
- Define all special vocabulary. Avoid overuse of specialized jargon and acronyms.
- Define all acronyms and abbreviations. The first time a term is used, it should
be used in its full, spelled-out form. If an acronym is used, the acronym should be introduced at the first use, flowing the full term: place the acronym in parentheses following the term. After it has been introduced, the acronym can be used on its own. For example, “The American Society for Civil Engineering (ASCE) was founded in 1852. Now ASCE represents 150,000 members.”

- In a longer report, a list of acronyms and abbreviations might be included.
- Double check for grammar mistakes and typos. Automated grammar and spell checkers are great tools, but may not pick up all errors. For instance, an automated grammar checker might not highlight a capitalization mistake.

**Passive vs. Active Voice**

Engineering reports should be written clearly and directly. To this end students are often told, *Always avoid personal pronouns*. But that can lead to a poor use of passive voice, which it can be quite awful:

**Poor Use of passive voice:** “In the event of additional hotel accommodation being required over and above that which has been booked, this should be done by telephoning the Travel team.” (example from *The Stroppy Editor* blog.)

The addition of “you” could greatly improve the offending sentence: “If you need to book additional rooms, call the Travel team.” Or “[You] Call the Travel team to book additional rooms.” However, this sentence can also be rewritten using an active verb and no personal pronouns: “The Travel team can book additional rooms when necessary.”

Here is another example excerpted from *The Stroppy Editor* blog. Read the full explanation at https://stroppyeditor.wordpress.com/2013/07/02/whats-wrong-with-the-passive-voice/.

“*Compare these two fantasy news stories…*

1. **ACTIVE:** Scientists at the University of Birmingham discovered a drug that cures AIDS…
2. **PASSIVE:** A drug that cures AIDS has been discovered by scientists at the University of Birmingham…

*The first (active) version will immediately hook you only if you’re a fan of that fine university, while the second (passive) version gets straight to the point [that is, it puts the most interesting information about the drug first]….So the passive voice can be good…”

Rigidly following rules with little understanding can lead writers and readers into confusion. The inconvenient truth here is that the author has to think about how the message will be received and used. Think about the impact of the message, do not just plug words into rules. Perhaps the following guidelines are more nuanced (not easier, but perhaps more helpful):

- Focus on making your lab report about the steps and the outcomes of the experiment.
- Make nouns (for example, *results, spectrophotometer*) the subjects of your sentences.
- Use verbs without *be, been*, or forms of those words.
- Avoid passive voice when it creates writing that is unclear, misleading, or just uninteresting.

But if those guidelines do not yet make sense to you, keep searching for a way that will help you communicate clearly and effectively—that is the big goal. It is not about remembering rules of grammar.
Engineering Lab Reports

Many labs or companies will develop style guidelines that address their particular processes or products. However, lab reports frequently follow a standard format, divided into sections shown in Table 1.

Table 1. Common divisions in laboratory reports.

<table>
<thead>
<tr>
<th>Often, engineering lab reports will include the following sections:</th>
<th>An engineering lab report may also include these sections:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Title Page</td>
<td>• Executive Summary or Abstract</td>
</tr>
<tr>
<td>• Introduction/Background</td>
<td>• Calculations</td>
</tr>
<tr>
<td>• Methods (or Procedure)</td>
<td>• References</td>
</tr>
<tr>
<td>• Results</td>
<td>• Appendices</td>
</tr>
<tr>
<td>• Discussion</td>
<td></td>
</tr>
</tbody>
</table>

A report may not include all the sections listed, but will likely include some variation of these sections. For instance, if your work consisted of computer modeling, your report may include a Design Analysis section, describing how the model analyzes data. This is a variation on a Methods section. Or, instead of a general Results section, your report may have several more specific sections discussing results, such as SWMM Simulation. While the titles and organization of the report may vary, sections covering introduction, methods, results, and discussion are usually included in some form.

Title Page

For lab reports in CEGE classes, the title page should include:

- the author’s name or, for group reports, names of all group members
- date the report is submitted
- the course and section number

Abstract or Executive Summary

An abstract or executive summary section summarizes the main points in the report. You may be asked to include one or the other in your report. These brief overviews should be written last when the final and most relevant information of the lab experiment can be determined and included.

