

Summary

Changes from Pre-Assessment

The planned *Major Topics* changed little. All listed topics except system and network architecture considerations were covered.

The *Laboratory Projects* experienced moderate changes. Some individual work was cancelled to allow for more in-depth collaborative work experiences. A balance of analysis and design work was planned, but the bulk of the course work was in the analysis phase, only (though the distinction is a bit arbitrary for some pieces of systems development).

Planned *Oral and Written Communications* activities were maintained. An additional hybrid individual- and group-exercise concerning heuristic evaluation occurred.

Post-Assessment

There were mixed results in comparing student performance on two similar exercises on data flow diagramming. Generally, students who started strong finished strong, but students who started at medium or low strength maintained their performance or indeed declined. Within this declining group, it appears that only half of the data is useful however. The conclusion is to re-organize the schedule to allow for slightly more time on the topic (allowing one additional feedback cycle) as well as targeting students of low strength for individual instruction in the early part of the course.

Students generally maintained their levels of performance on presentations, which is currently at a good, but not excellent, level. The schedule should be able to be adjusted to allow for a small amount of additional time geared to prompting students to craft excellent presentations.

The following report was created by Duke Hutchings.

Course Number, Course Title and Credit Hours

CIS 330 – Systems Analysis and Design – 4 semester hours

Course Coordinator

Duke Hutchings

Current Catalog Description

This in-depth study of standard techniques for analyzing and designing information systems (IS) emphasizes effective written and oral communication as students examine a system using a realistic business scenario. Appropriate CASE tools (Visible Analyst and/or Visio) are used during the analysis phase. Visual Basic, Crystal Reports, and Access are used during the implementation phase to create a simulated software application.

Textbooks

Systems Analysis and Design (7th edition) by G. B. Shelly, T. J. Cashman, & H. J. Rosenblatt. ISBN: 1423912225.

UML for Mere Mortals by R. A. Maksimchuk & E. J. Naiburg. ISBN: 0321246241.

References

Students do not receive reference material at the beginning of the class. The instructor will provide references to online manuals for various software applications (such as CASE tool documentation) as necessary. The instructor will also provide references to Web material as the semester progresses.

Course Goals

The following description is taken directly from the course syllabus (<http://facstaff.elon.edu/dhutchings/classes/CIS330/syllabus.shtml>).

Stated broadly, there are three learning goals in this class.

1. Students learn about several popular, commonly used methods for the overall analysis and design of computer information systems.
2. Students learn about the details of a particular analysis and design method: structured analysis.
3. Students engage in many key activities that comprise structured analysis.

Prerequisites by Topic

CIS 301 – Database Management and Analysis and one of the following courses.

- CIS 216 – Programming in a Visual Environment
- CSC 130 – Computer Science I

Major Topics Covered in the Course

- Definition of a *computer information system*
- Modern methods of building CISs: structured analysis, JAD, RAD
- Systems Planning
 - The role of a CIS in a business model: making a business case for a CIS
 - Visualizing and creating business models with UML
 - Understanding factors that affect the success of a CIS
 - Reading and responding to system requests, conducting feasibility analyses
- Systems Analysis
 - Determining and defining system requirements, including interpersonal skills
 - Visualizing requirements with UML Use Case Diagrams
 - Differentiating logical and physical process and data models
 - Using CASE tools to create and critique dataflow diagrams and data dictionaries
- The transition from Analysis to Design
 - Choosing a platform (mixing web-based approaches with traditional software)
 - Deciding to proceed: choosing whether to Outsource, Buy, or Design?
- Systems Design
 - Ensuring the usability of designed interactive applications
 - Creating sensible databases, including a review of normal forms
 - ~~Considering possible architectures, including networking considerations~~

Learning Outcomes with Cross Reference to CIS Program Outcomes

The following description is taken directly from the course syllabus (<http://facstaff.elon.edu/dhutchings/classes/CIS330/syllabus.shtml>).

