

CURRICULUM PROPOSAL FORM 2000-2001

NEW PROGRAMS, MAJOR PROGRAM REVISIONS, AND PROGRAM NAME CHANGES PROCESS C

*DEADLINES: Deadline dates for 2000/2001 submissions: Regular proposals: October 20, 2000 to be implemented in Fall 2001; Short-Term proposals: December 8, 2000 to be implemented in Fall, 2001; Regular proposals February 16, 2001 to be implemented in Spring, 2002; March 23, 2000 for short-term courses to be implemented in Spring 2002.

PROPOSAL TITLE: REVISIONS TO THE MA IN HIGHER EDUCATION INSTRUCTIONAL TRACK - COMPUTER SCIENCE SPECIALIZATION

SPONSOR(S): THOMAS L. MUNAHAN - ED LEADERSHIP
JENNIFER KAY - COMPUTER SCIENCE

DEPARTMENT:

COLLEGE:

IF LAS CHECK ONE: History/Humanities Math/Sciences Social/Behavioral Sciences

Check One: Undergraduate Graduate

The attached NEW PROGRAM/MAJOR PROGRAM REVISION/PROGRAM NAME CHANGE proposal is best described by the item(s) checked.

New degree program

New Certificate of Graduate Study Program

New major

New minor

New concentration, specialization, or track

Major changes to degree requirements, major, minor, or certificate program.

Changes to name of college, school, department or degree

Quasi Curricular

DEPARTMENT

(Signature indicates approval)

[Signature] pt. Curriculum Chair / Date 5/3/01

[Signature] Dept. Chairperson / Date 5/3/01

ACADEMIC DEAN (& Graduate Dean, for New Graduate Programs Only)

Approved _____ Not Approved _____ Comments:

Academic Dean's Signature/Date _____

Graduate Dean's Signature/Date _____

See attached coversheet

COLLEGE CURRICULUM COMMITTEE

Approved _____ Not Approved _____

Comments:

Signature of College Chair/Date: _____

See attached coversheet

UNIVERSITY CURRICULUM COMMITTEE

Date of Open Hearing (if necessary) _____ Approved _____ Not Approved _____

Comments:

Curriculum Chair Signature/Date _____

Date voted upon at Senate (if necessary) _____ Approved _____ Not Approved _____

See attached

EXECUTIVE VICE PRESIDENT/PROVOST

Approved _____ Not Approved _____ If no, reasons are as follows:

Student Credit Hours _____ Faculty Load Hours _____ Equalized Credit Hours _____

Official Copy & Approval Sheet Filed (Date): _____ Executive VP/Provost Signature/Date _____

REGISTRAR

Date Approved Course Description Received 5/23/01 Hegis Taxonomy & Course Number Assigned _____

Registrar Signature/Date [Signature]

NOTIFICATION FORWARD

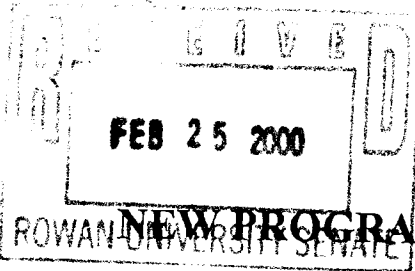
_____ Senate Curriculum Committee Chairperson

_____ Academic Dean(s)

_____ Department Chairpersons

_____ Registrar

_____ Sponsor(s)



CURRICULUM PROPOSAL FORM 1999-2000

NEW PROGRAMS, MAJOR PROGRAM REVISIONS, AND PROGRAM NAME CHANGES PROCESS C

DEADLINES Deadline dates for 1999/2000 submissions: Regular proposals: October 22, 1999 to be implemented in Fall 2000; Short-Term proposals: December 10, 1999 to be implemented in Fall, 2000; Regular proposals February 18, 2000 to be implemented in Spring, 2001; March 24, 2000 for short-term courses to be implemented in Spring 2001.

