

The Anatomy of a Computer Information Systems (CIS) Capstone Course at a Small Midwestern University

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Abstract

In recent years greater attention has been paid to the development of capstone courses in undergraduate programs. This paper describes the methodology used by the Computer Information Systems program at Siena Heights University in Adrian to develop and implement a capstone course. Students seem to find the approach educational, valuable and enjoyable, and it is hoped that this paper can provide some useful information to those who are in the process of designing or redesigning CIS capstone classes for their institutions.

Key words: Capstone Course, Senior Project, Feasibility Study, Systems Analysis, Systems Design, Systems Implementation, Poster Presentation, CIS curriculum.

1. INTRODUCTION

In recent years greater attention has been paid to the development of capstone courses in undergraduate programs. According Burrows (2002), capstone courses should provide an opportunity for conscious integration of knowledge gained during the college experience into a project that involves both reflective thought and effective action in the contemporary world. Fanter (2006) pointed out that capstone courses give those nearing graduation an opportunity to integrate all of the materials they have learned in a one or two-semester course, assuring that the learning objectives set by the faculty, department or university have been met. At Siena Heights University

the CIS capstone course is intended for undergraduate students nearing the completion of their degree program. This course builds on the skills and knowledge acquired in previous courses emphasizing "real world" situations, and provides an opportunity for the students to demonstrate their competencies and communication skills. Our capstone course, CIS 495 – Senior project is a three credit year long course. Students have the option to finish this course in one semester, but the recommended duration is a year. This paper describes the development and the implementation of this course as it has involved. It is hoped that the ideas and concepts developed here can provide some useful information to those who are in the

process of designing or redesigning CIS capstone classes for their institutions.

2. CIS CURRICULUM & CAPSTONE COURSE

The CIS curriculum in Siena Heights University consists of 45 hours. Out of these 45 hours 12 hours are cognates, while the other 33 hours are Computer Information Systems classes. Out of these 33 CIS hours, 15 hours are core requirements while the other 18 hours are arranged around three concentrations: (1) Information Systems, (2) Computer Networking, and (3) Web Development. CIS 495 Senior Project is part of the concentration requirement which is a part of the 33 CIS hour requirement. Students are advised to choose a senior project that is suitable for their concentration. For example a student who is concentrating on Web development must choose a web development project while a student who concentrates on Information System should choose an Information System project. The Faculty advisor is available to help the student to choose an appropriate project. The department also works with the community and our alumnae who are working in the field to help the student to choose real world projects. CIS majors are advised to register for CIS 495 during the fall semester of their senior year. During the fall semester, the faculty advisor works with the students to choose a suitable project and then to develop the scope of that project. Fig 1 shows the required courses for a CIS major at Siena Heights University. It also shows the three concentrations and the required classes for these concentrations. Please note that the CIS 495 is listed under the concentrations to show the importance of choosing a project that is appropriate for the concentration.

Computer and Information Systems Bachelor of Arts Degree Major

A. Cognate Requirements

.....12 hours

- 1. BAM 311 Business Ethics 3
Or PHI 220 Introduction to Ethics 3
- 2. MAT 174 Introduction to Data Analysis 3
- 3. MAT 260 Discrete Mathematics 3
- 4. TSC 101 Fundamentals of Speech 3

B. Core Requirements

.....15 hours

- 1. CIS 119 Visual Basic Programming 3
- 2. CIS 218 Introduction to Info Systems 3
- 3. CIS 252 Introduction to C++ 3
- 4. CIS 353 Systems Analysis 3
- 5. CIS 363 Database Management Systems 3

C. Concentrations

.....18 hours

a. Information Systems

- 1. CIS 340 Java Programming 3
- 2. CIS 443 Data Communications 3
- 3. CIS 465 Management Info Systems 3
- 4. CIS 400/300 Approved Electives 3
- 5. CIS 480 Internship 3
- 6. CIS 495 Senior Project 3

b. Networking

- 1. CIS 370 Network Operating Systems 3
- 2. CIS 443 Data Communications 3
- 3. CIS 470 Data and Network Assurance 3
- 4. CIS 400/300 Approved Electives 3
- 5. CIS 480 Internship 3
- 6. CIS 495 Senior Project 3

c. Web Development

- 1. CIS 340 Java Programming 3
- 2. CIS 485 Special Topics 3
- 3. CIS 460 Web Development 3
- 4. CIS 400/300 Approved Electives 3

5. CIS 480	Internship	
	3	
6. CIS 495	Senior Project	3
D. Total for Major		
.....45 hours		
E. General Education		
.....29 - 34 hours		
F. General		
Electives.....41- 46 hours		
G. Total for		
Degree.....120 hours		