By completing various in-class exercises, individual homework assignments, and collaborative homework assignments, students should acquire or improve a number of skills that can help them excel as a systems analyst.

1. The ability to compare alternatives and provide relevant justifications in decision-making scenarios (Outcomes 1, 3, 5, & 9 – 11).
2. The ability to emphasize the role of people in a computer information system by creating systems that have the following properties (Outcomes 5 & 9).
 - Systems that exhibit high degrees of usability for end-users.
 - Systems that can be maintained and understood by analysts and programmers.
 - Systems for which analysts and managers can make a strong business case.
3. The ability to use industry-standard tools in the analysis and design process, such as CASE tools (Outcomes 3, 10, & 11).
4. The ability to work with people as a team and present information to people inside and outside of a team (Outcomes 1 – 3).

Laboratory projects

Planned: Four individual assignments comprise one to two weeks each. Planned topics include analyzing a preliminary investigation report, creating a dataflow diagram, creating a data dictionary, and database normalization analysis.

Actual: Two individual assignments each comprised approximately 1.5 weeks. The first two planned topics (analyzing a preliminary report for the existence of standard feasibility tests and creating a dataflow diagram) were covered. Data dictionary creation occurred in a collaborative project. Database normalization analysis did not occur.

Planned: Two collaborative assignments comprise two to four weeks each. Planned topics include description of CIS opportunities given a business model and design of a usable interface.

Actual: There were two collaborative assignments. The first assignment lasted two weeks and proceeded as described. The second assignment lasted five weeks but did not focus on the creation of a usable interface. Instead, students completed an analysis phase of a simulated large project by conducting interviews, designing and piloting questionnaires, crafting UML diagrams to illustrate project requirements, and creating a comprehensive set of dataflow diagrams and a data dictionary. Groups presented their work in each of the collaborative assignments.

Estimate Curriculum Category Content (in semester hours)

	Core	Advanced
Hardware and Software		
Modern Programming Language	< 0.5	
Data Management	< 0.5	
Networking and Telecommunications		
Analysis and Design	2.5	1.0
Role of IS in organizations	< 0.5	
Quantitative Analysis	< 0.5	
Information Systems Environment	< 0.5	

Oral and Written Communications

Students completed two individually-written reports of one to two pages.

Students completed two collaboratively-written reports of one to two pages and deliver collaboratively-developed oral presentations of 10 to 20 minutes.

Students also participated in a number of in-class discussions and exercises, including a heuristic evaluation of an airline Web site.

Collaborative Skills

See *Oral and Written Communications*. In addition, students will take quizzes in a collaborative fashion to foster discussion of key concepts and devote extra time to challenging topics.

Global, Social and Ethical Issues

Planned: The topic *Deciding to proceed: choosing whether to Outsource, Buy, or Design?* addresses concerns raised by allowing companies in foreign lands to be involved in some part of the systems design process. The instructor uses two class periods for this topic. Students receive informal feedback from an in-class exercise and receive formal feedback from sections of one quiz and one examination.

Actual: The planned in-class exercise did not occur.

Planned: Social issues pervade the course material, with emphasis occurring broadly in the *Planning* and *Analysis* sections. Students come to understand the needed emphasis on people in building an IS and realizing that businesses have a variety of social systems and mechanisms in place that affect the other phases of structured analysis.

Actual: No changes.

Planned: Ethical issues arise only upon student interest. A more thorough treatment of ethics occurs in the follow-on course (CIS 430).

Actual: No changes. Note that ethics is likely to occur more tangentially than as a “thorough treatment.” See the assessment materials for CIS 430 for more details.

Theoretical Content

The course covers the typical steps that compose the SA method. We devote one class period to discussing the similarities and differences of SA to JAD and RAD, two other popular, modern approaches. Most of the course is applied however, with students participating in the detailed steps that comprise SA.