Abstracts tend to be more common in scholarly or journal articles. The publication will usually specify a word length (commonly 150, 250 or 500 words). An abstract should be a very condensed version of all of the important information in your paper. It is a way for the reader to quickly determine whether the information they are looking for will be provided in your report. As a broad guideline, think about including one sentence on each of the main sections.

An executive summary similarly presents a condensed version of all the information in a report. Executive summaries are more often included in long business and governmental reports. A general rule of thumb is that an executive summary should be about one-tenth the length of a complete report.

Introduction/Background

The Introduction section should tell your readers what to expect in the report, provide necessary background information, indicate the question you are trying to answer through the experiment, and preview the remaining sections of the report.
Methods
The Methods section describes the work performed. Enough detail should be given so that the reader could understand the processes performed and evaluate the validity of and perhaps repeat the approach. Provide enough information to reproduce your results, but avoid giving so much detail that the report is cluttered the reader confused.

For example, include a description of the key equipment used, but do not include the color of your countertop—it does not affect the procedure and would be different in another lab.

Calculations
If calculations are performed, equations should be provided in symbolic and numeric form. In CEGE, your professors may permit you to submit hand written calculations. If you submit a typed or electronic report, use an equation editor to ensure the clearest presentation of your equations.

Formatting should be consistent for all calculations, and font size and style should match the rest of the report. Define all variables. Be consistent with units—do not switch back and forth between metric and imperial systems. If necessary, provide values in both systems.

Present calculations in a logical order. For example, provide the equation for stress before using stress in another equation.

- A description should precede each equation.
- Each equation should be numbered.
- Present calculations clearly. Each equation should be easy to read and should provide all relevant information (what is being calculated, where the calculation came from, definition of all variables, and the units used for each value, see Figure 1).
- The equation should be on its own line and centered on the page.
- Put the number of the equation on the right-side margin (Figure 1).
- All variables should be defined. Two styles are common: paragraph form or list format (left justified, not centered).
- Allow enough space for the equation and variable definitions.

Tensile strength is calculated using Equation 3, taken from AASHTO Designation T322-7:

\[
T = \frac{2P}{\pi bD}
\]

where
T = tensile strength (MPa)
P = failure load (N)
b = thickness (mm)
D = diameter (mm)

Fig. 1. An example of proper formatting for an equation in the text of a lab report.
Results
The Results section communicates data collected in the experiment. Present a narrative of the results as well as tables and figures of results.

Present the data in an objective manner. You might, however, point out relevant findings, such as “the aluminum sample had a lower modulus of elasticity than the steel sample.”

In the course of an experiment, you might collect much more data than needed for the final report. The text should present only information relevant to the points being made in the report. Data that are not pertinent to the points you make in the report should be included as an appendix. Including pertinent data is not the same as including only supportive data. Leaving out data that do not support your hypothesis is unethical. Include all influential data.

Start the Results section with a brief introduction to your data. For example:

“Results obtained from laboratory testing of both samples are presented in this section. Concentrations were measured using a spectrophotometer. All calculations used are presented in section 5.”

Explicitly state in which figures data can be found:

“The results of the tensile tests are presented in Figure 1, and the results of the compression tests are presented in Figure 2.”

Graphic Elements
Elements such as figures and tables are used to portray a large amount of information in an easily understandable, compact form. Readers will often look at figures or tables independently, so they should be able to understand the main point of a table or figure without reading descriptive text provided in the body of the report.

Each figure or table should be set apart from the text in a way that makes it easy to read. White space in and around a figure can add to its clarity or meaning. Leave at least one blank line between text and a figure or table. Make the graphic large enough to be clearly read and avoid crowding elements within the table or figure.

Each figure and table should be introduced in the text of the report before it appears on the page. The text description helps the reader interpret the graphic information.

The following sections describe more detail about formatting tables and figures.

Tables
Here are a few point to remember about tables.

