

Course Group Status Report

Operating Systems Group

Course no.	Title	Credit hours	Reqd – core (R)/ Reqd – opt (O)/ Elective (E)	Capstone?
CIS660	Introduction to Operating Systems	3	R	
CIS662	Operating Systems Laboratory	3	E	
CIS741	Comparative Operating Systems	3	E	
CIS760	Operating Systems	3	E	
CIS762	Advanced Operating Systems Laboratory	3	E	Y ?
CIS763	Introduction to Distributed Computing	3	E	

1. Summary

Operating systems, along with the newer and related field of distributed system, has been a core component of computer science education. We are fortunate to have a good range of classes in this area. The sequence starts from CIS 660, a typical undergraduate operating systems class.

CIS 662 is a related lab class, which focuses on implementation and evaluation of the algorithms the students study in CIS 660. CIS 760 is one of our core graduate classes, and is an elective for our undergrads. CIS 762 is the second lab class. CIS 763 focuses on distributed computing.

Finally, CIS 741 is a class comparing different operating systems.

2. Detailed Analysis

Section 2.1 describes the individual courses in the group. Section 2.2 explains how the group is related to the rest of program. Section 2.3 explains how the group helps meet a range of ABET and CSE objectives. Section 2.4 provides information on the feedback we have received about the courses in the group. Section 2.5 summarizes the changes we are considering in the various courses.

2.1 Summary of each course

CIS 660: Introduction to Operating Systems focuses on concepts relevant to operating systems design and implementation. Major topics include processes, CPU scheduling, critical section problems including producer/consumer and dining philosophers, semaphores, memory management including paging and virtual memory and secondary storage. The course also introduces students to system programming including the use of system calls.

CIS 662: Operating Systems Lab. This class is a follow up of 660, and focuses on implementation aspects of operating system modules. The modules typically implemented include CPU scheduling, File System management, devices management, and virtual memory management. Currently, a simulator, OSP, is used.

CIS 741: CIS 741 instructor could not be contacted through e-mail. The registrar's web-site lists the course contents as: "A careful examination of a number of representative computer operating systems".

CIS760. The purpose of this course is the study of advanced operating systems concepts and mechanisms, such as process synchronization, concurrency control, process deadlock, distributed systems, atomicity, transaction commitment, fault-tolerance, computer security.

CIS 762: Advanced operating system laboratory focuses on select concepts relevant to operating systems design and implementation, above the OS kernel level. Major topics include shell design and implementation issues, the shell support of login, environment variables, and command history, and interprocess communication by way of datagram and stream sockets.

CIS 763: Introduction to Distributed Systems", presents concepts and mechanisms in the design, specification, and verification of distributed algorithms. Some synchronization, consistency, and resource management issues that are introduced and motivated in earlier courses are revisited in CIS763, with a focus on disciplined verification of the algorithms. Topics are presented in a layered manner, with each layer building on the previous. The focus through the presentation of the algorithms is on careful reasoning with respect to correctness. With this in mind, the course begins with an introduction to calculational proofs, temporal logic, and action systems. Occasionally, CIS763 also includes programming assignments where students implement (simple) distributed systems in CORBA and/or Java RMI.

2.2 Relation to the rest of the program

Course	Prereqs:	Is a Prereq for:
660	560, 675/EE 662, Stat 427	662, 678, 741, 760, 770, 775
662	660	762
741	660	-
760	660	763
762	662	-
763	760	-

2.3 Relation to program objectives

Relationship to CSE Objectives:

Class	1a	1b	1c	2a	2b	2c	3a	3b	4a	4b	5a	5b	5c
660	xxx	x	xx							x	xxx	xx	xxx
662	xxx		xx							xx	xxx	xx	xx
741	?	?	?	?	?	?	?	?	?	?	?	?	?
760	xxx	x	xx							x	xxx	xxx	xxx
762	xxx		xxx							xx	xxx	xxx	xxx
763	xxx	xxx	xxx					x		xx	xx	xxx	xxx