Analysis

See *Major Topics Covered in the Course*.

Design

See *Major Topics Covered in the Course*.

Course Assessment (final assessment: January 12, 2009)

Proposed changes from last offering (Planned assessment)

Not applicable – The instructor is new to Elon and the previous instructor has retired.

Learning objectives/outcomes to be assessed, how they will be assessed and success criteria (Planned assessment)

Outcome 3 regards the selection of appropriate artifacts of the analysis and design process. I plan to assess this particular outcome through the following analysis.

- There are four individual homework assignments in the class. The second assignment requires that students produce a dataflow diagram (DFD) and the third assignment requires that students produce one or more DFDs and a data dictionary. The instructor will grade the DFDs using the same methods and will record individual performance for each student for each assignment. The following observations are considered successful.
 - Students who improve performance on individual sections of the grading
 - Students who maintain high performance on individual sections of the grading
 - Students who show overall improvement or maintenance of high performance

I also plan to assess the effectiveness of the feedback received on the first collaborative assignment by comparing performance on the in-class presentation of the first and second collaborative assignments (again, both graded in the same way). I will consider that feedback to be successful if overall class performance improves.

Final Assessment data and analysis (written January 12, 2009)

Two assignments are considered: an individual assignment in which students create a small portion of a data flow diagram (worth 50 points) and the first half of a collaborative assignment in which the students create a comprehensive data flow diagram (also worth 50 points). There were some differences in the grading of the assignments, but grading criteria essentially overlapped. Raw data appears at the end of this subsection.

Two groups produced outstanding work by scoring 49 and 50 points, respectively, on the second assignment. Most of these students also did well or extremely well on the preceding individual assignment, so there was success in that six of twelve students initially exhibited high performance and then maintained or exceeded that level of performance on a subsequent, more in-depth and difficult assignment.

Two groups produced fair or poor work by scoring 36 and 29 points, respectively. Most of these students produced good or fair work on the preceding individual assignment, so these students in fact decreased in performance on a subsequent more in-depth and difficult assignment.

In summary, half of the students maintained high performance while half of the students fared worse when given a more challenging assignment. Appearing below is the raw data. Note that student grades appear under codes to protect student privacy. The first letter of the code indicates group membership on the second assignment.

<u>Name</u>	<u>IA</u>	<u>CA</u>	
A1	47	29	
A2	41	29	Group A fared worse
A3	37	29	
B1	45	36	
B2	39	36	Group B fared worse
B3	36	36	
C1	52	49	
C2	50	49	Group C maintained high performance
C3	48	49	
D1	49	50	
D2	49	50	Group D maintained high performance
D3	43	50	
Avg	44.7	41.0	
σ	5.4	9.3	

Note that while the average score falls from the first assignment to the second assignment, the standard deviations indicate that this difference is unlikely to be statistically significant. Nevertheless, a decrease in average is undesirable.

I was not surprised about the maintenance of high performance in groups C and D but was surprised about the dramatic drop in performance of groups A and B. As a result, the instructor informally conferred with members of the groups.

Group A: Two members admitted that they ignored the instructions to develop the diagrams together and instead parceled out pieces of the assignment to different group members. One group member was responsible for the entire 50 points and further was unable to spend a desirable amount of time in completing the assignment. The low score appears to reflect a lack of effort rather than an absence of skill.

Group B: Members indicated that they did work together but were unclear on a number of design issues and design rules for data flow diagrams. In a sense, this was a “true drop,” unlike Group A.

In summary, 50% of the students maintained high performance, 25% of the students were unable to maintain performance or perform better when given a more challenging assignment, and 25% of the students are difficult to assess because of the combination of ignoring instructions and lack of appropriate effort.