- Tables are helpful for presenting precise values.
- The rows and columns should be distinct and each one should be clearly labeled.
- Include a label and number for each table. Place the table title above the table.
- Make all text and numbers legible.
- Justification should make sense and be consistent.
  Use white space to highlight the data in the table. Adjust column and row widths and heights to minimize unnecessary white space.

Table 2 and Table 3 present the same information in different formats. Table 3 is easier to read. Column headings are bold, which helps readers understand the organization of the information. The column and
cell sizes fit the data. Font sizes are consistent. The numerals in column three are aligned on the decimal, allowing for a clear visualization of value and comparison of like numbers.

Table 2. An Example of Poor Formatting

<table>
<thead>
<tr>
<th>Calculation</th>
<th>Units</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured $\varepsilon_p$</td>
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<td>0.000919</td>
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<tr>
<td>$\varepsilon_q$</td>
<td>-</td>
<td>-0.000275</td>
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<tr>
<td>Measured $v$</td>
<td>-</td>
<td>0.299</td>
</tr>
<tr>
<td>Calculated $\sigma_p$</td>
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<td>9554</td>
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<tr>
<td>$\sigma_q$</td>
<td>-</td>
<td>-0.3479</td>
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<tr>
<td>Theoretical $\sigma_p$</td>
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</tr>
<tr>
<td>Theoretical $\sigma_q$</td>
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<td>0</td>
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</tbody>
</table>

Table 3. Clearer Data through Formatting

<table>
<thead>
<tr>
<th>Calculation</th>
<th>Units</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured $\varepsilon_p$</td>
<td>-</td>
<td>0.000919</td>
</tr>
<tr>
<td>Measured $\varepsilon_q$</td>
<td>-</td>
<td>-0.000275</td>
</tr>
<tr>
<td>Measured $v$</td>
<td>-</td>
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<tr>
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</tr>
<tr>
<td>Theoretical $\sigma_p$</td>
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</tr>
<tr>
<td>Theoretical $\sigma_q$</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

NOTE: In this example, Tables 2 and 3 present only the measured values. Statistical information surrounding the measured values (average, standard deviation, or 95% confidence limits) should be included when the data is reported.

Figures

Figures can include several types of graphical material—graphs, drawings, photos, maps, etc.

- Figures must be large enough for readers to clearly see the point(s) being made.
- The caption is important. It should be a clear statement that provides sufficient information to allow the reader to understand the figure.
- Place caption below the figure.
- Abbreviations should only be used if minimal space is available. If used, abbreviations must be explained in a legend or in a note.
- Units should always be included on axes labels.
- Do not include unnecessary decimal places. Only include the number of decimal places needed to understand the values presented, or the number of significant figures in your data.
- Gridlines should only be used if they help the reader digest the information more easily. Another option is to use tick marks along the axes, which can help specify value points but not clutter up the figure.
- Include a legend. (If only one data series is presented, there is no need for a legend.)
- Data series should be named (if there is more than one series). Do not use the Excel default option of “series 1,” “series 2.” For instance, if you have samples from different locations, you could name the data after the location: “east bank,” “west bank.” Make the names descriptive. Naming the data series is another opportunity to provide information for readers.
- Select data markers that are easily distinguishable from one another. Do not rely only on color; color distinctions can be perceived differently when presented in different formats or if printed in black and white.
• If it is useful, include model predictions or regression lines in the figure. Remember, however, that regression lines are not data; they should be displayed as a line and not as data points. Include the regression formulas or model equations in the figure caption (not within the figure).
• Figures and graphs need to balance portraying information in compact form and retaining readability. If a graph holds too much information, it may not be readable.

Sample Figures
Some clear, uncluttered sample figures with correct captions, and labeling of variables and axes are shown in Figures 2–5.

Fig. 2. The volumetric changes for Dunnville sandstone at constant effective pressure of \( P' = P - p = 5.0 \) MPa.

Fig 3. Pyramidal failure surface in (a) principal stress space; (b) \( \pi \)-plane (dashed circle represents the failure surface of a cone).
Uncertainty and Significant Digits
Present data and uncertainty together. For example, if a measurement is made in triplicate, the average and uncertainty should be reported together:

“The steady-state concentration of potassium permanganate was 148±7 µM.”

