The Office of the Vice Provost of Undergraduate Education
Center for Writing
University of Minnesota
612-625-0791
www.wec.umn.edu

WEC
WRITING-ENRICHED CURRICULUM

I. Writing Plan Cover Page

Please fill in the gray areas on this form.

May 11, 2017

☒ First Edition of Writing Plan

☐ Subsequent Edition of Writing Plan: previous plan submitted SEM/YR, First edition submitted SEM/YR

Department of Electrical and Computer Engineering (ECE)	
WEC Unit Name	
Electrical and Computer Engineering	College of Science and Engineering
Department	College
David Orser	Teaching Assistant Professor
WEC Faculty Liaison (print name)	Title
orser@umn.edu	612-212-2156
Email	Phone

Writing Plan ratified by Faculty

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

Date: 5/11/2017 If Vote: 30 (# yes) / 30 (# total)

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

Hand vote was taken at full faculty meeting, support was unanimous.

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II. Unit Profile: ECE

Please fill in the gray areas on this form.

Number of Tenured and Tenure-Track Faculty:

29	Professors
7	Associate Professors
10	Assistant Professors
46	**Total**

In addition to 46 Tenure and Tenure-Track Faculty there are three full-time teaching faculty and three part-time teaching or emeritus faculty that participated in the WEC process.

Major(s) *Please list each major your Unit offers:*	**Total # students enrolled in major as of Fall 2016**	**Total # students graduating with major AY 16-17**
Electrical Engineering (intended + declared)	199+305	113
Computer Engineering (intended + declared)	171+143	56
Total:	370 + 448	169

WEC Process	**Date**	**# participated**		**# invited**
Faculty introduced to WEC project	9/1/2016	43	/	**49**
Student Survey	Fall 2016	338	/	**768**
Instructor Survey (includes emeritus and lectures)	Fall 2016	49	/	**68**
TA/GI Survey	Fall 2016	44	/	**62**
Affiliate Survey	Fall 2016	7	/	**10**
Working Faculty Meeting #1	10/18/2017	10	/	**14**
Working Faculty Meeting #2	12/6/2017	11	/	**14**
Working Faculty Meeting #3	2/15/2017	10	/	**14**
Working Faculty Meeting #4	3/27/2017	8	/	**14**

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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

David Orser	Teaching Assistant Professor, ECE
WEC Faculty Liaison (print name)	Title
Signature	5/11/2017
	Date

Department Head/Chair

Randall Victora	Professor and Department Head, ECE
Print Name	Title
Signature	5/11/2017
	Date

Associate Dean

Paul Strykowski	Associate Dean for Undergraduate Programs, CSE
Print Name	Title
Signature	
	Date

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IV. Writing Plan Narrative, 1st Edition

Please retain section headers and prompts in your plan.

Introductory summary:
Briefly describe the reason(s) this unit (department, school, college) become involved in the WEC project, key findings resulted from the process of developing this plan, and the implementation activities are proposed in this Writing Plan. (1/2 page maximum)

The Electrical and Computer Engineering (ECE) faculty recognize that written communication skills are of paramount importance to graduates in our field. Success in engineering is not just determined by a graduate's technical capability to develop ideas or interpret data, but also by their ability to communicate a proposed solution clearly to managers, executives, the public, and engineering peers.

There are currently three writing intensive courses within the ECE department, of which only one is required for graduation (Senior Design). With the implementation of this plan, the ECE department intends to bring a more comprehensive approach to writing instruction, throughout our curriculum, by embedding specific written communications assignments in the curriculum. The embedding of specific writing assignments will provide additional fixed opportunities for students to practice and improve their writing skills as they progress through the degree programs.

Faculty participation in the WEC self-study process identified a broad recognition that ECE students are evaluated most heavily on technical knowledge. Furthermore, there was agreement that writing and communication skills are of critical importance in industry, often providing significant career advancement opportunities. Our students get opportunities to exercise these writing skills in senior design, but often it comes too late in the curriculum.

During the first year of implementation, the faculty will meet to review current writing assignments and identify additional areas within the curriculum to improve instruction of writing. The WEC liaison, WEC consultant, and WEC RA will develop improved writing rubrics and samples for use in teaching and in training of TAs. TA training materials will be prepared and disseminated throughout this year.

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

Exceptional writing in Electrical and Computer Engineering doesn't simply state a mathematical answer but should tell a story. Telling a story is important as it engages the reader, sets expectations, presents content, and summarizes findings. This concept is clearly applicable within formal papers but is also broadly applicable. Even basic circuit problem sets can find a foundation in this concept. For example, restating the problem or redrawing a circuit schematic "sets expectations," intermediate work "presents the content," and boxing an answer "summarizes the finding."

