**Professional Development Requirement for the**

**Master of Engineering in Energy Systems Degree**

This document provides information regarding the Professional Development requirement for the Master of Engineering in Energy Systems degree. All students in the degree program are advised to carefully go through this document. A checklist is given in Appendix A.

**Why Professional Development?**

Professional development requirement (through ENG 572, ENG 573, or approved course work) is aimed at developing the following skill set in the context of energy systems:

- Leadership
- Teamwork
- Project development
- Project management
- Oral and written communication
- Feasibility studies
- Innovation and entrepreneurship
- Engineering economics and business aspect of technology
- Component or system-level conceptual design studies
- Design and build activities
- Experimental work
- Detailed numerical simulations
- Detailed theoretical analyses of physical systems

These skills form the backbone of a leader. While core engineering skills (near the bottom of this list) will be developed in other courses, skills near the top of this list are emphasized in the professional development requirement.

**Professional Development Requirement**

Student must complete four credit hours of work to satisfy the degree requirement for professional development. This requirement can be satisfied by completing one or more of the following three options for a total of 4 credit hours:

- Practicum: ENG 572 as approved by an advisor (4 credit hours)
- Project: ENG 573 as approved by an advisor (4 credit hours)
- Course work approved by an advisor (4 credit hours)

In order to lay down an even groundwork for all students in the degree program, all incoming students are expected to register for one credit hour of ENG 573 in their first semester on campus. This one

credit hour course, taught during the fall semester, is designed to help students develop important skills and prepare for their future practicum, project, or professional development coursework.

Thus, in practice, three hours of additional ENG 572, ENG 573, or approved course work are sufficient to satisfy the rest of the professional development requirement. Remaining three hours must be satisfied by completing the requirement within *one* of the three options above. *You should discuss your options for the professional development requirement with the program advisor and your plan must be pre-approved.*

**ENG 572 (*Professional Practicum* or *Internship*)**

ENG 572 (*Practicum or Internship*) is most often (but not exclusively) selected for work carried out in an internship at a location away from campus. It is characterized by a non-faculty site-supervisor (mentor) in addition to a faculty advisor. In some cases, practicum may be at a UIUC facility/project. Examples of such a practicum are energy sustainability projects sponsored by the Student Sustainability Committee and supervised by personnel from the SSC and/or Facilities and Services (F & S) department of UIUC. Some students do internship in an energy-related community project in Urbana-Champaign.

Each student participant must have a mentor at the site of the practicum and a faculty member to provide oversight. Once a practicum, corresponding site, and site-supervisor have been identified, a faculty advisor for the practicum must be identified. MEng Program Director may be the default faculty advisor. Next, a plan needs to be developed for the scope of the practicum and agreed upon by the site-supervisor, faculty advisor, and the student. See Reporting Requirements for further detail. In addition to normal reporting of the work carried out at the internship, the Professional Practicum involves reporting on how experience in an internship relates to pertinent course work.

Please note: One cannot get course credit for work that one is doing as part of a *regular* job for which one is being paid. For example, those with full time jobs who are pursuing the online degree cannot use part of their regular job-related projects as part of their ENG 572 report. They must do something beyond what was expected of them as part of their job. On the other hand, a paid internship is something similar, but the difference is that there is no full-time or part-time job behind it. Internship is for a finite period (a few months). Internship is essentially an opportunity to learn, become familiar and grow, as opposed to a "job" that primarily expects you to deliver, while learning and growth is secondary.

**ENG 573 (*Capstone Project*)**

ENG 573 (*Project*) aims to have students integrate advanced technical knowledge in a real-world project experience sponsored by an industry client. Students enrolled in this course work either independently or in an assigned team to accomplish the project goals as identified by the industry client. There is weekly contact throughout the semester between the student(s) and an assigned industry representative, who serves as the primary project mentor.

Students remain at Illinois during the semester and work remotely with the industry client. Students interact on a regular basis throughout the semester with the industry representative through webinars or Skype meetings. On occasion, the client may request the student(s) to travel to the client's site for an

in-person meeting. The course instructor (faculty advisor) provides students with additional guidance as needed throughout the semester.

At the start of the semester, students develop a project plan, including a budget, in collaboration with the industry client. The plan may include research, design, development, analysis, prototype build, test, and evaluation with emphasis on deliverables that are reasonable given the project duration and of importance to the industry client. Both the industry representative and the course instructor keep project records during the semester. Students participate in at least one oral presentation and submit a final written project report at the end of the semester. See Reporting Requirements for further detail.

