TO: Office of Student Affairs  Date: June 4, 1998
6426 Boelter Hall

FROM: D.S. Parker, R. Bagrodia, C. Zaniolo
(Proposers) Department

Course No. CS230A  Title Models of Information and Computation  Units 4
New Course  x  Revision  Deletion
Prerequisites CS131 and CS181, or equivalent

CATALOG DESCRIPTION (Limit 40 words):
Paradigms, models, frameworks, problem solving; axiomatic systems; domains, fixpoint theory; induction. Logical models: deduction; proof; models; semantics; propositional & first-order logic; logic programming. Functional models: equations; combinators; lambda calculus; functional programming. Program models: Hoare logic; object models; standard templates; design patterns; frameworks.

OBJECTIVES OF THE COURSE:
To expose graduate students to the principles behind dominant models of information and computation, models that arise in software paradigms and frameworks.

JUSTIFICATION FOR PROPOSAL:
This material is fundamental in both research and development of software and information management systems.

REQUIRED TEXTBOOKS:

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Title</th>
<th>Publisher</th>
<th>Publication Date</th>
</tr>
</thead>
</table>

Selected research papers from the literature.

RECOMMENDED TEXTBOOKS:

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Title</th>
<th>Publisher</th>
<th>Publication Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hennessey, M.</td>
<td>The Semantics of Programming Languages</td>
<td>J. Wiley</td>
<td>1990</td>
</tr>
<tr>
<td>Gamma, E. et al.</td>
<td>Design Patterns</td>
<td>Addison-Wesley</td>
<td>1995</td>
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</tbody>
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Revised 06/04/99
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.)

TOTAL 12

Use of Computer Resources

Yes ___ NO _x_

To be offered in the_____ , _____, _____, _______, ___, ___, ___, ___, _____, _______, beginning with the____ S_ Qtr., 19___

EVERY YEAR ALTERNATE YEARS

_x_

EXPANDED OUTLINE:

Models, paradigms, frameworks, and problem solving [4 lectures]:
- problem solving, models, and paradigms; UML and metamodeling;
- elementary models of information and computation; axiomatic systems;
- domain theory; least fixed point theory; well-founded induction.

Logical models [6 lectures]:
- sentences and wffs; axioms and inference rules;
- propositional logic; first-order logic; normal forms;
- derivation and proof; models and semantics; logic programming.

Functional models [5 lectures]:
- expressions, equations, evaluation;
- combinators, the lambda calculus;
- functional programming.

Program models [5 lectures]:
- program derivation and verification using Hoare logic;
- standard templates; object models; design patterns; frameworks.

GRADING BASIS:

1/2 Programming projects
1/2 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:

<table>
<thead>
<tr>
<th>Constraints</th>
<th>Suggested Units</th>
<th>Units Approved by UPC</th>
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</tr>
<tr>
<td>Design</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
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<tr>
<td>Engineering Science</td>
<td>0 1 2 3 4</td>
<td>0 1 2 3 4</td>
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<td>Laboratory</td>
<td>0 1 2 3 4</td>
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<td>Engineering and Science in Society</td>
<td><em>DO_NOT_FILL_IN</em></td>
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<tr>
<td>Mathematics - Upper division</td>
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RECOMMENDED

Signatures(s):

___________________________ _______________________________
DEPARTMENT CHAIRMAN PROPOSER DATE

___________________________ _______________________________
ACADEMIC POLICY COMMITTEE (CSD) PROPOSER DATE
CHAIRMAN

__________________________ Signature: _____________________________
EXECUTIVE COMMITTEE (SEAS) INSTRUCTOR IN CHARGE DATE
CHAIRMAN
Information for the Academic Policy Committee:

(1) Approximately how many sessions of this course will be lectures by the instructor? ____20____

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

N/A

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

The class will be graded on the basis of programming assignments and a final exam.

(4) Is this course a standard course of a major or minor field? Yes___x___ No ______

If yes explain:

This course integrates, and supersedes, a number of courses previously offered by different instructors on different topics:

   232A. Operational Semantics of Programming Languages.
   232B. Semantics of Programming Languages.
   234A. Correctness Proofs.
   235A. Logic Programming and PROLOG.

Elements of the material are also taught in other courses, particularly the data management course sequence. The idea is to form a "core" course in the software area, covering important foundations that underly modern software research.

(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? ___Stott Parker, Rajive Bagrodia, Carlo Zaniolo___

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?

Fairly hard.