Professional Science Master's in Biotechnology
Capstone Research Project

Please complete and attach this page when submitting your abstract, proposal and final paper

Student Name:

Project Title:

Project Advisor(s) and Affiliations:

Host Institution/Department:

Biotechnological Focus: Environmental / Biomedical / Bioinformatics / Other

Confidentiality Agreement Required: Circle: Yes or No

If yes, please have your mentor sign a statement below that the organization has given you permission to present this work in written and oral presentations.

Suggested Steering Committee Mentor(s):

Steering Committee Recommendations

Recommended Steering Committee Mentor:

Capstone Research Project

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1. Capstone Research Project

The purpose of the Capstone Research Project is to integrate scientific knowledge and professional skill development accrued through research, didactic learning, and professional networking.

The Professional Science Master's (PSM) in Biotechnology program aims to train globally-minded problem solvers of new and emerging challenges, addressing questions through life cycle analysis and application of modern biotechnology. The **Capstone Research Project (Capstone)** represents an independent and novel research project in an area of the student's stated interest, and should have an emphasis on current challenges in human health and/or the environment. The Capstone project is an essential component of the student's professional and scientific training, and is to be conducted under supervision of a mentor who is an expert in the field, and who will be responsible for oversight of the project. The Capstone also may be conducted outside of Temple, with co-mentors in the hosting business, industry, or government agency, as approved by the Steering Committee.

The Capstone will have three time-sensitive components. Please see the Appendices for schematic overview of timeline. The **Title and Overview** will be due by the end of the summer, of the first year of completed study. The **Capstone Proposal Outline** should be submitted by the beginning of October of the 2nd year. The **Final Capstone Presentation** and **Paper** will be presented at the Annual PSM Symposium at the end of the spring semester of the second year. The presentation and paper represent the culminating achievement of the PSM in Biotechnology Program. For those completing the program in 18 months please view look at appendices for modified timeline.

2. Capstone Project Guidelines

As the culminating event leading to graduation from the PSM program, the Capstone learning outcome is to demonstrate the ability of the student to participate in research in a professional environment, in the manner of an early career scientist.

It is strongly recommended that students ask a Steering Committee member for guidance in identifying a Capstone project in the area of their research interest and assistance with finding a mentor, during the spring semester of the first year

of study. The research subject should be based on the student's interests. The concentration of the study can be in any field consistent with the overall goals of the program.

Once the area of research is identified, the student will need to obtain permission from the Steering Committee to ensure that the proposed Capstone is within the scope of the program. Any student in the may complete their Capstone project at their workplace with the approval of their employer and the Steering Committee.

The student is then encouraged to work with the mentor to develop a research project that addresses a specific problem; 'gap in knowledge' in the field of interest or the development of a novel methodology. This will become the student's Capstone project. To develop a well-articulated, focused project, the student should review the literature in the specific topic of interest; identify the methodology established in the field; and identify possible outcomes of the research, if accomplished.

2.1 Capstone Title and Overview

The first page is used to provide the project title and overview to the Steering Committee. The Capstone Title and Overview is a one-page abstract that presents a description of the proposed Capstone to the Steering Committee for approval. The PSM student will also name the laboratory and the Principal Investigator (PI) under whose supervision they will be completing the project.

The recommended submission due date is Aug 1st of the first year of completed study in the program. The Capstone Title and Overview will be reviewed by the Steering Committee, who will assign a co-mentor from the Committee, or from the Department of Biology, to advise the student, receive updates on the project progress and serve as a liaison for the student to the Committee.

An extension for submission of the Capstone Title and Overview may be requested in writing to the Steering Committee explaining the reason for delay. This extension request must be made by August 1st.

2.2 Capstone Proposal

Capstone Proposal should be submitted as a two-page outline of the proposed project, with details of the previously submitted abstract (Capstone Title and Overview). This proposal should include significance, goals, methods, experimental approach, and expected outcomes of the Capstone Project. The Capstone Proposal is to be submitted to the Steering Committee co-mentor, with a copy to the Steering Committee, no later than 2 months following approval of the Title and Overview.

Capstone Research Project

The first page of the document can be used as the title page for the Capstone proposal. The single-spaced document should use Arial font, 11 point, with a 'footer' that has the name of the student submitting the Capstone proposal. The student may personalize the 'header' with the title of the proposal.

The project start time is dependent on the student and mentor, but it is recommended that it be no later than the fall semester of the second year. A confidentiality agreement between student and mentors and/or Temple University and external mentors will be drawn up if needed through the University Counsel's office.

