AE/BME/CS/ECE/ME/PHYS 8741 Robotics Capstone Project
Fall 2026

MS Robotics Capstone Course Description and Learning Objectives
Students in the MS Robotics program complete a 6-credit project over two semesters. When feasible, the Capstone project should represent a collaboration between the student, the student's internship supervisor and the student's faculty advisor.

The capstone project is a comprehensive assessment of the knowledge and skills acquired throughout the program. There is freedom for great diversity in project topics and options for investigating, designing, and/or developing artifacts that are relevant to Robotics research and technology areas.

While most students will choose to complete an individual project, groups of 2-3 students may also work together on projects. Projects are typically completed during the second year of the program and are graded based on satisfactory progress towards the expectations set forth in the project syllabus. Deliverables include (but not limited to) a mid-point presentation, final written report, and completion presentation. Expectations include:

- Critically assessing the prior art in an area outside his/her own,
- Performing state-of-the-art experimental or simulation work in a multidisciplinary area,
- Coherently reporting, at the level of a conference publication, on the research performed.

All deliverables will be reviewed by the faculty advisor and when possible, a partner company collaborator.

SCHEDULE OF PROGRESS

Timeframe/Deadline	Activity/Deliverables	Action
Year 1 Fall – Year 1 Spring	Explore advisor and project options	Self-directed; engage in strategies listed in Proposal section
Year 1 Spring: end of 15th week of classes	Proposal and Project Proposal Form	Turn in hard copy of proposal and form;
Year 2 Fall: by mid-September	Initial Progress and Planning Meeting	Meet with Program Director
Year 2 Fall: end of semester	Midpoint Presentation	Sign up to present your work to date; Prepare and give presentation for feedback
Year 2 Spring: April	Robotics Industry Day Showcase Poster	Sign up to present your work as a poster at the Robotics Industry Day; Prepare and present

Year 2 Spring: final weeks of semester	Final Presentation	Sign up to present your project; Prepare and give presentation of project
Year 2 Spring: last day of semester	Final Report and Project Completion Form	Turn in hard copy of project completion form.

Proposal: It is your responsibility to identify a project and faculty project advisor (and industry contact, if applicable). You are encouraged to begin exploring ideas during your first semester. Do not expect to be successful by sending random or generic emails to faculty asking them for a research project or GRA. Do your homework and find out what is going on around campus by actively seeking information. Some suggestions for gaining inspiration for proposals are:

- Visiting or joining labs in your first semester.
- Attending the Robotics Seminar Series
- Talking with PhD students, research faculty, and others about their work. Getting to know the
- work of others is a useful skill for your professional career.
  Reviewing previous projects.
- Exploring the various Georgia Tech school, faculty, lab, department, center, and program
- websites to learn about the wide range of projects and interests across campus.

You will develop your project proposal during the spring semester of your first year, in consultation with Robotics faculty project advisor working in an area of interest to you. You should discuss your project idea with the Program Director to ensure that it will meet the criteria set by the program. If you are planning to work with an industry partner, you will need to get approval from the Program Director. Information about the content of the proposal is listed in a later section of this document. Before the end of the 15th week of classes you are required to turn in a hard copy of your proposal and signed project proposal approval form to the Program Director. The specific deadline for the proposal will be announced early in the Spring semester.

Project Advisor: All students must have a project advisor who is Robotics faculty member. Your Project Advisor serves as the academic leader, and in many cases, is an expert in the project topic, methods, technology, population of interest, etc. Typically, you will work directly with your Project Advisor to perform the project work. Therefore, you should identify a faculty advisor who can facilitate your learning. Some criteria to consider: shared research and design interests, knowledge or skill in your project area, needs for project oversight, lab and resource supports, and availability. Start your search process early so that you have some experience with multiple faculty members. Students are often less successful at finding an advisor when they wait until late in the Spring semester to start the process. In addition, faculty members are more likely to be interested in working with you if they have had previous interaction with you during a course, through a GTA/GRA, in their lab, or by other similar means. You should consult

with the Program Director if you have questions about faculty availability or eligibility. A listing of possible Robotics faculty Project Advisors is available on the Robotics website.

If you change your faculty Project Advisor, you must notify the Program Director. You may be required to register for additional credits of 8741 with the new advisor, regardless of the number of credits you have already completed with the previous advisor. You may also be required to submit a new proposal document, signed proposal approval form, and syllabus.