During the self-assessment meetings the faculty gathered the following characteristics of writing in ECE:

- Tells a story and doesn't merely offer a mathematical answer
- Focused; Provides as much information as necessary and no more
- Provides necessary context for understanding technical and mathematical answers
- Clear explanation of processes, mechanisms, analyses, and findings
- Appropriate visual modes for describing solutions (diagrams, tables, charts, figures)
- Visuals are clear; include captions, labels, and symbols
- Clearly stated assumptions
- Coherent- structured and oriented toward a purpose
- Uses technologies of writing well (Excel, LaTeX, etc.)
- Uses writing to boil down to an issue and justify conclusions
- Impacts and consequences tied to audience
- Representative of professional standards and practices
- Documents development of ideas, steps in process, and variations/decisions
- Consistent style (consistent in first and third person)

More broadly, when presenting content, there are three areas the above characteristics can be grouped into:

- Observing and reporting data clearly, while communicating the assumptions and limitations of that data
- Draw conclusions and persuade audiences, in a method relevant and appropriate to the targeted audience
- Utilizing professional standards and practices to produce high-quality writing

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

The Department of Electrical and Computer Engineering understands writing as an iterative process central to engineering. Whether in homework, laboratories, or formal papers, students will report data accurately, draw well-supported conclusions, and will follow standards and expectations for writing in industry and academia.

Report data and observations

- Synthesize information from sources of data and evidence, including limits on available data
- Provide sufficient explanation for technical answers, such that it can be understood by particular audiences (peer level, non-technical, stakeholders)
- Provide clear explanation of processes, mechanisms, analyses, and findings
- Select appropriate visual modes for describing data and observations.

Draw conclusions and persuade audiences

- Tell a coherent story: Set the purpose and context, establish motivation or research question
- Identify and explain the impacts of technical data in ways that are meaningful to intended audience.
- Structure documents to draw well-supported conclusions; avoid tangents and irrelevant information.
- Use engineering data, evidence, and reasoning to persuade specific audiences.

Demonstrate attention to professional standards and practices

- Grammar, mechanics, punctuation, spelling
- Citation practices (quotation, paraphrase, figure captions)
- Ethics (avoid plagiarism and research misconduct)
- Follow expected publication standards (Professional journal guidelines, employer's documentation standards, etc.)

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?

The current structure of writing in ECE is focused around the Junior Labs and a Senior Design (WI) course. Students are required to take University Writing (WRIT 1301) and Senior Design (EE 4951W), plus three more WI courses. The junior level labs (EE3101 and EE3102) provide instruction in the development of lab notebooks and written lab reports. Senior Design provides for some opportunities to develop a broader range of writing skills, short memos, presentations, marketing focused pitches, etc. However, Senior Design is the final course in ECE and students are often unprepared to excel at these necessary skills.

Additional opportunities for writing are present in other courses, but these opportunities are inconsistent and dependent on the emphasis of the professor teaching the course.

What, if any, course sequencing issues impede an intentional integration of relevant, developmentally appropriate writing instruction?

Transfer students and ESL students are common in Sophomore and Junior level students. These students vary more in incoming writing skill and will be less impacted by changes to lower level courses.

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 Project's longitudinal rating process.).

Faculty-generated list of writing abilities expected of ECE students The student…	Faculty generated evaluative criteria (What observable textual features can be used to evaluate the students' ability?) The text…
Report data and observations	
1. Synthesize information from sources of data and evidence, including limits on available data	Describes the sources from which data is derived. Distills the data to a subset supporting the conclusion. Explicitly discusses contradictory data and sources of error or noise.
2. Provides clear and sufficient explanation for technical data, processes, mechanisms, analyses, and observations	Includes information about the starting point (provided technical information) Addresses related engineering concepts that impact method for obtaining data, analyses, and resulting observations. (additional criteria for oral assignments) offer a verbal explanation of technical answers, particularly in lab contexts.
3. Select appropriate visual modes for describing data and observations	Includes graphs that summarize data. Uses clear format– title, axis, units are labeled and standard. Includes schematics that are consistent with professional expectations (no crossed wires, values expressed appropriately).
Draw conclusions and persuade audiences	
4. Tell a coherent story: Set the purpose and context, establish motivation or research question	Explicitly states purpose and motivation, particularly in formal documents. States the problem or redraws the circuit, particularly for informal documents or homework.
5. Identify and explain the impacts of technical data in ways that are meaningful to intended audience	Adapts choices in language, vocabulary, and technical detail to the intended audience. Identifies common concepts understood between writer and reader then connects them meaningfully to conclusions.

