The Ph.D. Research Process
ME599-009, Winter 2012

Instructor
Prof. John Hart, ajohnh@umich.edu
2214 GG Brown

Logistics
- Fri 2-4pm, 3150 DOW
- 2 credits
- Open to all graduate students, and prospective graduate students (senior undergraduates) by permission

Summary and Objectives
The Ph.D. Research Process course aims to develop skills in, and awareness of, research methods that are practiced by Ph.D. students in engineering. Above all, the course seeks to unravel the mysteries of the Ph.D. process and the academic environment, and to chart a path toward a more successful, purposeful, and enjoyable experience in research for everyone.

The course meets weekly, with a combination of lecture-style presentation, class discussion, and small group activities. The students complete three major assignments related to their individual research topic: a background report, a research proposal (a hybrid format based on graduate fellowship and small research grant applications), and a final presentation (emulating the ME RFE format). There are also readings and small tasks assigned in preparation for class discussion. The major objectives are summarized below.

- Understand how and why research is a dynamic and challenging process—an intellectual adventure—requiring both structured and unstructured thinking.
- Teach basic methods for designing and implementing your individual graduate research program, aiming to:
  - Improve your ability to analyze the literature and identify the important questions/needs related to your research theme.
- Improve your ability to define both short-term and long-term goals, and to manage your time effectively.
- Improve your writing and presentation skills.
- Emphasize how to build a constructive relationship with your advisor and research group.
- Emphasize good research practices and responsible conduct of research.
- Discuss the research landscape beyond the day-to-day life of a Ph.D. student, including the writing and evaluation of grant proposals, university administration, and commercialization.

**Course materials**
- All lecture notes and readings will be posted on ctools (ME599-009 W12).
- There is no textbook.

**Course format and policies**
- Each session will comprise a brief lecture, followed by class/group discussion.
- This course is meant to be an open a dialogue, where we exchange interpretations and opinions about the research process. Our discussion will be structured around reading assignments, examples, and in-class activities. Your candid thoughts will make the class content most valuable and useful.
- You are expected to complete the assigned readings before class.
- Attendance is required and will be taken. You may nominally miss one class. If something comes up and you need to miss a second class, please tell John in advance.
- Assignments are due as noted below. Late submissions will not be accepted.
  - 2pm Thursday for pre-class tasks
  - 2pm Friday for regular assignments
- I hope that a large part of the time you spend for this class will be directly useful to your research, e.g., searching/analyzing the literature in your field, and planning for the RFE.

**Assignments**

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Weight</th>
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<tbody>
<tr>
<td>In-class participation</td>
<td>10</td>
</tr>
<tr>
<td>Pre-class tasks and peer review</td>
<td>10</td>
</tr>
<tr>
<td>Literature search</td>
<td>5</td>
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<tr>
<td>Background report</td>
<td>30</td>
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<tr>
<td>Research proposal</td>
<td>30</td>
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<tr>
<td>Presentation</td>
<td>15</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
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1 Will be graded on a 1-10 scale overall for the semester. Everyone can get 10/10.
2 Will be graded 0/50/100% in each instance. 0 = nothing or late; 50 = partially complete or did not follow instructions; 100 = complete.
<table>
<thead>
<tr>
<th>#</th>
<th>Date</th>
<th>Theme</th>
<th>Pre-class task</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Jan/6</td>
<td>Course overview; recap of ME RFE/candidacy process</td>
<td>(Thurs 2pm)</td>
<td>(Fri 2pm)</td>
</tr>
<tr>
<td>1</td>
<td>Jan/13</td>
<td>Defining “research”; learning styles</td>
<td>Research words</td>
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<tr>
<td>2</td>
<td>Jan/20</td>
<td>Searching and analyzing the literature</td>
<td>Research theme</td>
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<td>3</td>
<td>Jan/27</td>
<td>Creativity and impact; choosing a research topic</td>
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<td>4</td>
<td>Feb/3</td>
<td>Planning and time management</td>
<td>Literature search</td>
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<tr>
<td>5</td>
<td>Feb/10</td>
<td>Advisor-student relations; mentorship and collaboration</td>
<td>Discussion topics</td>
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<tr>
<td>6</td>
<td>Feb/17</td>
<td>Responsible conduct of research</td>
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<td></td>
<td>Feb/24</td>
<td>No class</td>
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<td>Background report</td>
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<td></td>
<td>Mar/2</td>
<td>No class (spring break)</td>
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<td>7</td>
<td>Mar/9</td>
<td>Formulating and writing a proposal</td>
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<td>8</td>
<td>Mar/16</td>
<td>Evaluating proposals</td>
<td>Proposal exercise</td>
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<td>9</td>
<td>Mar/23</td>
<td>Graphics and visual aids</td>
<td>Proposal aims</td>
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<tr>
<td>10</td>
<td>Mar/30</td>
<td>Giving and evaluating presentations</td>
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<td>Proposal</td>
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<tr>
<td>11</td>
<td>Apr/6</td>
<td>Research administration and commercialization</td>
<td>Proposal peer-review</td>
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<tr>
<td>12</td>
<td>Apr/13</td>
<td>Student presentations (extended session)</td>
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<td>Presentation</td>
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