In some cases, you may have a secondary "project mentor" – typically an expert in the domain of your project, but not a Robotics faculty member. You will still need a Robotics faculty Project Advisor. A project mentor can be a GT researcher or academic faculty member from a non-Robotics field or who is unable to assign grades for project credits. Project mentors may also be industry or government professionals who are associated with your project work and contribute specific expertise. If you think your project might involve a project mentor, talk with the Program Director.

Registration for Project Credits: The project requires two semesters each of 3 credits of AE/BME/CS/ECE/ME/PHYS 8741 (for a total of 6 credits). You will register for the credits associated with the School of your faculty project advisor (if the advisor is not able to assign credit, you will need to discuss your options with the Program Director). As a general guideline, one credit hour equals roughly three hours of work per week, resulting in 9+ hours per week for 3 credit hours of project work. *This translates to 144-160 hours per semester for your project.* Your course grade is assigned by your faculty Project Advisor in consultation with the Program Director. You must achieve an "A" or "B" grade in these credits to graduate. If you receive a grade lower than a "B" in either semester of the credits, you are required to retake the credits in a following semester.

Before the start of your third semester (or the semester in which you enroll in your first 3 credits), you will review your proposal with your advisor, make any updates, and agree to the syllabus associated with your project credits. This syllabus contains details about deliverables, deadlines, and grading criteria. You must complete the proposal update and syllabus process by the end of the registration period (first week of classes) in order to receive your permit to register for the project credits. You will not be able to for (project course) credits if you have not completed this process.

Progress Reporting: During both semesters of your project credits, you will be expected to make satisfactory progress on your project. To report on your progress, you will provide your faculty advisor with periodic updates according to his/her preferred methods (e.g., reporting during lab meetings, demonstrations, written reporting documents, etc.). You must also:

- Have an initial meeting with your advisor to review your progress and planned work during the first semester of your project. This will be scheduled for early in the first semester of your project and count towards your grade.
- Prepare a Mid-Point Presentation to be given at the end of the first semester of your project. This will serve as an opportunity to share the work you have performed to date

and discuss your plans for completion. Your presentation will be brief to allow for ample time to thoroughly discuss your work with faculty and other invited experts. This will also be a chance to assess your plans for the second semester and adjust accordingly. This presentation will count towards your grade.

- Have a progress meeting with the Program Director to give an update on your project and discuss your completion plan. This meeting will be scheduled for the 2nd month of the 2nd semester of your project and count towards your grade.

Project Poster: During the final semester of your project work, you are required to present a project poster at the Robotics Industry Day (mid-April). This will count towards your grade.

Final Deliverables: In order to graduate, you will turn in a high-quality final report document (or other agreed upon equivalent document) and present your work to the program (i.e., the Program Director, Robotics faculty coordinators, fellow MS Robotics students, other interested faculty members, and invited experts). These deliverables are graded as part of your project credits and must be completed to a level deemed satisfactory by your advisor, the Program Director, and faculty coordinators. The signed project completion form is due by the last day of finals in the semester you expect to graduate. This form should not be signed until all project deliverables have been submitted.

DELIVERABLES

Project Proposal

The project proposal is a 5-10 page document. Discuss the format and content details with your advisor. In general, you should address the following:

1. Introduction/Background: Overview of the problem area that your project will address. Discuss the history of the problem including any literature, statistics/data, specific examples, related work that you or others have done. Describe the target user or subject group, behavior of interest, stakeholders, context of use, and/or business or market situation. Discuss the significance of addressing the problem -- what are the benefits, innovations, valuable aspects, etc.?
2. Potential Solution, or Contribution: What is the general nature of the work you hope to complete? What do you expect to develop, design, or investigate? Do not get overly descriptive in this section because these details should be informed by the work you do to understand the user needs/design criteria.
3. Expected Methods: What you will do in each stage of the project (many of the steps listed in the schedule will be discussed in this section). How will you collect data? How will you develop and get feedback about your concepts or ideas? How will you develop and test a prototype or draft of your design? What methods will you use to get experts' feedback?
4. Expected Resources: Description of resources you will need and how you will obtain them. This includes hardware, software, data sets, access to resources.
5. Schedule: This list of milestones is suggestive, not definitive. You may adapt it, in consultation with your advisor, based on the specific characteristics of your work:

- Literature review
- Rough prototype
- Mid-Point Presentation
- Testing of rough prototype
- Implementation of a functional system
- Testing of functional system
- Final report and other deliverables
- Presentation to Robotics faculty advisors and students

You must turn in your signed project proposal approval form and proposal document to the Program Director.