Fig 1: CIS Curriculum

3. GENERAL COURSE STRUCTURE

The catalog description of this course from the University catalog reads as follows: "Under faculty supervision, students will design and implement major projects which integrate their previous course work and experience. The projects will include formal proposals, systems analysis and design, program design, testing and implementation, user's manuals, poster sessions and formal oral and written reports. Additional transitional experiences will include activities such as preparation of a formal resume, participation in professional meetings/conferences, poster session, membership in professional organizations, career professional interview, and presentation of journal articles." (Siena Heights University, 2006)

Senior project is a 3 credit hour class and at Siena Heights University all 3 credit hour classes meet for three 50 minute periods or two 75 minute periods. As this course is year long with only three credit hours associated with, we vary a little bit from the norm for this class. During the fall semester the class normally meets one time per week and this time is used to discuss the project selection process, the project report requirements, oral presentation requirements, poster presentation requirements, and faculty expectations. As the semester progresses students are expected to report their progress with the students and faculty. At this time the faculty member who is responsible for the Sr. Project course may pair a particular student with another faculty member who is an expert in the topic. If a particular student

needs more consulting time with the other faculty members to discuss his/her project, the faculty members are available outside the class time. At the end of the fall semester students who registered for the course will receive an I grade and this incomplete grade will be removed by the end of the academic year by completing the project successfully. This process has been approved by the registrar, and the academic dean. While this is the normal process, there are exceptions where a student would like to graduate at the end of the fall semester or a student cannot register for the course until the winter semester. The department always tries to work with the student to solve these individual problems.

In the fall semester, students in consultation with the faculty member decide on a project and then determine the scope and the complexity of the project. The expectation of the faculty is that by the end of the fall semester, students must have a clear idea about the scope and depth of their project. During this time students communicate their project descriptions with faculty, other students, and their site supervisor (for external projects) to develop an appropriate proposal for their project. Once the proposal is agreed upon by the faculty and the student, the student is responsible for the completion of the project. Even though minor changes are inevitable in any technology project, any major changes in the scope are discouraged after the project is approved. This policy is implemented due to the time constraint and also to let the student know the importance of time management, and project management.

4. COURSE STRUCTURE

We offer the capstone class (CIS 495) in the fall semester of every year. During the first few weeks the instructor introduces the capstone course concept and its requirements in the class. During this time the instructor emphasizes the importance of time management, and project management. Next the instructor discusses the selection of a project for their capstone course. Some students are employed full time and they may already have a project to work with. A good number of Siena CIS alumni are working locally and the

department has established a good relationship with their employers. If a Siena student is in need of a project, the CIS department will contact these employers to see whether a student can be matched with a business. The department would like the students to work on real world problems and we have been very successful in finding projects for the students. If a student is developing a project externally, then the department would like to have an external site supervisor to monitor the progress of the project at the external site. The site supervisor who is an experienced in the field will become a mentor to that particular student.

Topics	Year Long
Project Proposal	October 1
Update 1	December 1
Update 2	Feb 1
Update 3	March 1
Rough Draft	April 1
PP review	April 15
Presentation	April 25
Poster	April 25
Final Report	Final Week

Fig 2: Sr. Project Schedule

Fig 2 above shows a typical schedule and the major milestones in the development of the capstone course. As listed above, the project development starts with a proposal, then three updates, and then a draft of the final report. Students are required to create a poster of their project and this poster is displayed before the project presentation. Students are also required to make a 30 minute oral presentation (20 minute presentation with 10 minute questions and answers session) of their project towards the end of the semester. The final report of their project is due during the last week of the class.

a. Project Proposal

In this document students are expected to propose a project for detailed study and development. This may be a project development, web site design, or the in-depth study of some other major CIS related topic. Students will consult with the

instructor and the site supervisor to complete this document. In this document students are expected to describe the problem, solutions, rationale for solutions, resources needed, time line and any other information that is necessary to understand the problem. Sometimes students present their proposal in the class so that others can critique and provide suggestions for improvements. Students are expected to develop a clear and workable time line and then to keep it. The minimum length requirement for the project proposal is 5-pages. This is a graded activity and students are encouraged to consult with faculty members before the submission of the proposal. This document must be approved by the site supervisor before submission.

b. Analysis & Design Report/Update 1

Once the proposal is accepted, this proposal will serve as the base for the year long project. Students normally spend the next two months researching the project, collecting data, and conducting a feasibility study and a systems analysis. The system design component could also be finished by this time. Students are expected to be in contact with the faculty member and the site supervisor to apprise them the progress of their study. Students are expected to submit their feasibility, Analysis, and Design summary in a report form. This report should include all the data collection, input, output, file designs, storyboards etc. A 10 page paper is expected for this report. This document must be approved by the site supervisor before submission.