PROPOSAL TITLE: PROPOSAL TO UPDATE THE CURRICULUM OF THE COMPUTER SCIENCE SPECIALIZATION WITHIN THE M.A. IN HIGHER EDUCATION PROGRAM

SPONSOR(S): THOMAS C. MCNAHAN AND JENNIFER KAY

DEPARTMENT: EDUCATIONAL LEADERSHIP AND COMPUTER SCIENCE

COLLEGE: EDUCATION L.A.S.

IF LAS CHECK ONE: History/Humanities Math/Sciences Social/Behavioral Sciences

Check One: Undergraduate Graduate

The attached **NEW PROGRAM/MAJOR PROGRAM REVISION/PR** by the item(s) checked. scribed

New degree program

New major

New minor

New concentration, specialization, or track

Major changes to degree requirements, major, minor, or certification

Changes to name of college, school, or department

Coll. South...
Thomas C. McNa...
Jennifer Kay

DEPARTMENT
(Signature indicates approval)

Thomas C. McNa... Educational Leadership

Dept. Curriculum Chair / Date

Jennifer Kay 4/24/00

Dept. Chairperson / Date

S Bergmann Computer Scien

124/00

ACADEMIC DEAN (& Graduate Dean, for New Graduate Programs Only)

Approved Not Approved _____ Comments: _____

Academic Dean's Signature/Date [Signature] 3/31/00 Joy Hays 4-10-00

Graduate Dean's Signature/Date [Signature] 4-24-00

COLLEGE CURRICULUM COMMITTEE

Approved Not Approved _____

X. Approved

Comments: _____

Unanimous approval with recommended changes

Signature of College Chair/Date: [Signature] 4/12/01 [Signature] 4/14/01

UNIVERSITY CURRICULUM COMMITTEE

Date of Open Hearing (if necessary) 4/27/01 Approved _____ Not Approved _____

Comments: _____

hold for minor changes - including hours of credits

Curriculum Chair Signature/Date [Signature] 4/27/01

Date voted upon at Senate (if necessary) 5-8-01 Approved Not Approved _____

EXECUTIVE VICE PRESIDENT/PROVOST

Approved Not Approved _____ If no, reasons are as follows: _____

Student Credit Hours _____ Faculty Load Hours _____ Equalized Credit Hours _____

Official Copy & Approval Sheet Filed (Date): _____ Executive VP/Provost Signature/Date [Signature] 5/16/01

REGISTRAR

Date Approved Course Description Received _____ Hegis Taxonomy & Course Number Assigned _____

Registrar Signature/Date _____

NOTIFICATION FORWARD

_____ Senate Curriculum Committee Chairperson

_____ Academic Dean(s)

_____ Department Chairpersons

_____ Registrar

_____ Sponsor(s)

Major Curriculum Change

M.A. in Higher Education: Instructional Track Specialization in Computer Science

1. ABSTRACT

- (a) **Title:** A Proposal to Update the Curriculum of the Computer Science Specialization within the M.A. in Higher Education Program

Sponsors: Thomas C. Monahan, Educational Leadership Department
Jennifer Kay, Computer Science Department

- (b) **Need for the Program:** This specialization within the M.A. in Higher Education is designed to prepare students to teach introductory computer courses, including computer literacy and using the Internet and World Wide Web, to students in (primarily) two- and four-year colleges. Insofar as the knowledge base of computer science and computer-related functions has been growing at an exponential rate, and insofar as the curriculum for this specialization has not undergone any significant change in some time, it is now necessary to revise the the curriculum by adding a series of new courses, the majority of which already exist at the undergraduate level.
- (c) **Relationship to Department, School, and/or College:** Both this curriculum proposal and this program are jointly sponsored by the Educational Leadership Department within the College of Education and the Computer Science Department within the College of Liberal Arts and Sciences.
- (d) **Summary of Curriculum:** The curriculum consists of 37 s.h. of course work, including 13 s.h. offered by the Educational Leadership Department and 24 s.h. offered by the Computer Science Department.
- (e) **Implementation Time Frame:** If approved, these curriculum changes would become effective for all new students beginning in Fall 2001.
- (f) **Resources:** No new resources will be necessary within either the Educational Leadership Department or the Computer Science Department if the program remains at the current size. Should the program grow additional faculty resources in Computer Science may be necessary.