Mid-Point Presentation

At the end of your first semester of project work, you will give a presentation to the Program Director, and others on your progress to date and plan for completion. You are expected to summarize your efforts towards the 3 credits of project work. This presentation will include a 5-minute overview of your work and a faculty-led discussion about your progress and future plans. The outcome of this presentation will be considered as part of your grade for the semester.

Your brief presentation should orient your audience to your problem space, review the tasks you have completed, and propose the next steps. While you will not have time to get into specific details of your work to date or future plans, you should have those details available in case you are asked to discuss them. Your presentation should include 4 slides: 1) Problem Overview; 2) Completed Work; 3) Completed Work cont.; and 4) Planned Work.

Final Report

This is an expanded and updated version of your project proposal, typically 30-40 pages, including photographs, diagrams and appendices. Because there is a range of acceptable project contexts, your project may not have all of the details listed below. If you expect significant deviation from this outline, please discuss your needs with the Program Director. A typical outline is:

1. Background and Related Work: For conference papers I like to combine these two topics into one section (in lieu of "Introduction"). Include: What is the problem you are trying to solve? Why is it important? Why is it hard? How have others solved it, including your own previous solutions. When you mention other approaches, suggest reasons your approach is different or better.

2. Approach: What is the key insight or innovation of your approach? If at all possible describe the method simply in *words* first (not equations!). Then follow up with equations or algorithmic details as necessary. Avoid nitty gritty details of implementation for now.

3. Implementation: This section is not always necessary. The point is to explain those details not covered above that might vary from implementation to implementation but that others need to know in order to reproduce your results. Also information about the specific implementation that might explain extremely good (or bad) quantitative results: Things like machines you ran it on, language you wrote it in, other details one might need to know.
4. Methodology: Describe the experimental setup, the various conditions of the experiment, how the results were measured and recorded.
5. Experimental Results: Describe in a factual manner, the quantitative results of the experiments. Hold off on rendering an opinion or conclusion here.
6. Discussion and Conclusion: This is were you draw conclusions from the results. You might speculate on the causes of the results or opine on what future work might entail or reveal. Recap what you did, restate the main points from your abstract. Acknowledge those who helped or funded.

As per your project proposal milestones, you must have a draft final report for your faculty project advisor prior to the due date (last day of exams) for the completion form to be signed. Confer with your advisor to determine how far in advance of the due date the draft is expected to be ready for review.

Final Presentation
You will prepare and give an 18-minute PowerPoint or similar style presentation near the end of the semester to the program (i.e., the Program Director, four Robotics faculty coordinators, fellow MS Robotics students, other interested faculty members, and invited experts).

Given the 18-minute time limit, you should structure your presentation to efficiently and effectively tell the story of your work. Keep in mind that you are being graded on the elements discussed above. A typical presentation could follow this flow and time structure:

1. Introduction to the problem (1-2 minutes)
2. Design requirements/investigation plan (2 minutes)
3. Design iteration activities (e.g., processes, feedback from others, etc.) (3 minutes)
4. Description and display of final artifact (4-5 minutes)
5. Evaluation/validation description and findings (4-5 minutes)
6. Conclusions and wrap up (1-2 minutes)

Academic Integrity
Academic dishonesty will not be tolerated. This includes cheating, lying about course matters, plagiarism, or helping others commit a violation of the Honor Code. Plagiarism includes reproducing the words of others without both the use of quotation marks and citation. Students are reminded of the obligations and expectations associated with the Georgia Tech Academic Honor Code and Student Code of Conduct, available online at www.honor.gatech.edu.

Learning Accommodations
If needed, we will make classroom accommodations for students with documented disabilities. These accommodations must be arranged in advance and in accordance with the Office of Disability Services (http://disabilityservices.gatech.edu).

Excused absences policy
In case students miss a deadline or an exam, the course will abide by the institute policy on student absences http://www.catalog.gatech.edu/rules/4/

Grading Policy – it is a letter grade course.

Attendance Policy – it is a project based course so attendance is only necessary for the two presentations. Other meetings as appropriate between teammates and faculty advisor.

Last update 12/03/2018