Report one significant digit of uncertainty, and round your average value to that decimal point. For example, consider the example above where the average concentration is 148.3489 µM and the uncertainty is 7.046 µM. If you are uncertain about the digit in the ones space, you cannot say with any certainty that you know something about any of the digits beyond that.
Significant Digits

Significant digits help keep track of the amount of error or confidence in experimental measurements. Significant digits apply to experimental, measured, or calculated numbers. They help ensure that you are not reporting a calculation that is more precise than the starting measurements.

Three general rules help determine how many significant figures are in a number:

1. Non-zero digits are always significant.
2. Any zeros between two significant digits are significant.
3. Trailing zeros are significant if a decimal point is present.

(A decimal point indicates a level of precision. For example, 12700.0 should indicate that an exact measurement was made to the tenths place. However, 12700 could be a rounded number and the last 2 zeros would not be significant.)

When calculating with significant figures, the result should only have as many significant figures as the smallest number of significant figures present in the elements of the calculation.

If you need a refresher on significant figures, Khan Academy has some videos explaining the basics: [https://www.khanacademy.org/math/arithmetic-home/arith-review-decimals/arithmetic-significant-figures-tutorial/v/significant-figures](https://www.khanacademy.org/math/arithmetic-home/arith-review-decimals/arithmetic-significant-figures-tutorial/v/significant-figures)

Discussion

In the Discussion section, explain the implications of the findings. Discuss whether the values found make sense, why you believe your data turned out the way it did, and whether there were any issues or potential errors that could have led to less accurate results.

Be specific. If you are stating that something will have “significant impacts,” state those impacts.

This section should contain observations and/or interpretations of the results. What does your data tell you? How is it relevant (or not relevant) to your questions? Do your findings match your expectations? Are there any issues, errors, or anomalies in your data?

Discussion of Sources of Error or Bias

The purpose of discussing error or bias in your lab report is to communicate your understanding of factors affecting the experiment and your confidence in your results. A table of measurements or calculations should always indicate the uncertainty associated with that data.

It is impossible to be perfect, but you must strive to reduce error as much as possible and describe any error or bias that might have influenced the results.

In your discussion of possible sources of error, it is not enough to refer to “human error.” Mistakes such as spilling, mis-measuring, or skipping a step are not a source of error or uncertainty to be discussed in your report. Such mistakes render your results unusable and require that the experiment be done again, avoiding simple mistakes.
Each source of error should be identified as either random or systematic. Random errors occur by chance, are unpredictable, and uncontrollable. For example, physical variations within a material sample. While the occurrence of a random error cannot be controlled, a researcher should try to minimize the effects of random error on experimental results.

Systematic errors occur based on the design of the system. For example, measurements are made on two machines and one consistently reads higher than the other. Additional examples of systematic error include failure to account for an influential factor in the experiment, the influence of weather or time, or characteristic(s) of the measuring device. Systematic errors can be corrected or eliminated—provided the researcher is aware that an error has occurred.

Conclusion
Summarize the results and discussion from the report. You can include your opinion about the procedure and results. Include the key findings. Indicate the answer or solution or recommendation that follows from the results found. Be specific.

References
Indicate your sources of information.

Use reliable sources. While a lot of information is available on the internet and much of it may be reliable, it can be difficult to ascertain which sites are trustworthy. The best references are published standards (such as AASHTO and ASTM) or for more specific or less well-known topics, papers or articles published in peer reviewed journals. For class assignments, textbooks may be referenced.

Unless your professor requires that you use a particular style for your references, choose a standard format for your references and follow it consistently throughout your document. You might be familiar with MLA citation style from your first year writing courses; however, APA or Chicago citation styles are more commonly used in writing related to science or engineering. There are many software solutions that will help you manage references.

Every source included in your list of References must be cited within the body of your lab report. Every source cited within the body of your lab report must appear on your list of references.

There are many resources online to help with citations. The UMN Student Writing Support website offers http://writing.umn.edu/sws/quickhelp/sources.html.