2.3 Final Presentation of Capstone project

Final Presentation and the final paper will be the culminating event of the Capstone project. The Final Presentation will be made by all PSM students at the Annual PSM symposium at the end of the spring semester of the second year. The oral presentation should be a ~10-12 minute PowerPoint slide show.

Prior to the final presentation, the student is asked to apprise his /her Steering Committee co-mentor on project progress; its anticipated completion; or when the stated outcomes are achieved. The Steering Committee co-mentor (and other members) should be invited to a preview of the presentation for feedback prior to the Annual PSM Symposium.

2.4 Final Paper of Capstone

The Final Paper represents the written summation of the Capstone. The Final Paper will demonstrate the professional and scientific growth of the PSM candidate, and serve as the final academic assessment of the student.

The Final paper should be single-spaced, using Arial 11 font with a 'footer' showing the name of student and page number. Below are the recommended page limits for the paper:
- Background, 4 pages
- Materials and methods, 2-3 pages
- Results and presentation of data has no specific page limit
- Discussion, 1-2 pages
- Bibliography can be completed using Reference Manager, Endnote or other commonly used software.

The background portion of the paper should include the history, significance, goals and limitations of the project, with relevant literature review supporting the work. The materials and methods should detail any novel technology or experimental approach, along with references for methods previously described

in literature. The results should be presented as figures within the paper and any supporting result not shown in figures should be added to the appendices, if necessary. The discussion section should state all outcomes and include a critical analysis of the data, highlighting prevailing ideas in the field.

Any details that need to be redacted to honor confidentiality agreement will be noted in the appendices, with a statement explaining the omission. For e.g.: A proprietary drug may be called "Chemical X", patient names and personal information may be excluded per HIPAA regulations etc., with a statement explaining the proprietary nature, or the HIPAA regulation etc. for patient rights which have resulted in the omission of information.

2.5 Capstone timeline constraints

The timeline of completion of Capstone should be no later than the end of spring semester of the second year of study for a full time student. Exceptions can be made to extend the research component of Capstone Research Project to no later than the summer semester of the second year. This timeline can be relaxed for students who are not completing the PSM in Biotechnology program as full time students.

Please complete this page along with mentor signatures when submitting Abstract, Proposal and final paper.

3. APPROVALS

Prepared by _____

        Student

Approved by_____
        Project Sponsor

        _____
        Steering Committee Co-Mentor

4. APPENDICES

Time Line for Capstone:
- ➢ Spring semester 1st year identify a lab / workplace for Capstone. Seek approval from committee and discuss confidentiality agreements with lab / workplace.
- ➢ Start work on Capstone and by Aug 1 st of second year in program submit a title and abstract of project with names of mentors as detailed in capstone document.
- ➢ Beginning of Fall semester second year a Temple Mentor will be assigned to students who is completing Capstone outside of Temple. Students working in a Temple lab will be mentored by PI of that lab.
- ➢ Oct 1st proposal for the project is to be submitted to steering committee

Early Completion 18 months December graduation:
- ➢ Submit the first draft of final paper to mentor by mid-November
- ➢ Prepare a PowerPoint presentation of project to committee at External Advisors' meeting by December 1st to show Temple mentor and plan a practice presentation
- ➢ Submit final draft before the end of semester to Directors of the program for a Pass / Fail grade

Completion after 24 months in program Spring graduation
- ➢ Submit the first draft of final paper to mentor by April 1st
- ➢ Prepare a PowerPoint presentation of project to committee at External Advisors' meeting by April 15th to show Temple mentor and plan a practice presentation
- ➢ Submit final draft before the end of semester to Directors of the program for a Pass / Fail grade

Capstone Research Project

18 month track
COMPLETION IN 18 months
Spring Semester
1st year

- Seek mentor, project and approvals

Aug 1 st, start of 2nd year

- Submit Title and Abstract of the Capstone Project

Fall Semester
Submit proposal Oct 1st of second year
Submit final paper draft mid Nov
Oral presentation draft December 1st

- Present Capstone at External Advisors' meeting

24 month track
Spring Semester
1st year

- Seek mentor, project and approvals

Aug 1st start of second year

- Submit Title and Abstract of the Capstone Project

Spring Semester
Submit proposal Oct 1st of second year
Submit final paper draft April 1st
Oral presentation draft April 15th

- Present Capstone at External Advisors' meeting