SCHOOL OF ENGINEERING
AND APPLIED SCIENCE

UNIVERSITY OF CALIFORNIA
LOS ANGELES

COURSE PROPOSAL

TO: Office of Student Affairs
6426 Boelter Hall

Date: ___**October 21, 1998**___

FROM:_____**Peter Reiher**_____**Computer Science**____
(Proposer) Department

Course No. __**CS236A**__ Title ____**Advanced Operating Systems**___ Units _**4**__
New Course _____**X**_____ Revision _____ Deletion _____
Prerequisites _____**CS111 or equivalent**_____

CATALOG DESCRIPTION (Limit 40 words):

Advanced material in operating systems, including operating system architectures (kernels, microkernels, extensibility), fundamentals of distributed operating systems and synchronization, interprocess communications, modern file systems, failure recovery and fault tolerance, security, multiprocessor operating systems, performance and benchmarking.

OBJECTIVES OF THE COURSE:

To expose graduate students to advanced concepts in operating systems and to prepare graduate students for research in the field of operating systems.

JUSTIFICATION FOR PROPOSAL:

This material is fundamental to research in operating systems, a field in which UCLA has excelled for over two decades. The course has been taught successfully as a CS239 seminar course for the past five years, with approximately 15 students per offering.

REQUIRED TEXTBOOKS:

Author(s)	Title	Publisher	Publication Date
Singhal and Shivaratri	*Advanced Concepts in Operating Systems*	McGraw-Hill	1994

Selected research papers from the literature
(a partial list of readings is included below).

RECOMMENDED TEXTBOOKS:

New 10/21/98

HOURS PER WEEK REQUIRED OF EACH STUDENT Lecture__**4**__

A full course should involve a total of twelve (12) hours per week (in-class and outside class), and a half-course should involve six (6) hours, or the equivalent. Senate regulation 760 provides that credit be reckoned at the rate of one unit per three hours of work per week per term, or the equivalent. (For laboratory courses a minimum of (2) of these (3) hours must be in the laboratory - UPC, May 17, 1978.

Recitation_____

Laboratory_____

Outside Study & Preparation__**8**__

Other (explain)_____

TOTAL_**12**__

SCHEDULING DATA: Use of Computer Resources Yes ___ NO _**x**__

To be offered in the _____, __**x**___, _____, _____
SU F W SP
_____**x**_____, _____ beginning with the ___**F**_____ Qtr., 19_**99**_
EVERY YEAR ALTERNATE YEARS

EXPANDED OUTLINE:

Week *Lecture*

1. OS Architectures
1. OS Extensibility
2. Synchronization and Deadlocks
2. Distributed OS Architecture
3. Theoretical Foundations
3. Agreement Protocols
4. File Systems Performance
4. Extensibility in File Systems
5. MIDTERM
5. Failure Recovery
6. Fault Tolerance
6. Midterm debrief/discussion
7. Performance/Benchmarking
8. Security & Protection/Encapsulated Environments
9. Multiprocessor Operating Systems
9. Database OS/Concurrency Control Theory
10. Concurrency Control Algorithms
10. Hot Topics

GRADING BASIS:

25% midterm exam
25% paper/project
50% final exam

Does this modification affect major or minor field program?
Yes ___**X**___ No _____

Submit major field program sheets with handwritten correction.

This course is recommended to satisfy an elective constraint as indicated below:

	Suggested Units (please circle)	Constraints Units Approved by UPC
___ Design_____	0 1 2 3 4	0 1 2 3 4
___ Engineering Science_	0 1 2 3 4	0 1 2 3 4
___ Laboratory_____	0 1 2 3 4	0 1 2 3 4
___ Engineering and Science in Society		DO_NOT_FILL_IN
___ Mathematics - Upper division		

RECOMMENDED Signatures(s):

_____ _____
DEPARTMENT CHAIRMAN PROPOSER DATE

_____ _____
ACADEMIC POLICY COMMITTEE (CSD) CHAIRMAN PROPOSER DATE

_____ Signature: _____
EXECUTIVE COMMITTEE (SEAS) CHAIRMAN INSTRUCTOR IN CHARGE DATE

Expanded Course Reading List

Sources of Failure in the Public Switched Telephone Network, by D. Richard Kuhn, in *IEEE Computer*, Vol. 30, No. 4 (April, 1997), p. 31-36.

IEEE Computer, April, 1997. Issue on Fault Tolerance.
Understanding Fault Tolerance and Reliability, p.45-50.
Beyond Fault Tolerance, p. 47-49.
Toward Systematic Design of Fault Tolerant Systems, p. 51-58.
Software-based Replication for Fault Tolerance, p. 68-74.