Appendices
Appendices are used to include information that might be of interest to readers even though it is not necessary to the narrative or support your main point. Appendices can be used to show a data set or other supporting documents (worksheets used, standards, preliminary reports).

For instance, if you tested multiple replicates, you may have used averages of the replicate data in order to show your main points. It is not necessary to include data from all replicates in the body of the report (the reader may get lost in an excessive amount of data). However, the information is pertinent to the work and readers may be interested in seeing the data. Therefore, those data may be included as an appendix. That way, the key points are clearly stated in the main section of the report, and the data are available to the reader.

Formatting
Use formatting (headings, subheadings, fonts, spacing, indentation, etc.) to make the organization of the report clear and to help readers find information. Many times people using your report will be primarily
interested in only one or two sections. For instance, someone might be very interested in a portion of the results and might ignore the detailed methods section. Formatting can help readers find specific information more quickly.

Formatting styles change according to professional discipline, publishing journal, document type, and audience. Whichever formatting style you follow, it is important to be consistent throughout the document.
APPENDIX A: COMPUTER PROGRAMS
Several word processing programs are available for creating your lab reports. Some common programs with pros and cons are listed in Table A1. Choose one that works best for you, as long as you can deliver the format requested or required by the intended readers.

Table A1. Common Programs for Writing Lab Reports

<table>
<thead>
<tr>
<th>Program</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microsoft Word</td>
<td>• Freely available to UMN students in campus labs</td>
</tr>
<tr>
<td></td>
<td>• Very widely used in industry</td>
</tr>
<tr>
<td></td>
<td>• Very portable, easily shared</td>
</tr>
<tr>
<td></td>
<td>• Require users to own the software</td>
</tr>
<tr>
<td>LaTeX</td>
<td>• Available free online</td>
</tr>
<tr>
<td></td>
<td>• Less common in industry</td>
</tr>
<tr>
<td></td>
<td>• Relatively steep learning curve</td>
</tr>
<tr>
<td></td>
<td>• Has access to the coding done in the background</td>
</tr>
<tr>
<td></td>
<td>• Has more control over equations</td>
</tr>
<tr>
<td></td>
<td>• Issues might arise if documents need to be edited by users who are not familiar with this software</td>
</tr>
<tr>
<td>Google Docs</td>
<td>• Available free online; web based</td>
</tr>
<tr>
<td></td>
<td>• Good for team projects; multiple users can edit one document</td>
</tr>
<tr>
<td></td>
<td>• Not as many options for tables and figures, may be best to create figures in other documents and paste into Google Docs as images</td>
</tr>
<tr>
<td></td>
<td>• Less control over formatting</td>
</tr>
</tbody>
</table>
Appendix D Report on Civil, Environmental, and Geo-Engineering Rating upper-division writing of graduating majors

Civil, Environmental, & Geo-Engineering: Rating upper-division writing of graduating majors
August 1, 2018

Method: A team of three independent raters (one from inside the department, and two from outside the department), scored capstone-level writing collected from this unit. Raters used a four-point criterion-referenced scale, assessing student works as “insufficient,” (score of 0) “approaching sufficiency,” (score of 1) “sufficient,” (score of 2) or “more than sufficient” (score of 3) for capstone-level writing for each criterion provided by the unit (drawn from the unit’s Writing Plan). No cumulative scores were given. Prior to rating student writing, raters were provided a “training” session by a faculty member drawn from inside the unit. During this session, criteria were discussed and anchor papers were rated. After the rating session, raters were debriefed on the student work and rating process.

Results: Where 0 is complete (three-rater) agreement on “Insufficient,” 1 is complete agreement on “Approaching Sufficiency,” 2 is complete agreement on “Sufficient,” and 3 is complete agreement on “More than Sufficient.” Each rating represents an average of all raters’ scores for all writing samples for each criterion.