2. DETAILS

(a) Title of the Proposal:

A Proposal to Update the Curriculum of the Computer Science Specialization within the M.A. in Higher Education Program

(b) Sponsors:

Thomas C. Monahan, Educational Leadership Department
Jennifer Kay, Computer Science Department

(c) Scope and Size of the Program

At present, this specialization within the M.A. in Higher Education program is poorly subscribed, with fewer than five students currently enrolled. This is due, at least in part, to the lack of currency and relevance of many of the courses.

(d) Need for the Program

It is important to note that this is not a new program; it is one that presently exists, but is in need of revision. This revision removes some introductory courses that were seen as too basic and enables students to study advanced topics that previously were available at the undergraduate level, but not at the graduate level.

(e) Requirements for Admission and Graduation

It is expected that all students entering this specialization will have already earned the bachelor's degree in computer science or in education. However, special consideration will also be given to students with a degree in another discipline, but whose continuing education and/or professional experience clearly demonstrate that he/she possesses adequate prerequisite knowledge to be successful in this specialization. In order to graduate, students must complete: (i) a comprehensive examination prepared by the faculty of the Computer Science Department and the Education Leadership Department, (ii) a research project and thesis administered and supervised by the faculty of the Computer Science Department, and (iii) a supervised seminar/internship in a two- or four-year college administered by the Educational Leadership Department.

(f) Implementation Time Frame

If approved, these curriculum changes would become effective for all new students beginning in Fall 2001. Students who are already matriculated in the program will have the option of either enrolling in the new courses or following the already existing curriculum.

(g) Resource Requirements

Insofar as the majority of the proposed new courses described in the proposal to update the computer science specialization already exist at the undergraduate level, *no new space or computing resources will be necessary* within either the Educational Leadership Department or the Computer Science Department.

(h) Recommended Library Resources

Insofar as the majority of the proposed new courses described in the proposal to update the computer science specialization already exist at the undergraduate level, *no new library resources will be necessary* within either the Educational Leadership Department or the Computer Science Department.

(i) Staffing Resources

Insofar as the majority of the proposed new courses described in the proposal to update the computer science specialization already exist at the undergraduate level, *no new staffing resources will be necessary* within either the Educational Leadership Department or the Computer Science Department. Should the program grow additional faculty resources in Computer Science may be necessary.

3. Rationale

The M.A. in Higher Education program is consistent with the Rowan Vision, the existing Rowan Plan, as well as the missions of the colleges of Education and Liberal Arts and Sciences and the departments of Educational Leadership and Computer Science in that it seeks to provide applied graduate level programming to meet emerging regional needs within the scope of existing resources. It is designed to offer state-of-the-art coursework in computer science and to provide best practices in instruction to students who may wish to pursue entry level positions and career paths as instructors in computer literacy and/or Internet/World Wide Web courses in two- or four-year colleges.

4. Essence of the Program

Introduction to the Requested Changes:

The curriculum changes that are proposed involve updating several of the courses within the specialization in computer science: (1) to bring it more in line with the expanding knowledge base in computer science and the Internet and World Wide Web, and (2) to make it more attractive to students who may wish to enter careers in two- and four-year colleges as instructors in computer literacy and/or Internet/World Wide Web courses. Some of the more basic courses have been removed, and advanced topics which were previously available only to undergraduates have been added. In addition, students will no longer take the Problems in

Mathematics Education I & II sequence, but rather a Thesis Project I&II in Computer Science sequence.

The **current** Computer Science specialization reads as follows:

Specialization in Computer Science *Total.....24 s.h.*

From:

Required Courses

Computer Science I (0704.540).....	3 s.h.
Computer Science II (0704.541).....	3 s.h.
Computer Science III (0704.542).....	3 s.h.
Problems in Mathematics Education I & II (0833.600/601)..	6 s.h.
Total.....	15 s.h.