Based on this information, instructional methods are likely to require changes. Although half of the students performed at a very high level, having one quarter of the students drop in score is unacceptable. In looking at the course schedule, I recommend removing some time from other areas (likely slimming down on some usability and some UML),

adding some time for a quiz to allow an additional feedback cycle, and possibly requiring in-office conversations for students who perform fair or worse on the initial assignment. Having an additional graded assignment can also mediate difficulties in comparing individual work to group work.

Regarding class presentations of collaborative assignments, I recorded scores along three key dimensions on 100-point scales: (1) adherence to time limits; (2) oral and visual delivery; and (3) overall persuasiveness (presentation flow, question-answering ability, confidence, etc.). The table below indicates the average score in each category for the first project (P1) and second project (P2).

<u>Category</u>	<u>P1</u>	<u>P2</u>
Time	83	100
Delivery	83	82
Persuasive	83	80

As we see, performance was good for the initial projects. Students performed better with time on the second project but unfortunately did not rise to the level of very good or great on delivery or persuasiveness in the second project. As a result, it seems that the feedback that students are receiving is insufficient. Given that students are doing well but could clearly improve, one way to address the issues is to introduce a dedicated class period concerning presentations that include technical topics (and how to deliver to a business, technical, or mixed audience).

Ignoring the quantitative data for a moment, I did observe a few students improve on mistakes from their first presentations while also observing some students introduce new mistakes on their second presentations. A noticeable problem in the first round was using visual figures that were too small to read, perceive, or use in a meaningful way. This problem disappeared in the second round. I saw one group introduce videos that could have been useful, but in fact detracted from the presentation. Allowing students one more opportunity to learn about presentation skills would be helpful in the class.

Proposed changes for next offering

As stated above, re-aligning the schedule will likely be beneficial, as would incorporating additional time to discuss effective presentation techniques. Additional changes:

- *Change the textbook.* I had the opportunity to inspect a number of alternative textbooks during the term and concluded that the current textbook has a number of serious relative weaknesses, including both breadth and depth of presented material. In particular, the poor use of images and graphics and overuse of jargon (often undefined) raises significant questions about the use of the book in an academic setting. The corresponding UML textbook often confused the students and was hard to integrate with the main textbook. I found the following two books to be superior but others likely exist that should be considered: *Systems Analysis & Design* (4th Edition) by Dennis, Wixom, and Roth (9780470228548) and *Modern Systems*

Analysis and Design (5th Edition) by Hoffer, George, and Valacich (9780132240765). I have placed orders for review copies.

- *Consider effects on CIS 430.* In the past CIS 430 has mostly been an extension of CIS 330, but I found it difficult to accomplish with the current textbook (based on the prior instructor's written materials, I covered more ground than in previous years). Using a textbook that is both broader and deeper like the ones presented above allows for more flexibility in CIS 430 (whether it extends 330 or can be treated as an independent course).
- *Evaluate the use of a project.* I adopted an approach of using two projects that were unconnected, but the course could also use a semester-long connected project as well. There are benefits and drawbacks to each approach. A key issue is to address the utility of completing a project or multiple projects and students prepare to apply for job interviews. Juniors might be in need of a "big project" but seniors might benefit from smaller projects that expand or hone existing skill sets (since they are already applying for graduate school or in some cases interviewing for jobs). Do students need a comprehensive project for a portfolio or can they better exhibit different skills by highlighting work from different projects? Should "project skills" come mostly from internship experiences while classes cover the breadth of systems analysis and design techniques? If there is interest in the department, it might be worthwhile to explore this topic during a department meeting or through brief position papers.
- *Tighten the schedule.* A number of aspects of the schedule worked well (such as quizzes) but others did not. For example, during the first project, the instructor allowed approximately 20 to 30 minutes for groups to meet in class to accomplish project objectives, but several teams often used only 5 or 10 minutes of the time. Curiously, students often find trouble trying to meet outside of class but did not exploit in-class time for work. For both exams, the instructor allowed an entire day for review (before the exam) and an entire day for discussion (after the exam), but both periods went underutilized. Better use can be made of available time.