Relationship to ABET Objectives:

Class	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	3.10	3.11
660	x	xx	xxx		x		x		xxx	x	xxx
662		xxx	xxx		xx		xx		xx		xxx
741	?	?	?	?	?	?	?	?	?	?	?
760	xx	xx	xxx		x		x		xx	x	xxx
762	xx	xx	xxx		xx		xxx		xxx	x	xxx
763	xxx		xxx		xx		xx	x	xxx	xx	xx

2.4 Feedback

The principal official vehicle for student feedback has been student evaluations in the form of SETs. These have generally been positive, with a few suggestions that students would like to see some aspects of the course updated.

2.5 Possible changes

Two major and one minor issue seems to exist with respect to this sequence of classes.

The minor issue is regarding the update of 760 material. Lauria is considering using an alternative book for the offering next year, as well the possibility of including topics reflecting recent developments in the field, such as middleware for high performance distributed computing, encryption and security.

The first of the two major issues is regarding 741. This class has been offered every summer by Prof. Heimaster, whose primary appointment is with Physics department. He did not reply to the first two e-mails sent regarding this report. Therefore, his input could not be taken as part of this report. However, based upon what we know about the class contents, we are concerned if it is appropriate as an advanced elective or a graduate class in the CS curriculum. We are not aware of a similar class being part of CS curriculum at another university. It also seems that the material has not been updated for a long time, and the coverage of topics is not rigorous. Some informal feedback from the student seems to give an indication that the class is essentially "easy" credits over summer.

The second major issue is regarding 762, in view of the revised criteria for capstone classes and the impending retirement of Prof. Mamrak.

CIS762 as it is currently taught (see <http://www.cse.ohio-state.edu/~mamrak/CIS762/index.html>) meets few of the new criteria for a capstone course. It is not primarily a design course, although students are required to make some design decisions when implementing the labs. The labs are not done in groups, but individually by each student. Documentation is done mainly by way of README files, which can be extensive. There are no presentations by students.

Prof. Mamrak has the following ideas regarding the revision of this class: The course could be redesigned so that the project is to implement a full, extensible, easily maintainable, well-documented shell, containing one example of each essential shell component (token set, grammar, flow-control, login, internal command, and external command). They would also be required to provide stubs for other common shell features (scripting, command-line editing, and job control), and perhaps provide an implementation of one of these features. This new shell project could be done easily in groups, requires considerable design and documentation, and could be described in student presentations to the whole class.

However, the problem with the above revision is that there does not seem to be anyone interested in assuming ``ownership'' of this class when Prof. Mamrak resigns in June 2005. Agrawal and Lauria, who might be considered as potential candidates, are not particularly interested in shell design issues, and may not like to or be effective in running a capstone class on this topic.

Agrawal and Lauria are instead interested in creating a significantly different version of 762, which involves distributed software design with technologies like web-services and/or grid-services. Though this idea has not been developed in details, it seems that such a class could meet the following objectives: 1) the new set of criteria for capstone classes, 2) giving students experience in an area of demand among the employers, and 3) a class that intersects with the interests of the current systems group in the department (particularly, Agrawal and Lauria). We look forward to discussing this idea with the curriculum committee during our 7th May presentation. If we move ahead, the first offering of this class may be in Spring 2005, by Agrawal and/or Lauria. This needs to be discussed with the department chair. A possible arrangement could be a switch between 762 (likely to be assigned to Prof. Mamrak) and one of the sections of 662 (likely to be assigned to Agrawal).

3 Conclusions

The Operating Systems Group is a key component of the CSE program and helps us meet a number of objectives of the program as well as a number of the ABET Criterion 3 objectives. We do not anticipate any changes in 660, 662, and 763 in the near future. Some revisions to 760 are likely in the near future and Lauria is working in this direction. We look forward to discussing the issues regarding 741 and 762 with the curriculum committee.