**ENG 572 Practicum and ENG 573 Project** both involve component or system-level conceptual design studies, design and build activities, feasibility studies, experimental work, detailed numerical simulations, or detailed theoretical analyses of physical phenomena, related to any aspect of the broad field of energy systems. Both *Practicum* and *Project* expect students to develop good project management and communication skills. This involves an initial plan/proposal, intermediate progress reports, and occasional oral presentations. Team work is also emphasized (either in the form of a team project, or team work at internship site). The main output of the practicum/project will be a final report that describes in detail what was done, why it was done, what avenues were not pursued and why, and makes appropriate recommendations, and as appropriate, suggestions for further work. Students are required to consult with the Program Coordinator to confirm that they are registered for the correct course.

Please note: ENG 572 (Practicum) may be the most challenging to complete—largely because of the time constraints associated with the MEng degree. Most internships are decided by late fall, which means that student starting in fall should arrange an internship within three to four months after starting the program. Landing an appropriate practicum/internship in this short duration of time is often challenging.

**Steps for ENG 572 (Practicum):**

- Select an energy systems related internship
- Complete the Professional Development Proposal (See Appendix B)
- Submit proposal form to Program Director
- Get the internship approved by Program Director
- Request registration approval/override by Coordinator
- Register for ENG 572 Professional Practicum (Energy Systems section)
- Survey associated literature and state-of-the-art research
- Conduct, as appropriate, system-level or conceptual design studies, design and build activities, feasibility studies, experimental work, detailed numerical simulations, or detailed theoretical analyses of physical phenomena
- See Appendix A for step-by-step checklist
- Always discuss with the program director and coordinator

**Steps for ENG 573 (Project):**

- Select an industry-sponsored project
- Complete the Professional Development Proposal (See Appendix B)
- Submit proposal form to Program Director
- Get the project approved by the Program Director
- Request registration approval/override by Coordinator
- Register for ENG 573 Capstone Project (Energy Systems section)
- Survey associated literature and state-of-the-art research
- Conduct, as appropriate, system-level or conceptual design studies, design and build activities, feasibility studies, experimental work, detailed numerical simulations, or detailed theoretical analyses of physical phenomena
- See Appendix A for step-by-step checklist
- Always discuss with the program director and coordinator

**Professional Development approved coursework**

The following courses have been identified to satisfy the professional development requirements of the MEng degree. One or more courses can be taken to fulfill the requirement. These do not require prior approval, but students are expected to communicate their plan to the program coordinator.

- TE 450 — Startups: Incorporation, Funding, Contracts, and Intellectual Property
- TE 460 — Lectures in Engineering Entrepreneurship
- TE 461 — Technology Entrepreneurship
- TE 462 — Leading Sustainable Change
- TE 466 — High-Tech Venture Marketing
- TE 510 — Advanced Creativity
- TE 565 — Technology Innovation and Strategy
- TE 566 — Finance for Engineering Management
- TE 567 — Venture Funded Startups

## APPENDIX A

**Checklist for ENG 572/573:**

- ✓ A 2-3 page proposal that outlines the scope of the internship/project. This should be submitted as soon as the faculty advisor and site-supervisor and the scope of the project/internship have been identified. When appropriate, a few of the most pertinent references or reports should be cited.

- ✓ A 10-12 page interim progress report. This progress report should further focus the scope beyond what was in the original proposal, followed by a review of current understanding including a discussion of relevant literature. It should then describe the progress made and summarize the remaining work.

- ✓ A 25-30 page comprehensive final report. This should include an Abstract, Introduction, Literature Review, Work Done (in appropriate number of chapters), Summary and Conclusions, and suggestions for Future Work. A Bibliography is also an essential part of the final report.

- ✓ A 10-minute oral presentation summarizing project/practicum work. Presentation is given the semester project/practicum is complete (2-3 weeks before end of semester). Presentation includes powerpoint, 8-minute presentation, and 2-minute Q/A.

Note that the Proposal, Progress Report, and the Final Report may go through a few revisions before they are finalized.

**File Naming Convention:**

All files should be names as:

LastName FirstName_ENG 57x Project Proposal_Semester Year
LastName FirstName_ENG 57x Project ProgressReport_Semester Year
LastName FirstName_ENG 57x Project FinalReport_Semester Year

Example: McCullough Amy_ENG 573 Project Proposal_Fall 2024

Reports should be submitted by email as both pdf and MS Word file. **Email must be cc'd to the program director, program coordinator, and industry supervisor.**

**Timeline:**

**Fall and Spring** semester timeline for the submission of the three required reports:

Proposal: Prior to registration
Interim Progress Report: 10th Wednesday of the semester
Comprehensive Final Report: 15th Wednesday of the semester

**Summer** semester timeline for the submission of the three required reports:

Proposal: Prior to registration
Interim Progress Report: 7th Wednesday of the semester
Comprehensive Final Report: 11th Wednesday of the semester

Projects and practicums may span more than one semester on occasion. In these circumstances, a grade of DFR (deferred) is given until the course is completed the following semester. Student must first receive approval from the program director.

