Completing a Capstone on Co-op

One of the exit strategies for the MMSI program is to complete a capstone project. The capstone project must demonstrate that graduates have an ability to apply master's level knowledge in a specialized area of engineering related to the program. The preferred option for completing a capstone project is to complete a project under the guidance of an RIT faculty member that supports their research. There are situations where it may be possible to complete a capstone project while on co-op assignment. A successful company project does <u>not</u> necessarily mean a successful Capstone Project. Because the RIT awards the MMSI degree, a company project, if it is to be used must satisfy the degree requirements - not the company's requirements for the Capstone Project.

The project should provide a challenging educational experience. It should emphasize creativity, independence, a methodical approach, and a professional delivery. The project should demonstrate a level of accomplishment that could not be achieved without graduate study in the MMSI program.

A goal of a Capstone project is to provides the MMSI graduate students an opportunity to complete their degree requirements by addressing a practical real-world challenge using the knowledge and skills acquired throughout their studies. This course is not only the culmination of a student's course work, but also an indicator of the student's ability to use diverse knowledge to provide a tangible solution to a problem. The Capstone Project topic can be in the areas of product development, manufacturing automation, management system, mechanics, materials, quality management or electronics packaging.

Requirements for Capstone Projects Completed on Co-Op Assignment

- Must comply with all requirements for the Capstone project, which includes completion of a proposal report and proposal presentation and final report and final presentation.

  - In addition to the Capstone project requirements, Capstone projects completed on co-op must also include a draft journal article that is submitted as part of their final documentation.

- The scope and focus of the problem or application area are properly defined and consistent with three credit hours of semester work.

- Demonstrate mastery in the use of knowledge and skills from developed competencies from the MMSI. The selected project area must include the integration of a reasonable scope of MMSI knowledge, including emphasis on the application of multiple methodologies.

- A topic idea for the project is determined by the employer and student, perhaps a project the company needs performed and a topic that is of value to the employer.

- The topic idea is submitted by the student with validation of approval from the Employer Capstone Advisor and review/approval by a RIT Faculty Capstone Advisor. Upon approval, the student will be registered for the capstone project and will begin work on the project.

- Capstone proposals for projects completed on co-op must be submitted to the department, defended and approved a minimum of 6 weeks BEFORE the project is completed (while the student is still actively employed with the company). The ideal situation is 12-15 weeks of time to complete the project.

- The goals of the project must be clearly defined and achievable.
- The student should have a minimum of 8 weeks remaining on the project/their employment at the company.
  - If this is not the case, and the student believes that a project on a completed co-op could be a topic for their project, they <u>must:</u>
    - get prior approval from the Graduate Director of the MMSI program
    - identify a faculty member with related expertise to oversee the completion of the project
    - an extensive literature review be conducted that includes
    - current state of knowledge related to the research problem to be solved and assist with the development of strategies for approaching the problem
    - examples of applications and best practices
    - the final project documentation include a completed paper that meets the guidelines for a conference or journal paper that is in a venue appropriate for the topic. The draft journal article must follow the format and content found in the Capstone Report Guidelines. The student may choose not to actually submit the journal article for publication; however, they must consent to their advisor submitting the journal article for publication on their behalf.
- Complete and submit the Capstone on Co-op Approval Form

The project should be sufficiently complex to allow the student to demonstrate a wide range of engineering and systems integration principles based on the MMSI curriculum.
The project should:

- Include a literature review that informs the project from a foundation of knowledge about the current state of knowledge related to the research problem to be solved and assist with the development of strategies for approaching the problem.
- Include and follow a planned methodology for solving the problem.
- Demonstrate mastery in the use of knowledge and skills from developed competencies from the MMSI. The selected project area must include the integration of a reasonable scope of MMSI knowledge, including emphasis on the application of multiple methodologies. Examples: Lean Six Sigma techniques, Design of Experiments, Systems Fundamentals, and /or knowledge and skills from your concentration courses and/or MMSI electives. At least three principles or tools must be utilized. This should be clearly articulated in both the project proposal and in the final report.
- Demonstrate effective project planning and management by the student.
- The Capstone project must be original work by the student.
- It is imperative that the capstone project write-up and presentation be completed professionally.

The Literature Review

Your proposal and your final project require a literature review as part of the Introduction section. In the proposal, you are expected to provide a brief review of the relevant literature pertaining to the proposed problem/project. Carefully select the articles you review to inform and/or support the need for your project, for example:

- Does the literature provide supporting documentation of the existence of the problem you have identified? Your project should not be based solely on your own subjective perceptions, intuition, or opinion.

- Does the literature support the methodology or "solution" you have selected to address the problem? It can be helpful to have a template/model to follow.

- Does the literature point to major gaps that your project can fill? What new knowledge will be generated by completion of your project?

- Are there published reports by others who have already done what you propose to do? If so, critique this literature, and discuss how your project can improve/expand/build on it.

You should review a minimum of 5 sources for the proposal (many more will be needed for the final paper). The articles should be fairly current (the majority should have been published within the last 10 years; seminal works in the area of interest may be older), and should come from peer-reviewed journals or conference papers. Edited texts or textbooks may also be appropriate source material. Web sites should be used with extreme caution. Refer to APA guidelines for how to incorporate in-text citations of the articles you review. Recommended length is 1-2 pages for your proposal and 3-4 pages for your final project.

For projects that have deficiencies in scope or execution (for example, the project was not fully implemented so a comprehensive analysis of improvement cannot be documented), a more comprehensive literature review is required. It would include the current state of knowledge related to the research problem to be solved and assist with the development of strategies for approaching the problem and examples of applications and best practices. A minimum of 15 sources is expected for this scenario with a literature review length of 5-7 pages.

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Capstone on Co-op Approval Form

This form must be completed before a student can be enrolled in the Capstone course
for a project to be completed while on a co-op assignment.

Student Name: _____

Student UID: _____

Co-op Employer: _____

Project Topic:

_____

☐ The identified project will utilize a minimum of three principles or tools from MMSI course
work. Identify the course AND tool/principle:

Course	Tool/Principle
1.	
2.	
3.	

☐ The project aligns with the student's concentration in the MMSI program.

Concentration: _____

☐ The scope and focus of the problem or application area are properly defined and consistent
with three credit hours of semester work.

☐ I understand a required output is a draft conference or journal paper for an appropriate venue for the topic of the project.

☐ There is a <u>minimum</u> of 8 weeks remaining at my co-op assignment

Planned Start Date: _____

Proposal Date (no later than): _____

Defense Date (no later than): _____

☐ Approval has been obtained from the co-op employer supervisor to use the industry project as a capstone project. Supervisor's signature indicating awareness of use of project to fulfill capstone requirements and agreement to serve as a technical resource for the student when completing the project.

Name (print): _____ E-mail: _____

Title: _____

Signature: _____ Date: _____

☐ I have read and understand the requirements for completing a capstone on co-op.

Student signature/date: _____

Graduate Director's Signature/date: _____