

## Master of Science in Applied Cyber Operations Capstone Project Requirements

The capstone project is the culminating intellectual product for students earning a Master of Science Degree in Applied Cyber Operations (MACO). Capstone projects allow students to learn and gain experience in a team-oriented process, while working on a problem relevant to Navy, DoD, and U.S. Government sponsors. A capstone project must meet the same requirements for analytical rigor and mastery of the relevant background material as a thesis, but can take different forms from the typical thesis that proposes hypotheses and tests them based on quantitative or qualitative data.

The capstone project will typically be one of two types: (1) analysis of a specific problem, policy, strategy, or system; or (2) hardware or software development, implementation, or integration. A capstone project must focus on a problem of specific and immediate sponsor interest. Ongoing sponsor participation, therefore, is paramount in the capstone process. Sponsor participation includes taking on a capstone advisor role (e.g., second reader), informal mentoring, providing proposal and final product feedback, and funding for travel and equipment, among others.

It is anticipated that all members of most MACO cohorts will work together on a single capstone project. For larger cohorts, individual capstone teams consisting of no fewer than two and no more than six students may be utilized. The specific assigned role and contribution of each student must be clearly stated in the capstone project proposal. The contribution of each student must be sufficient on its own to demonstrate appropriate mastery of MACO concepts to justify graduation. Each capstone team will be advised by at least one NPS faculty member with appropriate subject matter expertise and approved by the Cyber Academic Group (CAG) Chair. Additionally, each team will have at least one second reader (or co-advisor) from NPS and optionally a second reader (or co-advisor) from the sponsoring organization. Sponsoring organizations with identified projects are strongly encouraged to provide an actively involved advisor or second reader, or risk diversion of the team to other topics.

Each capstone project must be approved by all advisors and second readers, the MACO Program Officer, the MACO Academic Associate, and the CAG chair. A capstone project proposal will include the following at a minimum:

1. A clear problem description including requirements, objectives, and anticipated results.
2. Advisor and second reader names and organizations.
3. A discussion of relevance and value to a *specific* sponsor or government cyber stakeholder.
4. Individual team-member roles and responsibilities.
5. A viable product/result test, evaluation, or validation plan.
6. A summary of background research and reading.
7. Anticipated sponsor participation. To the maximum extent possible, this will include the names of sponsor POCs and advisors (and alternates where applicable) and agency directorates and offices that will be providing assistance (including contact information).
8. Final product disposition plans (i.e., software archiving, report generation, etc.).
9. Plan of action and milestones (including completion dates).

## 10. Institutional Review Board (IRB) review checklist.

The capstone process includes a number of milestones and products. The following is a listing of required milestones:

1. Capstone proposal. The capstone proposal will be completed in accordance with the preceding guidance. The capstone proposal is to be complete by the end of quarter two (two quarters prior to graduation).
2. Mid-course review. The capstone team, advisors, and sponsors will formally review the progress of the capstone project at the approximate project mid-point. This review will include an assessment of completed and remaining work and an assessment of the relative contribution of each team member will be evaluated by the advisors and sponsors. The mid-course review will be completed no later than the end of quarter three (one quarter prior to graduation).
3. Final presentation. The capstone team will conduct a presentation of their work for advisors, CAG, sponsors, and other interested parties. This presentation will be given in a “brownbag” or classroom setting after completion of the capstone project work (the final report does not have to be complete).
4. Final report. The capstone project will be formally documented by a capstone report in accordance with NPS requirements. The capstone report will include a full discussion of the work to include problem statement, background research, method of solution, data or experimental results, findings, and recommendations. In addition, the capstone report will include a thorough discussion of the project’s benefits to the Navy, DoD, or other sponsoring agencies. The capstone report must be completed, signed, and accepted by the NPS Thesis Processing Office prior to graduation.

Sponsors and capstone advisors may determine that additional milestones and deliverables are required for completion of the project.

Capstone advisor requirements are as follows:

1. A MACO capstone project will be advised by a committee configured as follows:
  - a. Advisor and co-advisor,
  - b. Advisor and second reader, or
  - c. Two co-advisors

Additional committee members are permitted and will be designated second readers

2. Acceptable capstone committee members will meet the following requirements:

All capstone committee members must hold at least a master’s degree and possess appropriate subject matter expertise for the specific capstone project. In addition, at least one advisor or co-advisor must have an existing association with the NPS CAG.

Any NPS faculty member meeting the above requirements can serve as a capstone project advisor. Any NPS faculty member or sponsoring agency representative meeting the above requirements can serve as a capstone project co-advisor or second reader. A minimum of two capstone committee members must be NPS faculty.

3. The NPS CAG Chair may make exceptions to these policies on a case-by-case basis. Requests for exceptions should be justified in the capstone proposal. Approval of the proposal constitutes approval of the exception.