<table>
<thead>
<tr>
<th>#</th>
<th>Criteria</th>
<th>2015&lt;sup&gt;1&lt;/sup&gt;</th>
<th>2018&lt;sup&gt;1&lt;/sup&gt;</th>
<th>2018 CEGE Inside Rater Only</th>
<th>2018 CEGE Outsider Raters Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unambiguously names purpose of writing (in the title page, the letter of transmission, and the introduction).</td>
<td>1.7</td>
<td>2.04</td>
<td>2.13</td>
<td>2.0</td>
</tr>
<tr>
<td>2</td>
<td>Clearly conveys the overall message or recommendation.</td>
<td>1.6</td>
<td>1.73</td>
<td>1.60</td>
<td>1.80</td>
</tr>
<tr>
<td>3</td>
<td>Is organized comprehensively and cohesively; ideas are sequenced logically within and between sections.</td>
<td>1.8</td>
<td>2.04</td>
<td>2.07</td>
<td>2.03</td>
</tr>
<tr>
<td>4</td>
<td>Contains an executive summary that succinctly states the problem and the results or recommendations.</td>
<td>1.6</td>
<td>1.82</td>
<td>1.13</td>
<td>2.17</td>
</tr>
<tr>
<td>5</td>
<td>Provides detailed and technical explanation in body of the report that makes problem and solution clear.</td>
<td>1.7</td>
<td>2.07</td>
<td>1.80</td>
<td>2.20</td>
</tr>
<tr>
<td>6</td>
<td>Is consistently written in tone, voice, and style appropriate to specified audience.</td>
<td>1.8</td>
<td>1.91</td>
<td>1.53</td>
<td>2.10</td>
</tr>
<tr>
<td>7</td>
<td>Uses terminology and notation correctly.</td>
<td>1.8</td>
<td>1.96</td>
<td>1.87</td>
<td>2.00</td>
</tr>
<tr>
<td>8</td>
<td>Uses visuals (diagrams and flow-charts) to clearly and effectively present complex ideas and data in support of the core message.</td>
<td>1.0</td>
<td>1.98</td>
<td>2.27</td>
<td>1.83</td>
</tr>
<tr>
<td>9</td>
<td>Includes visuals (figures and charts, etc.) that are drawn or drafted legibly and are properly numbered, labeled, and referenced.</td>
<td>1.1</td>
<td>1.89</td>
<td>2.00</td>
<td>1.83</td>
</tr>
</tbody>
</table>
Responses: Civil, Environmental, and Geo-Engineering

From RATING SESSION DEBRIEFING

At the conclusion of the rating session, raters completed an online survey. This survey asked for impressions of students’ writing strengths and weaknesses and reactions to criteria. In a brief debriefing discussion, these reactions were further discussed. What follows is drawn directly from the surveys and from transcriptions of the subsequent discussion.

1. Now that you’ve worked through a significant number of individual writing samples from a specific college/department, what patterns of strength and/or weakness did you notice?

Patterns of strength:

- Solid technical work throughout— the projects addressed the design problem in a competent way. The combination of formulas, equations, and terminology were typically good. Criterion #7 was solidly demonstrated.
- Documents were well formatted (good word processing, etc.) and well proofed (Criterion #11).
- Good use of visuals (such as satellite images, site photographs) to represent complex ideas (e.g. intersection design project).
- Figures and tables were meaningfully used and integrated; almost all were referenced in the text. Few extraneous visuals or figures.
- The few projects that used data summary figures (graphs) did it well.
- Use of graphical elements was well-executed and well-designed.

Patterns of weakness:

- Overall readability was poor due to a lack of transitions. About 2/3 were poor at flow and transition.
- Cover, title, and introductions were seldom consistently good. About 1/3 were good, 1/3 low average, and 1/3 weak. A lot of nondescript titles.
- Almost all of the reports relied heavily on chronological order and were presented like a journal of work (e.g. first we did this, then we did this, etc.).
- Reports often had issues with body vs. appendix (adding technical detail to the body that belonged in the appendix, or failing to draw conclusions by burying them in the appendix).
- The audience was unclear and/or varied in most documents: it is not clear who they are writing for (experts, client, instructor). Lack of clarity about the audience was most evident in the cover letters.
- Many of the weaknesses are associated with a lack of clarity about who the audience is. Students must understand who their client is.
- Huge variability in the cover letters—some were casual and folksy. Cover letters need more importance.
- More than half of the executive summaries did not summarize effectively. The summaries need more importance, clarity, and concision.
1. All could be improved with better editing, especially when it comes to consistent units of measurement.