Elective Courses (*Select three*)

Advanced BASIC (0704.550).....	3 s.h.
Instructional Computer Languages (0833.521).....	3 s.h.
Computer-Assisted Instruction (0833.530).....	3 s.h.
Programming Languages: Theory, Implementation and Application (0704.548)	3 s.h.
Design & Implementation of Operating Systems (0702.560).	3 s.h.
Compiler Design Theory (0704.564).....	3 s.h.
Linear Algebra and Matrix Theory (1701.502).....	3 s.h.
Probability and Mathematical Statistics (1701.505).....	3 s.h.
Introduction to Mathematical Logic (1701.504).....	3 s.h.
Total.....	9 s.h.

To:

The **proposed changes** are as follows:

CHANGE the Computer Science courses to read as follows:

Required Courses

Mathematical Foundations of Computer Science	3 s.h.
Programming Languages:	
Theory, Implementation and Application	3 s.h.
Advanced Design and Analysis of Algorithms	3 s.h.
Computer Science Thesis I	3 s.h.
Computer Science Thesis II.....	3 s.h.

Elective Courses

Design and Implementation of Operating Systems	3 s.h.
Software Engineering	3 s.h.
Compiler Design Theory	3 s.h.
Wireless Networks and Systems	3 s.h.
Computer Networks	3 s.h.
Advanced Theory of Computing	3 s.h.
Concepts in Artificial Intelligence	3 s.h.
Natural Language Processing	3 s.h.
Machine Learning	3 s.h.
Advanced Topics in Computer Science	3 s.h.
Embedded Systems Programming	3 s.h.
Advanced Computer Graphics	3 s.h.
Topics in Computer Architecture	3 s.h.
Advanced Robotics	3 s.h.
System Programming	3 s.h.
Advanced Object Oriented Design	3 s.h.

(a/b) Goals and Objectives of the Program

The overarching goals and objectives of this specialization and program are to provide state-of-the-art coursework in computer science and to provide best practices in instruction to students who may wish to pursue entry level positions and career paths as instructors in computer literacy and/or Internet/World Wide Web courses in two- or four-year colleges.

(c) Structure of the Program

Students will be required to enroll in four courses offered by the Educational Leadership Department including (i) Higher Education in America, (ii) Procedures and Evaluation in Research, (iii) an approved restricted elective course, and (iv) Seminar/Internship in Higher Education Instruction, for a total of 13 credits.

The courses, Higher Education in America and Procedures and Evaluation in Research, are recommended to be taken at the very beginning of the student's program, while Seminar/Internship in Higher Education Instruction must be taken in the student's final semester.

Students will be required to show evidence of a core knowledge of computer science as a prerequisite to admission to the specialization and program. Additionally, students will be required to enroll in five courses offered by the Computer Science Department including Mathematical Foundations of Computer Science *, Programming Languages: Theory, Implementation, and Application, Advanced Design and Analysis of Algorithms *, and Computer Science Thesis I&II *. Those students who do not complete their thesis during the Computer Science Thesis II, but who are recognized as making reasonable progress towards the thesis are required to take Research Seminar "R" in subsequent semesters while completing the thesis.

Finally, students will be required to select three 3-credit elective courses from within a bank of electives (see Appendix A of this proposal for a full listing of the proposed electives). The total number of credits within the area of specialization is 24.

The courses Mathematical Foundations of Computer Science *, Programming Languages: Theory, Implementation, and Application, and Advanced Design and Analysis of Algorithms * are recommended to be taken early in a student's program while Computer Science Thesis I&II* should be taken near the end of a student's program.

* Proposals for these courses are attached as Appendix C.

(d) Compare and Contrast this Program with Other Programs

There are no other programs like this offered in southern New Jersey.

(e) Administration

Administratively, this program is housed and coordinated by the faculty of the Educational Leadership Department within the College of Education. However, it is closely coordinated with the Computer Science Department within the College of Liberal Arts and Sciences. Overall program advising is provided by the program coordinator in the Educational Leadership Department, and academic advising for the computer science specialization is provided by the academic adviser in the Computer Science Department.

