In addition to the other requirements, graduate students in this course must write a paper that explores some aspect of robotics more deeply than we cover in class. In most cases, I expect this exploration to follow this procedure similar to this:

1. Choose a topic. More specific is almost always better!
2. Read about this topic in one or more textbooks.
3. Use these textbooks and the Internet to find the published academic research papers that make substantial contributions on this topic.
4. Critically read and understand several (say, 4-6) of the most interesting or most important of these papers.
5. Synthesize the content these papers by noting their similarities, differences, strengths, weaknesses, etc.
6. Propose one or two new ideas that might address the weaknesses you saw, or answer questions that were left unanswered.
7. Write a paper of approximately 10 pages to document your findings. Your paper should convince the instructor that you succeeded at each of the previous 6 steps. Cite the papers and books you consulted, using complete and correct citations.

For graduate students already working on established research projects, it is especially encouraged to use this project as a chance to find and investigate connections between robots and your existing research.

**Topic ideas:** Here are a few ideas to jumpstart your topic selection.

- Minimalist robotics: What can be accomplished with limited sensing?
- Multiple-robot coordination: How can lots of robots work together?
- Pursuit and evasion: Robotic hide-and-seek.
- Sampling-based motion planning: Moving a piano through a cluttered house.
- Sensor networks: Groups of “actuation challenged” robots.
- Probabilistic localization and/or SLAM: Efficiently manipulating probability distributions.
- Rehabilitation robotics: Can robots help people recover from injuries and disabilities?
- Specific applications of robotics (provided you can find academic research on the subject)
- . . .

**Deadlines and deliverables:** There are three deadlines for this project.

✓ Topic choice with one page abstract – Due March 7.
✓ Reference list – Due April 1.
✓ Completed paper – Due April 24.
Evaluation criteria

Abstract (10):  
☐ Abstract is submitted on time.  
☐ Abstract describes a topic that is relevant to the content of the course.

Reference List (10):  
☐ Reference list submitted on time.  
☐ Reference list includes at least 4-6 academic research papers that make substantial contributions on the topic.

Content (60):  
☐ Topic is narrow enough to be covered in the paper.  
☐ Paper presents any essential background material clearly.  
☐ Paper cites and summarizes published academic research papers on its topic.  
☐ Paper synthesizes published results.  
☐ Paper contains comparisons and contrasts between published results.  
☐ Paper proposes new ideas to make progress in the topic area.

Presentation (20):  
☐ Paper is complete.  
☐ Paper has correct length.  
☐ Writing style is appropriate and professional.  
☐ Paper is mostly free from grammar problems and typos.  
☐ Paper contains helpful figures where appropriate.  
☐ Paper has consistent formatting.