2. Were any of the items on the rating guide difficult to interpret/use? If so, which were they? What sorts of questions did these items provoke?

   **Criterion 5:** Provides detailed and technical explanation in body of the report that makes problem and solution clear.
   - Hard to align the problem and solution, if one is not steeped in the literature. One of the outside raters was not confident with this criterion.

   **Criterion 10:** Effectively incorporates mathematical equations and formulas into prose.
   - Some of the reports had no role for mathematical expressions, so the equations were sometimes gratuitous. It made it hard to apply this criterion to some of the projects.

3. Did you find yourself wishing that you could address writing issues that were not contained in the rating guide? If so, what were they?

   - It would be useful to allow for a “not applicable” option, as some documents might not have needed formulae or data charts.

4. Additional comments:

   - Some things a professor would want (e.g. detailed transcription of notes) would not be valued by clients and engineers. It’s challenging for students to make that distinction between client and instructor as audience.
   - Capstones have a tension between what is meaningful (real-world problem) and what is manageable (able to finish within a semester).
   - There should be more interaction with the stakeholders; a “civic component” for these projects should be stronger. A section called “Stakeholder Interaction” would be useful.
   - Some projects lend themselves to better reports (comparing alternatives) than those that simply describe a single structure in detail.
   - Some students seemed to be motivated to create an artifact that could speak to future employment.
   - Some students seemed attentive to the “marketing and communication” aspect of professional success.
   - Some industries have moved from the REPORT as deliverable to Report, Technical Summary, and Newsletter article, and News Release. Should CEGE consider a mini-portfolio approach to the capstone?
VI. WEC Writing Plan Requests

Unit Name: Civil, Environmental, and Geo-Eng.

Unit Financial Contact Name/Email: Mia Rampi-Lambertz rampi003@umn.edu

Chart string for fund transfer: 1000-11101-20089-2729190

Financial Requests (requests cannot include faculty salary support) drop-down choices will appear when cell next to "semester" is selected

Total Financial Request: $25,272.43

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
<th>Item</th>
<th>Cost</th>
<th>Item</th>
<th>Cost</th>
<th>Item</th>
<th>Cost</th>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>25% Grad RA, salary</td>
<td>$5,091.96</td>
<td>25% Grad RA, salary</td>
<td>$5,040.00</td>
<td>12.5% Grad RA, salary</td>
<td>$2,520.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>25% Grad RA, fringe benefits</td>
<td>$819.81</td>
<td>25% Grad RA, fringe benefits</td>
<td>$811.44</td>
<td>12.5% Grad RA, fringe benefits</td>
<td>$405.72</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>25% Grad RA, tuition</td>
<td>$4,018.00</td>
<td>25% Grad RA, tuition</td>
<td>$3,977.00</td>
<td>12.5% Grad RA, tuition</td>
<td>$1,988.50</td>
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<td></td>
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<td></td>
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<tr>
<td>Refreshment for Workshop</td>
<td>$300.00</td>
<td>Refreshment for Workshop</td>
<td>$300.00</td>
<td>Refreshment for Workshop</td>
<td>$300.00</td>
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<td></td>
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</tbody>
</table>

Semester 1 Total: $9,929.77  Semester 2 Total: $10,128.44  Semester 3 Total: $5,214.22  Semester 4 Total: $0.00  Semester 5 Total: $0.00  Semester 6 Total: $0.00

Rationale for costs and their schedule of distribution

Stipend, fringe, and tuition benefits for proposed appointments for graduate RA's are based on expected rates for 2019-2020. The schedule for each semester is described in the WEC research assistant (RA) request form.