If student is not expecting to complete the requirements and not expecting a letter grade in the first semester, the comprehensive final report and oral presentation will be due the following semester when the course is to be completed and the letter grade awarded.

**Rubric for Presentation**

Following rubric is used to evaluate class presentations:

ENG 572/573 Research Project presentation rubric

| | |
|---|---|
| Technical quality of the project | /25 |
| Depth of work carried out | /25 |
| Quality of presentation | /15 |
| Quality of visual aid | /10 |
| Appropriate duration | /10 |
| Quality of answers in Q/A | /15 |
| Total | /100 |

Oral presentations will typically be held within the final two weeks of the semester.

**Tips for effective presentation:**

1. Always paginate all slides.
2. Have a look at http://publicaffairs.illinois.edu/marketing/templates/powerpoint.html for ppt slide templates with UofI theme.
3. Pay attention to choice of colors. Text should be easily distinguishable from the background.
4. Rule of thumb is that you need not have more than 1.5 slides per minute.
5. First slide must have the title; and names of all the faculty advisor and the industry/site supervisor.
6. Do not forget an acknowledgment slide (if needed; funding agencies?) at the end, or at the beginning.
7. Use large size font (ALARA; as large as reasonably achievable) so people sitting at the back in a deep room can still read it. No point in having a lot of blank space on the slide, while the text is too small to be readable. Stretch the text and figure boxes to fill empty spaces.
8. Avoid too much text—when a lot of text cannot be avoided, highlight (color, bold) the part(s) that you want to be paid attention to. For example, if you show a Table of numbers; highlight the entries that are being discussed.

9. Do not plan on going back to a slide shown earlier; insert a copy of the slide where it is needed.
10. Have an OUTLINE slide (with items like, INTRODUCTION and BACKGROUND; MOTIVATION; PAST WORK; xxx; XXX; RESULTS) but do not spend too much time on it when presenting.
11. Make sure you state your goal or objective early in your presentation.
12. A good plan is to repeat the OUTLINE slide, every time a particular section is finished, show the entire OUTLINE slide with a tick mark (or by highlighting) showing the new section you are about to start discussing.
13. An appropriate cartoon can sometime help in keeping the audience engaged.
14. Dynamic presentations with animations and videos are more easily remembered but should not be overdone.
15. Try to use dynamic arrows and boxes etc. to highlight and point at things, and to highlight terms (in an equation).
16. Tailor the technical level according to the audience.
17. If you are presenting to the other students in MEng program, who have a reasonably good understanding of Energy Systems, skip the basics, or go over them quickly. Focus on your work.
18. Talk loudly and clearly to make sure that people all the way in the back of the room can hear you. If necessary, ask if people can hear you in the back.
19. Practice giving your presentation in front of a mirror; or to friends. Time yourself.
20. Target for MEng in Energy Systems is to finish your talk in 8 minutes; leaving 2 minutes for questions and answers.
21. File naming convention for ppt files should follow the pattern given above for reports.

**All submissions (proposal, progress report, final report) must have a cover page that follows the format on the next page:**

572 (Practicum) or 573 (Project) or a Professional Development course

Proposal/Progress Report/Final Report

Submitted in partial fulfillment of the requirements for

ENG 572/573

Master of Engineering in Energy Systems

**<u>Title Title Title ……</u>**

**Student Name**

Date:

Credit Hours: xx

Term: Fall/Spring/Summer 201y

Faculty Advisor(s): Name: Email:

Affiliation:

Site-Supervisor: Name: Email:

Affiliation:

Timeline (for Proposal and Progress Report only):

Keywords (5):

*By submitting this report, I give consent for my work to be shared online or in person as an example of work completed in the M.Eng. in Energy Systems program.*

572 (Practicum) or 573 (Project) or a Professional Development course

**APPENDIX B**

See Proposal Form below.

## ENG 572 – Professional Practicum / ENG 573 – Capstone Project

## Plan / Proposal

**STUDENT NAME: _____UIN: _____**

**UIUC FACULTY ADVISOR / INSTRUCTOR: _____**

**SPONSORING COMPANY: _____**

**OFF-SITE SUPERVISOR / MENTOR: _____**

**COURSE (SELECT ONE):** ☐ ENG 572 ☐ ENG 573

**INSTRUCTIONS:**

**Attach a 2 – 3-page proposal that outlines scope of the practicum or the project.**

**Information to include:**

- Professional learning objectives
- Project learning objectives
- Plan for conduct as it relates to achieving overall practicum or proposal objectives such as conceptual studies, design and build activities, feasibility studies, experimental work, and results analysis
- Anticipated deliverables
- Possible literature and state-of-the-art research to be used

**APPROVALS:**

**Faculty Advisor / Instructor: _____Date: _____**

**Site-Supervisor: _____Date: _____**

**Program Director: _____Date: _____**

**Notes:_____**