Why do computers stop and what can be done about it? in *Proceedings of the 5th Symposium on Reliable Distributed Systems* , August, 1986.

High-Availability Computer Systems, in *IEEE Computer*, September, 1991.

ARPACrash Home Page, by Andrew Johnson.

Towards Transparent and Efficient Software DSM, by Scales and Gharachorloo, in *Proceedings of the 16th Symposium on Operating Systems Principles*, 1997.

Cashmere-2L: Software Coherent Shared Memory on a Clustered Remote-Write Network, by Stets et al, in *Proceedings of the 16th Symposium on Operating Systems Principles*, 1997.

UNIX disk access patterns, by Chris Ruemmler and John Wilkes, in *Proceedings of the Winter '93 USENIX Conference*, 405-420, January, 1993.

A Fast File System for UNIX, by Michael K. McKusick, W. N. Joy, S. J. Leffler, and R. S. Fabry, in *ACM Transactions on Computer Systems*, 2(3):181-197, August 1984.

A Log-Structured File System for UNIX, by Seltzer, M., Bostic, K., McKusick., M., Staelin, C., in *Proceedings of the 1993 Winter Usenix Conference*.

A Case for Redundant Arrays of Inexpensive Disks (RAID), by David A. Patterson and Garth Gibson and Randy H. Katz, in *ACM SIGMOD Conference Proceedings*, 109-116, 1988.

The Zebra Striped Network File System, by John H. Hartman, John K. Ousterhout, in *ACM Transactions on Computer Systems*, 13(3): 274-310, 1995.

Serverless Network File Systems, by T. Anderson, M. Dahlin, J. Neefe, D. Patterson, D. Roselli, and R. Wang, in *Proceedings of the 15th Symposium on Operating Systems Principles*, 1995.

A Pageable Memory Based Filesystem, by Marshall McKusick, Michael Karels, and Keith Bostic, in *Proceedings of the 1990 Summer Usenix Conference*.

A Flash-Memory Based File System, by Atsuo Kawaguchi, Shingo Nishioka, and Hiroshi Motoda, in *Proceedings of the 1995 Winter Usenix Conference*.

File-system development with stackable layers, by John Heidemann and Gerald Popek, in *ACM Transactions on Computer Systems*, 12(1):58-89, 1994.

Implementation of the Ficus Replicated File System, by Richard Guy, et al, in *USENIX Conference Proceedings, Summer 1990*.

The Performance of u-Kernel-Based Systems, by Hernamm Hartig, Michael Hohmuth, Jochen Liedtke, Sebastian Schonber, and Jean Wolter, in *Proceedings of the 16th Symposium on Operating Systems Principles*, 1997.

Microkernels Meet Recursive Virtual Machines, by Bryan Ford, Mike Hibler, Jay Lepreau, Patrick Tullman, Godmar Back, and Stephen Clawson, in *Proceedings of the Second USENIX Symposium on Operating Systems Design and Implementation*, 1996.

Extensibility, Safety and Performance in the SPIN Operating System,, by Brian Bershad, Stefan Savage, Przemyslaw Pardyak, Emin Gun Sirer, David Becker, March Fiuczynski, Craig Chambers, Susan Eggers, in *Proceedings of the 15th Symposium on Operating Systems Principles*, 1995.

Exokernel: An Operating System Architecture for Application-Level Resource Management, by Dawson Engler, Frans Kaashoek, and James O'Toole, in *Proceedings of the 15th Symposium on Operating Systems Principles*, 1995.

Plan 9 from Bell Labs, by Rob Pike, Dave Presotto, Sean Dorward, Bob Flandrena, Ken Thompson, Howard Trickey, and Phil Winterbottom, in *Plan 9, Volume 2: The Documents*.

Information for the Academic Policy Committee:

(1) Approximately how many sessions of this course will be lectures by the instructor? ____**18**____

(2) How will the remaining sessions be conducted (e.g. student project presentations, exams, guest lecturers)?

One midterm exam will be given in class.
One guest lecture.

(3) What is the intended basis of grading in this course?

The class will be graded on the basis of a midterm exam, a final exam, and a research paper and/or project.

(4) Is this course a standard course of a major or minor field? Yes__**X**___ No _____
If yes explain:

Although Operating Systems is fundamental to Computer Science, until now we have covered it at the graduate level with seminar courses.

(5) If this is a standard course, has it been evaluated and approved by the major field group as a whole? Yes __**X**__ No ____

If yes, which other faculty member(s) have agreed to teach the course in your absence? ___**Richard Guy, Richard R. Muntz**___

Optional:
(6) Is this a good course, and will you do a good job teaching it? Yes,yes__**X**__,Yes,no___,No,yes_____, No,no_____

(7) How hard is it?

Of typical difficulty for a graduate course.