c. Systems Development/Update 2

For the next two months students are expected to work on developing their system. This may include the selection of the appropriate programming language/software package, selection of hardware if required, and then convert the approved design into a working system. Students are expected to be in constant contact with the faculty and the site supervisor to report their progress during this period. Any problems arise during this time need to be solved in a timely manner with the help of the site supervisor and the faculty. The system components are written,

compiled and tested at this time. The final system must be submitted in machine-readable form. The actual code must be included with the final report as an appendix. A ten page paper is expected for this report. This report must be approved by the site supervisor.

d. System Implementation/Update 3

At this time students must be working on the implementation, system conversion, maintenance, and user guides. Students must consult with the site supervisor/users to develop the required training material. Students are requested to include the steps they have taken to train their users in the report. A ten page report is expected for this part.

e. Rough Draft of the report

This report consists of all the previous reports and updates combined. Students are expected to expand their reports from the previous submissions. Students are asked to organize this report in a logical fashion to make it easy to read. The report must be prepared to be published in a journal. The report must be between 30 and 35 pages long excluding the code, screenshots, reference, appendixes etc.

f. PowerPoint & Poster Review

Students are required to submit their PowerPoint Presentation and Poster a week before the presentation. A specification document that describes the detailed requirements of the oral and poster presentations is given to the student before the presentations. The instructor critiques the PowerPoint presentation and the poster for content, organization, and appropriateness. Students are expected to make modifications on their presentation and poster after this critique.

g. Poster Presentation

The oral presentations are normally in the evening starting at 6:00 PM. The whole campus is invited for this presentation together with the friends and the family of the graduating seniors. Light refreshments are normally served for this occasion. Students are expected to display their poster outside the presentation hall at 5:00 PM on

the day of the presentation. They are also required to be present to answer any questions raised by an attendee. This poster will be on displayed in a public area until the end of the semester.

h. Presentation

After the poster presentation, students will present their projects to the University community. Site supervisors together with the family and friends of the students are invited for this presentation. Each presentation will last for 20 minutes and another 10 minutes for question and answers. Pictures of the presentation were normally taken to include in the department news letter.

i. Final Report

The final report is the accumulation of all the projects /reports developed by the student so far. It must be of professional quality and must be suitable for publication. Students are required to consult the APA guide for the preparation of this document. The report must include a cover page, Table of Content, list of Tables and Figures, Introduction, Problem Statement, Feasibility, Analysis, Design, Development, Implementation, Maintenance, Conclusion, References and Appendixes. The size of your report varies but a minimum of 30 pages are expected excluding the appendixes

Milestones	Points
Project Proposal	50
Update 1	25
Update 2	25
Update 3	25
Draft Report	25
PP & Poster Review	25
Presentation	50
Poster Presentation	25
Final Report	50

Fig 3: Sr. Project Point Distribution

Fig 3 above shows the point distribution for each milestone. All milestones described above are graded and all grades are

awarded by the course faculty in consultation with the site supervisor.

5. LESSONS LEARNED

Overall the students seem to like the year long project format over the semester long format as it gives them more time to analyze, design and to develop the system. The faculty and the site supervisors are impressed by the quality of the project and the presentation. A study conducted by Tuttle (2000) reported that students recommended expanding the capstone course from a one semester course into a two semester course. The student evaluation of the course was very high compared with previous years with a different format. Students reported that they liked the site supervisor contact as that helped them to solve problems faster. We are planning to strengthen and expand the external site supervisor concept as a way to help the student to develop the best project they can. This also is helping the department to develop new internship sites for CIS majors.

Some students reported that the instructions for oral presentations and poster presentations were not very clear while the instructions for the written report was very clear. We are in the process of developing detailed instructions for oral presentations and poster presentations. We would like to distribute these documents to the students two months before the presentation. Students also reported that the most difficult aspect of the project development was to settle down on a project and then to develop the project proposal. We are in the process of developing a set of project criterions that can be helpful to a student in his/her project selection process.

6. CONCLUSION

Siena Heights University is a small undergraduate institution and we have very limited resources in terms of faculty and budget. The faculty members agreed to take the extra work to monitor the senior project progress with very limited remuneration. Our site supervisors are also volunteers and they accepted this challenge as a service to the institution. Duplicating this kind of

success may not be that easy in larger institutions. Our students accepted the challenge of doing the project in a year long format even though they are getting only three credits. Coordinating the activities of each student is a lot of work and currently a faculty member is coordinating/teaching the senior project as part of his regular workload.

7. REFERENCES

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