Approved 11/5/2002

The Capstone Experience
(for 2003-04 graduates)

The University requires a "Capstone Integrating Experience" of all seniors. A student in Mathematics will fulfill this requirement by completing a project which demonstrates his or her ability to independently study some area of mathematics, and to communicate, orally and in writing, the knowledge so obtained.

The Mechanism: Each student will be responsible for choosing a project and a supervisor. If the supervisor approves, the student will then propose (in writing) this project to the Undergraduate Committee. The Undergraduate Committee will then decide whether the project is appropriate.

At the completion of the project, the student, with the approval of the supervisor, will present the final written report to the Undergraduate Committee. The committee will then decide whether this report is adequate. If so, the supervisor will make arrangements for the public presentation. At the completion of this presentation, the student will have completed his or her capstone experience and met the graduation requirement.

The Project: Many different types of projects will be considered acceptable. They should all satisfy three criteria.

> The student should learn some Mathematics outside the classroom setting.
>
> The student should synthesize material obtained from different sources.
>
> The student should clearly communicate, orally and in writing, what he or she has learned.

Some possible kinds of project:

> The student may undertake research in collaboration with a faculty member.
>
> The project may be further study of an area of interest to the student. For example, someone interested in combinatorics could study, and report on, design theory.
>
> The project might be an application, new or old, of mathematics. For example, the student could learn about the application of linear algebra to Markov chains.
>
> The student could base his or her report on an article in The Mathematical Monthly.

Some projects that would not be acceptable.

> An unadorned computer program would be unacceptable. A nontrivial program, in conjunction with a paper explaining the mathematics involved might be acceptable.
>
> A summary of an article, or a book report, might be inadequate. As stated above, the student should synthesize material from different sources. The project certainly could be based on a single article or book, but at the very least, the material should be placed in an appropriate context.

A report on the history of some mathematics might or might not be acceptable. One of the criteria above is that the student learn some mathematics (not just history). A history that demonstrates the student's mastery of the mathematical issues involved would be good.

Projects undertaken for other purposes could be used for this as well. For example, the project could be based on a summer research experience or internship. (Projects undertaken for a class may serve as a basis, but must be considerably extended.) The paper and public presentation will still be needed, however.

The Roles of Student, Capstone Supervisor, Coordinator, and Reviewers:

The student is responsible for finding a capstone supervisor and a project, for getting the necessary approvals from the Undergraduate Committee, and for completing the project.

The capstone supervisor's role is primarily to provide guidance. He or she may help in the choice of project (e.g., by suggesting articles to look at), and may need to provide encouragement or suggestions at difficult moments. The capstone supervisor and student may choose to meet regularly to discuss the student's progress on the project. The amount of assistance needed will naturally vary, but the project is the student's not the capstone advisor's. The capstone advisor will, however, have to approve the student's work (both the project proposal and the project paper) before it is taken to the Undergraduate Committee.

The Undergraduate Committee assigns a coordinator for the capstone project. The coordinator selects two reviewers of the project, who decide on the eligibility of the project and ultimately rate the project. The reviewers are anonymous, although they may choose to reveal their identity to the student. (One of the reasons for the anonymity of reviewers is to help ensure that students write papers intended for a general mathematically mature audience whom they do not know.) The reviewers read the student's capstone proposal and rate it as acceptable or unacceptable. Once the proposal is rated as acceptable, the student proceeds to work on the project. When the capstone supervisor is satisfied that the written part of the project is complete, the coordinator passes the paper along to the two reviewers. The reviewers rate the project and give directions for changes (if necessary). The coordinator passes along the comments to the capstone supervisor, who discusses them with the student. The student makes corrections and resubmits the paper to the coordinator. This process is repeated until the paper is given a passing rating by the two reviewers. Once the paper has been passed, the student sets up a time to give the oral presentation of the project.

Some Final Notes:

An outstanding capstone project might satisfy the honors requirement.

Faculty in other disciplines can serve as supervisors.

The public presentations should be 25-50 minutes in length. Of course the paper will be more extensive.

The paper must adhere to the usual standards of style and format. It must be typed, and it must contain a proper list of references.
The final paper must be submitted to the Undergraduate Committee no later than the mid-term date of the student's last semester before graduation. Similarly, the student's presentation must be given no later than the last day of classes in the student's last semester before

graduation. The mid-term date and the last day of classes are determined by the Office of the Registrar and published in the semiannual *Schedule of Classes.*

DEADLINES FOR CAPSTONE PROJECTS

The student should choose a supervisor as early as possible in the term *before* graduation, i.e., the first term of the senior year. (An earlier start would be even better). The student and the supervisor then agree on a project, and the student writes a proposal, outlining the project. This proposal is submitted to the Undergraduate Mathematics Committee, which appoints a project coordinator. The project coordinator selects two anonymous faculty reviewers.

After the reviewers approve the project, the student does it, and writes a paper. This is then submitted for approval.

After the paper is approved, the student in conjunction with the advisor and coordinator will schedule public presentations. These will normally be given the semester in which the student graduates. The supervisor will actually make the arrangements for the presentation.

Deadlines For Spring Graduation:

By Registrar's Mid-term, Spring semester	Submit completed paper for review.
By the last day of Spring semester classes	Give presentation

Deadlines For Fall Graduation:

By Registrar's Mid-term, Fall semester	Submit completed paper for review.
By the last day of Fall semester classes	Give presentation

Deadlines For Summer Graduation:

By the last day of classes, Spring semester	Submit completed paper for review.
One week prior to the last day of second block classes	Give presentation

If a student fails to meet either of these deadlines, they will not be allowed to fulfill their capstone requirement until the following semester. This will delay their graduation.

In the event of an unforeseen and unavoidable emergency, a student has the right to appeal to the Undergraduate Mathematics Committee for an extension of the deadline. No extension will be granted for students who are not already making satisfactory progress toward the completion of their capstone at the time of their appeal. Appeals should be made two weeks in advance of the deadline to assure that the Undergraduate Mathematics Committee can rule on the appeal before the deadline date.

GUIDELINES FOR THE PROPOSAL

Keep it simple. No more than one page is needed.
References are required. (A minimum of three is suggested.)
The proposal must be typed.
The supervisor's signature is necessary.