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 at least ONE credit hour of ENG 573 in their first semester on campus. (More
on this a little later). Thus, in practice, three hours of additional ENG 572, or ENG 573, or approved course work is 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 (Energy Systems 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.

Practicum examples include:

- UIUC greenhouse energy efficiency improvements
- Design & build a solar boat
- Analyze UIUC solar PV farm data
- Manage a solar installation project on a local church
- Install solar cell phone charging shack in northern Ghana
- Work with City of Urbana on residential PV project
- Product Realization team member at G&W Electric Company

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 Energy Systems Practicum involves reporting on how experience in an internship relates to pertinent course work.

ENG 573 (Energy Systems Project)

ENG 573 (Project) is a more conventional form of a design, optimization, management, or research project supervised by one or more faculty members. Faculty advisor must be approved by the MEng Program Director. Scope of the project should be consistent with the credit hours. (Note that thesis for a MS degree earns eight credit hours. A four credit hour project is hence comparable to a mini-thesis; or a graduate level design project.)

Project examples include:

- Solar PV on wind turbine support towers
- Solar power satellite analysis
- Power train analysis
- Reduction of propulsion costs
• Analysis of environmental impacts
• Comparison of electricity and biofuels for transportation

**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.

While ENG 572 (Practicum) is the more desirable option, it is also 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. MEng office has a database of possible internships/practicums, which may be helpful in matching students with potential opportunities.

**Steps for both ENG 572 and ENG 573:**

- Select an energy systems related internship or project
- Get the topic approved
- 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 460 — Entrepreneurship for Engineers
- TE 461 — Technology Entrepreneurship
- TE 466 — High-Tech Venture Marketing
- TE 560 — Managing Advanced Technology I
- 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, few most pertinent references or reports should be cited.

- A 10-12 page mid-stage 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 2017

Reports should be submitted by email as both pdf and MS Word file. Email must be cc-ed to the program director, program coordinator, and faculty advisor (ENG 573) or off-site internship supervisor (ENG 572).

Time Line:

Since the durations for these projects and internships may vary significantly, it is not possible to provide a time line for report submissions. Student, in consultation with faculty advisor and coordinator of the MEng program, should plan a tentative timeline and include it in the proposal.

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.
Rubric for Presentation

Following rubric is usually used to evaluate class presentations:

ENG 572/573 Research Project presentation rubric

<table>
<thead>
<tr>
<th>Technical quality of the project</th>
<th>/25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth of work carried out</td>
<td>/25</td>
</tr>
<tr>
<td>Quality of presentation</td>
<td>/15</td>
</tr>
<tr>
<td>Quality of visual aid</td>
<td>/10</td>
</tr>
<tr>
<td>Appropriate duration</td>
<td>/10</td>
</tr>
<tr>
<td>Quality of Q/A</td>
<td>/15</td>
</tr>
<tr>
<td>Total</td>
<td>/100</td>
</tr>
</tbody>
</table>

Tips for effective presentation:

1. Always paginate all slides.
2. Have a look at [http://publicaffairs.illinois.edu/marketing/templates/powerpoint.html](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 co-authors. Either highlight the presenters name or remember to point it out. [If this is to be presented at a conference, include the name of the conference and date (useful when you look at the slide two years later).]
6. Do not forget an acknowledgment slide (if needed; funding agencies?) at the end, or at the beginning. Make sure that you include the names of your advisor, supervisor, technical advisor on the first slide or in acknowledgement.
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 fig 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, INTRO and BACKGROUND; MOTIVATION; PAST WORK; xxx; XXX; RESULTS; ETC) 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 awake.
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. If appropriate, make (oral) reference to the talk earlier in the session or a talk that will be given later in the same session.
17. Tailor your talk according to the audience. If a very similar talk preceded yours, you may go thru the background material rather quickly, referring to the earlier talk (we just heard the reasons why it is important to ...., so I am not going to repeat ....I would however like to add ....)
18. Tailor the technical level according to the audience. At some meetings you may need to emphasize the technical details (model and formulation etc); while at others you may need to spend more time on the results; etc.
19. 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.
20. Talk loudly and clearly to make sure that people all the way in the back can hear you. If necessary, ask if people can hear you in the back.
21. Practice giving your presentation in front of a mirror; or to friends. Time yourself.
22. Target for MEng in Energy Systems is to finish your talk in 8 minutes; leaving 2 minutes for Q/A.
23. 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:
Proposal/Progress Report/Final Report
Submitted in partial fulfillment of the requirements for
ENG 572/573

Master of Engineering in Energy Systems

Title Title Title ..... 

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):