6. Structure documents to draw well-supported conclusions; avoid tangents and irrelevant information	Provides a structured narrative (introduction, body, conclusion). Contains no extraneous material.
7. Use engineering data, evidence, and reasoning to persuade specific audiences	Emphasizes key features and results relevant to specified audience to persuade (such as technical specifications, cost/benefit, and intangibles)
Demonstrate attention to professional standards and practices	
8. Grammar, mechanics, punctuation, spelling	Contains no errors that could introduce ambiguity. Contains few, if any minor errors.
9. Citation practices (quotation, paraphrase, figure captions)	Uses paraphrase in a manner consistent with the writing in the field (no direct quotations) Consistent with its method of citation throughout the document (meets course stylesheet if provided.)
10. Ethics (avoid plagiarism and research misconduct)	Cites unique conclusions. Cites all figures, words, etc. extracted from other sources. Identifies roles and follows instructor guidelines for collaborative assignments.
11. Follow expected publication standards (Professional journal guidelines, employer's documentation standards, etc.)	Follows patent documentation standards as it relates to lab notebooks. Looks like NSF, NIH, DOD proposal or journal template, as assigned.

Section 5: SUMMARY OF IMPLEMENTATION PLANS, including REQUESTED SUPPORT 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?

In the next year, ECE will implement three activities for the improvement of the structure of writing instruction. First, improvements to the currently established writing-oriented junior-level lab assignments with be applied. Second, faculty will participate in focused discussions of current practices and identify new ways to implement more structured instruction on communications skills within ECE curriculum. Third, fair and efficient grading of writing practices will be addressed with the relevant faculty and teaching assistants.

A combination of a writing research assistant (TBD), the WEC Liaison (David Orser), the WEC Consultant (Dan Emery), plus funding for lunch and learn faculty meetings, and series of TA-oriented workshops will be utilized to implement these improvements.

The electrical and computer engineering program will target improving portions of the training and grading methodology for the junior electronics lab (EE 3101). These improvements will begin with a review and summary of the key assignments in the courses. After a review of the materials, a combination of the following outcomes will be delivered as determined by the liaison, RA, and relevant faculty:

- Revised grading rubric
- Select de-identified excerpts of student work that represent average, good, and exceptional writing
- Develop instructional grading criteria that can be shared with students before submission of their work
- Develop TA training materials that provide examples and clear grading criteria
- This outline of deliverables will be repeated in the spring for one or more additional courses identified by faculty.

Two faculty lunch and learn events (one per semester) will be held to discuss scaffolding of writing assignments within the ECE curriculum. These meetings will begin with a presentation of current faculty implemented writing features in selected courses and provide for discussion of the value of making these features foundational elements within the ECE curriculum. The result of these discussions will be reported in future writing plans.

Two workshops will be provided on the fair and efficient grading of writing. These workshops will be open to all, but targeted at TA's and specific courses. The first of these workshops will be held in the fall and leverage the work being developed by the RA on lab notebooks in EE3101. It will apply to TA's teaching EE 2002, 3006, 3101, and 3102. A second workshop will be held in the spring and will cover another assignment type as identified in the fall faculty lunch and learn.

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?

The WEC process was introduced to the majority of the faculty at the annual retreat in September. This meeting provided an introduction to the WEC process and an opportunity for faculty to engage in the topic. The WEC liaison, department head, and associate head then identified a group of faculty that regularly teach undergraduate level

courses. This subset of the faculty was then solicited and agreed to take part regularly in the WEC writing plan development process.

Through the WEC process, the WEC staff and the WEC liaison issued a survey to several core stakeholders. All of the undergraduate students in the ECE department (intended majors plus declared majors) were invited to participate via email. Additionally, faculty announced the survey to students in four large courses and set class-time aside for students to complete the questionnaire. These methods achieved >300 responses or 44% of current and likely ECE majors. All current regular faculty, lectures, and emeritus faculty were invited to participate in the survey. Instructors returned 49 or 72% of questionnaires. Teaching assistants and graduate instructors were also invited to participate and 71% responded. A selected group of industry affiliates (upper-level managers for large engineering companies) were asked to participate in the survey. A response rate of 70% was achieved for this group. These four groups provided a diverse set of perspectives on the writing instruction and outputs of the department.

The results of the survey, student writing abilities, and characteristics of writing in ECE were discussed during four WEC faculty group meetings throughout the '16-'17 academic year. The department had a roughly 70% attendance rate for the four WEC meetings with principally the same group of participants throughout. At the end of the spring term, the department held a full faculty meeting to review, discuss, and approve the 1st edition of this writing plan.

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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

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[i].

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

RA Name (Use TBD for vacancies): TBD
RA Contact Information: email TBD, phone TBD
Period of appointment (Semester/Year to Semester/Year): Fall/2017 to Spring/2017
RA appointment percent time: 25% FTE

Define in detail the tasks that the RA will be completing within the funding period:
The research assistant will develop and present materials for the improvement of grading of writing assignments within the ECE department.