Service Requests (requests cannot include faculty salary support) drop-down choices will appear when cell in the "service" column is selected

<table>
<thead>
<tr>
<th>Service</th>
<th>Sem 1</th>
<th>Service</th>
<th>Sem 2</th>
<th>Service</th>
<th>Sem 3</th>
<th>Service</th>
<th>Sem 4</th>
<th>Service</th>
<th>Sem 5</th>
<th>Service</th>
<th>Sem 6</th>
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</thead>
<tbody>
<tr>
<td>Workshop</td>
<td></td>
<td>Workshop</td>
<td></td>
<td>Workshop</td>
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<td>Workshop</td>
<td></td>
<td>Workshop</td>
<td></td>
<td>Workshop</td>
<td></td>
</tr>
</tbody>
</table>

Description and rationale for services

The spring 2020 workshop will focus on how-to-teach-with-writing training for TAs within CEGE. The fall 2020 semester workshop for faculty will focus on integrating the desired writing abilities throughout the entire curriculum. How to evaluate and address the progression of writing skills will also be discussed, based on the results from CEGE3402W writing assignments. The workshops will be coordinated by the WEC consultants, the CEGE writing specialist, and CEGE faculty liaison.
To: Mihai Marasteanu, Department of Civil, Environmental, and Geo-Engineering  
From: Jessica Kuecker Grotjohn, Office of Undergraduate Education  
Subject: Decision regarding WEC funding proposal

Thank you for providing the Office of Undergraduate Education with a 3rd Edition Writing Plan. On behalf of the Department of Civil, Environmental, and Geo-Engineering, you have requested the following funding to support that plan’s implementation.

As indicated in the previous letter regarding the Writing Plan approval, the Campus Writing Board felt that your department approaches for sustainability could be further developed. We encourage you to work with your WEC liaison to prepare a progress report in February so that the CWB can hear about the items in section 5 of your Writing Plan. Please discuss the past and anticipated future faculty involvement as it relates to sustainability. (See section 5 on page 10 to find language). We would like to see some preliminary results of the research that the WEC RA is conducting, and will fund the additional amount dependent on progress.

The table below outlines the fiscal requests made.

<table>
<thead>
<tr>
<th>Civil, Environmental, and Geo-Eng.</th>
<th>Fall 2019 25% Grad RA, salary</th>
<th>$5,091.96</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2019 25% Grad RA, fringe benefits</td>
<td>$819.81</td>
<td></td>
</tr>
<tr>
<td>Fall 2019 25% Grad RA, tuition</td>
<td>$4,018.00</td>
<td></td>
</tr>
<tr>
<td>Spring 2020 25% Grad RA, salary</td>
<td>$5,040.00</td>
<td></td>
</tr>
<tr>
<td>Spring 2020 25% Grad RA, fringe benefits</td>
<td>$811.44</td>
<td></td>
</tr>
<tr>
<td>Spring 2020 25% Grad RA, tuition</td>
<td>$3,977.00</td>
<td></td>
</tr>
<tr>
<td>Spring 2020 Refreshment for Workshop</td>
<td>$150.00 ($300 in initial request)</td>
<td></td>
</tr>
<tr>
<td>Fall 2020 12.5% Grad RA, salary</td>
<td>$2,520.00</td>
<td></td>
</tr>
<tr>
<td>Fall 2020 12.5% Grad RA, fringe benefits</td>
<td>$405.72</td>
<td></td>
</tr>
<tr>
<td>Fall 2020 12.5% Grad RA, tuition</td>
<td>$1,988.50</td>
<td></td>
</tr>
<tr>
<td>Fall 2020 Refreshment for Workshop</td>
<td>$150.00 ($300 in initial request)</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>$24,972.43</td>
<td></td>
</tr>
</tbody>
</table>
The items highlighted in yellow above have been approved at this time by the Office of Undergraduate Education, for a total of $19,908. These funds will be transferred in full during the FY20 to your department’s EFS account string. Please contact Reagan Mock-Nelson with the correct account number. The remaining $5,064.22 will be transferred upon review of your department’s progress.

We wish the department every success in this ongoing effort to support students and faculty.

CC: Dan Emery, Pamela Flash, Matt Luskey, Bryan Mosher, Jennifer Reckner, Leslie Schiff, Heidi Solomonson, Jessica Kuecker Grotjohn, Reagan Mock-Nelson, Mia Rampi-Lambertz