

Capstone Experience for BS in Physics

A *Capstone Experience* is a required component of all undergraduate programs at the University of Cincinnati. It must explore the student's mastery in all of the four *baccalaureate competencies*: critical thinking, effective communication, knowledge integration, and social responsibility. In the Department of Physics, this requirement is satisfied by a passing grade on the Capstone Project (PHYS4099), nominally a one-semester (3-credit) course taken in the senior year that requires the student to complete an independent research or teaching project under faculty supervision and prepare a written report on the project and its results. A poster and oral presentation are also required. Research initiated prior to a student's enrollment in the Capstone Project course may be used toward the Project but may not receive additional academic credit. In exceptional cases directed research for credit (PHYS5001) may satisfy the Capstone Experience, but such waivers must be approved by the Undergraduate Committee no later than the end of the Fall Semester of the senior year, and it must be demonstrated that the work completed addresses the four baccalaureate competencies.

Goals

The completion of a research project along with the report. Presentation and poster address the first three competencies. The process of research requires initiative, drawing on accumulated knowledge, acquiring additional knowledge through publications, application and extension of knowledge through analysis or experiment, and critical examination of results to draw scientifically valid conclusions. If the results of the research are to benefit others, they must also be communicated. The process of reporting requires a clear presentation of the work in its entirety and often helps the student researcher to clarify his or her own ideas. It may thus be an important and integral component of the research itself.

To satisfy the Social Responsibility component of the baccalaureate competencies, the student will include with the final report a 1-page statement describing what she or he has learned from the project and how this experience or a result of the project itself may serve as a contribution to society. Aside from the obvious extension to research in basic and applied physical sciences, which has been responsible for many of the technological and societal changes of the past century, the student who chooses physics as a major subject of undergraduate study may contribute to the society in many ways. It is now within the realm of possibility that human decisions and actions will have major global effects in such diverse areas as public policy, finance markets, energy resources, world health, and the environment. An education in physics provides the individual with unique critical thinking skills to apply quantitative analysis to real-world questions. Such skills are an essential component in solving or preventing the global problems of the future. Also essential will be the scientific and technological literacy of the general population, not only to keep abreast of technology but also to recognize its limitations. All physics graduates, by virtue of their scientific training, have a special obligation to help educate the public about the complex technical and scientific issues that face each citizen.

Project schedule and requirements

Each Project will be overseen by a designated **Project Supervisor**, normally a member of the faculty. All Capstone Projects in a given semester are overseen by the Undergraduate Committee. Capstone Project for credit (PHYS4099) is offered in the spring semester.

- **Proposal** - must be received by the Undergraduate Committee no later than the beginning of the twelfth week of the Fall Semester preceding enrollment in PHYS4099.

The proposal must include

- 1) Cover form, including Project title and designated Project Supervisor
- 2) Supervisor form, with signature of Supervisor, stating willingness to supervise and certifying that the project is substantial and realistic within the given framework
- 3) A description of the proposed project in some detail along with a timeline for the project, at least 2 pages long but no more than 10 pages.

Template forms will be provided.

- **Proposal review** - Proposal must be approved by the Undergraduate Committee.

Any proposals requiring revision will be returned to the student by the first day of final exams in the Fall Semester. All proposals must be approved by the end of the first week of the Spring Semester.

- **Mid-term review** – Student must submit to the Undergraduate Committee a brief report, 1 page or less, summarizing progress to date. Due at the end of the sixth week of classes. Student will be warned within one week if progress is not satisfactory.

- **Project** - should be completed by the last day of classes.

- **Project report** - due on the last day of classes. Should include

- 1) Cover form
- 2) Social Responsibility statement - 1-page statement describing what student has learned from the project and how this experience or a result of the project itself may serve as a contribution to society
- 3) Main report, written in the format of a scientific article. Minimum 10 pages.

- **Supervisor report** - due after the Project report is turned in, and before the end of the semester.

- Project Supervisor must submit a signed statement, 1 page or less, assessing the achievements of the project relative to the original goals and making a grade recommendation.

- **Posters** – due at the beginning of the last week of classes.

- **Oral Presentation** – to be given during exam week unless prior arrangements have been made.

Suggested projects

- Research in one of the department's research labs or on a theoretical physics project - an excellent way to get an early start is summer employment as a research assistant.

- Advanced Lab - complete a listed experiment not already completed for credit in Advanced Lab.

- Outreach - give a series of lectures or demonstrations at a public school.

The above are just suggestions to get you started in thinking about your project. Before writing the proposal, consult with the Undergraduate Committee if you have any questions about the appropriateness of what you plan to propose.

**Capstone Project Proposal
Cover Form**

Due at the beginning of the twelfth week of the Fall Semester

Student Name _____

Project Title _____

Project Supervisor _____

Date submitted _____

Project Approved? _____

Comments:

**Capstone Project Proposal
Supervisor Form**

Student Name _____

Project Title _____

I certify that I am willing to supervise this proposed Capstone Project. In my judgment, the proposed work constitutes a substantial and independent project that, if satisfactorily completed, will have fully addressed the four baccalaureate competencies as required by the General Education program of the University of Cincinnati. I have examined the student's proposal and believe that completion of the project including the report by the end of classes in the designated Spring Semester is realistic and reasonable.

Signed (supervisor) _____

Print name _____

Remarks:

**Capstone Project Proposal
Project Description (2-10 pages)**

Capstone Project Mid-term Report
Due at the end of the sixth week of classes

Student Name _____

Project Title _____

Please summarize your progress to date on this project and an outline of goals for each week remaining in the semester.

**Capstone Project Report
Cover Form**

Due on the last day of classes, Spring Semester

Student Name _____

Project Title _____

Project Supervisor _____

Date submitted _____

Committee Comments:

**Capstone Project Report
Social Responsibility Statement (1 page)**

**Capstone Project Report
Report (Minimum 10 pages)**

**Capstone Project Report
Supervisor Report Form
Due on last day of final exams**

Student Name _____

Project Title _____

Supervisor name (print) _____

Supervisor signature _____

Recommended grade _____

Supervisor: Please write a brief assessment of this project, including the achievements relative to the original goals.