The following tasks will occur through-out the year:

- Facilitate, attend, and document all implementation activities
- Co-lead TA training sessions
- Document and disseminate outputs of implementation activities
- Assist in the creation of the 2nd edition of the ECE writing plan
- Other tasks related to WEC activities as needed

The following tasks should be completed by the end of the Fall term:

- Revised grading rubrics for the Lab Notebook and Lab Reports in EE3101
- Select de-identified excerpts of student writing that represent average, good, and exceptional writing for EE3101
- Develop instructional grading criteria that can be shared with students before submission for EE3101
- Develop and present TA training material that provides examples of student work and clear grading criteria

During the spring term, based on faculty feedback during lunch and learn sessions, additional grading rubrics and training materials will be developed for key courses in the ECE curriculum. These will be completed by the end of the spring term.

Define deadlines as applicable (please note that all deadlines must be completed within the funding period):
Deadlines are defined in the section above, in summary:

Initial version of EE3101 materials will need to be prepped and presented during Fall term. Final versions of the EE3101 materials will need to be completed by the end of Fall Term. The presentation of these materials will need to be completed in Spring Term. Additional identified rubrics and training materials will be due at the end of Spring Term.

Describe how frequently the RA will check in with the liaison:
Weekly status meeting with the WEC liaison will be expected.

Describe in detail the RA's check-in process (e.g., via email, phone, in-person, etc.):
Weekly in-person meetings should be the norm. In the event travel or other exceptional circumstances, an online-chat or phone call can be used to provide weekly status updates.

[i] An example for determining funding for appointments can be found on the WEC Liaison Moodle. This is for planning and example purposes only and cannot be used to determine final budget items for the Writing Plan.

VI. WEC Writing Plan Requests

Unit Name: ECE

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

Total Financial Request: $20,641.18

Semester 1:	Summer 2017	Semester 2:	Fall 2017	Semester 3:	Spring 2018
Item	**Cost**	**Item**	**Cost**	**Item**	**Cost**
		25% FTE Research Assistant	$9,860.59	25% FTE Research Assistant	$9,860.59
		Faculty Lunch and Learn ($15/person)	$300.00	Faculty Lunch and Learn ($15/person)	$300.00
		TA Seminar Refreshments ($8pp)	$160.00	TA Seminar Refreshments ($8pp)	$160.00
Semester 1 Total:	**$0.00**	**Semester 2 Total:**	**$10,320.59**	**Semester 3 Total:**	**$10,320.59**

Rationale for costs and their schedule of distribution

Food is the most efficent method to generate good will and good attendance.
The RA will facilitate, document, and co-lead portions of the implementation activities.

Service Requests *drop-down choices will appear when a cell in the "service" column is selected*

Semester 1:	Summer 2017	Semester 2:	Fall 2017	Semester 3:	Spring 2018
Service	**Qty**	**Service**	**Qty**	**Service**	**Qty**
		Consultation	1	Consultation	1
		Seminar	1	Seminar	1
		Other	1	Other	1

Description and rationale for services

Dan Emery will consult on the faculty meetings and co-present for the TA seminars. Also, a small number of writing assignments that are identified by faculty during faculty meetings will have writing samples collected and de-identified for use in future writing curriculum improvements.

UNIVERSITY OF MINNESOTA
Office of Undergraduate Education

June 12, 2017

To: David Orser
From: Robert McMaster, Office of Undergraduate Education
Subject: Decision regarding WEC plan and funding proposal

The Department of Electrical and Computer Engineering requested the following funding to support its Writing Enriched Curriculum:

Fall 2017	25% research assistant	$	9,860.59
Fall 2017	Faculty lunch and learn ($15/person)	$	300.00
Fall 2017	TA Seminar refreshments ($8/person)	$	160.00
Spring 2018	25% research assistant	$	9,860.59
Spring 2018	Faculty lunch and learn ($15/person)	$	300.00
Spring 2018	TA Seminar refreshments ($8/person)	$	160.00
TOTAL		**$**	**20,641.18**

The Office of Undergraduate Education and the Campus Writing Board thank you for your participation in the Writing Enriched Curriculum program and applaud your proposed efforts to integrate writing more fully into your department.

All items above have been approved by the Office of Undergraduate Education, for a total of $20,641.18. Please email Pat Ferrian (ferri004@umn.edu) and Molly Bendzick (mollyb@umn.edu) within 30 days of the receipt of this letter with the EFS account string in your department that will receive these funds. Pat will transfer all funds at the start of FY18.

CC: Molly Bendzick, Dan Emery, Pat Ferrian, Pamela Flash, Jennifer LaFrance, Matt Luskey, Bryan Mosher, Lisa Norling, Jennifer Reckner, Rachel Rodrigue, Leslie Schiff