(f) Evaluation

Evaluation will be conducted jointly by the program coordinator and academic adviser through an analysis of students' performances in courses, student and instructor interviews, number of graduates, and students' abilities to secure meaningful employment within one year of graduation.

5. Results of Consultation

Letters of consultation are included in Appendix B.

6. New Course Proposals

See Appendix C.

APPENDIX A

Description of Differences in the Present and Proposed Curriculum in the Computer Science Specialization¹

FROM

Specialization in Computer Science *Total.....24 s.h.*

From:

Required Courses

Computer Science I (0704.540).....	3 s.h.
Computer Science II (0704.541).....	3 s.h.
Computer Science III (0704.542).....	3 s.h.
Problems in Mathematics Education I & II (0833.600/601)..	6 s.h.
Total.....	15 s.h.

Elective Courses (*Select three*)

Advanced BASIC (0704.550).....	3 s.h.
Instructional Computer Languages (0833.521).....	3 s.h.
Computer-Assisted Instruction (0833.530).....	3 s.h.
Programming Languages: Theory, Implementation and Application (0704.548)	3 s.h.
Design & Implementation of Operating Systems (0702.560).	3 s.h.
Compiler Design Theory (0704.564).....	3 s.h.
Linear Algebra and Matrix Theory (1701.502).....	3 s.h.
Probability and Mathematical Statistics (1701.505).....	3 s.h.
Introduction to Mathematical Logic (1701.504).....	3 s.h.
Total.....	9 s.h.

¹ There are **NO PROPOSED CHANGES** to the education courses (13 s.h.) offered in this program. The **ONLY** changes being proposed are in the computer science specialization.

TO

Specialization in Computer Science *Total.....24 s.h.*

Required Courses

Mathematical Foundations of Computer Science *	3 s.h.
Programming Languages:	
Theory, Implementation and Application (0704.548)	3 s.h.
Advanced Design and Analysis of Algorithms *	3 s.h.
Computer Science Thesis I*	3 s.h.
Computer Science Thesis II *	3 s.h.
Total.....	15 s.h.

Elective Courses (*Select Three*)

Design and Implementation of Operating Systems (0702.560)...	3 s.h.
Software Engineering (0704.510)	3 s.h.
Compiler Design Theory (0704.564)	3 s.h.
Wireless Networks and Systems (0706.505)	3 s.h.
Computer Networks (0706.510).....	3 s.h.
Advanced Theory of Computing (0707.522)	3 s.h.
Concepts in Artificial Intelligence (0707.550)	3 s.h.
Natural Language Processing (0707.555)	3 s.h.
Machine Learning (0707.556)	3 s.h.
Advanced Topics in Computer Science (0707.595)	3 s.h.
Embedded Systems Programming ⁺	3 s.h.
Advanced Computer Graphics *.....	3 s.h.
Topics in Computer Architecture *.....	3 s.h.
Advanced Robotics *	3 s.h.
System Programming *	3 s.h.
Advanced Object Oriented Design *	3 s.h.
Total.....	9 s.h.

* Proposals for these courses are attached as Appendix C.

⁺ This course was proposed in the Fall of 1999

Matriculated students are required to consult with Prof. Jennifer Kay, specialization (academic) advisor, before selecting courses within the area of computer science. A listing of those courses approved by the specialization (academic) advisor will be presented to the program coordinator, Prof. Tom Monahan, for placement in the student's program folder.

Written permission must be obtained from the program coordinator before enrolling in the Seminar/Internship in Higher Education Instruction (0806.603). An additional \$60 fee must be paid when registering for spring semester Seminar/Internship. Course requirement adjustments may be approved with the approval of both the academic advisor and the program coordinator.

Appendix B

Letters of Consultation/Support



Educational Leadership

February 22, 2000

Revised December 12, 2000

TO: The College of Education Curriculum Committee

FROM: Thomas C. Monahan, Chair

RE: Proposed Curricular Change

This is to advise you that at our department meeting on February 22, 2000, the Educational Leadership department approved the following proposal for curricular change:

- (1) Proposed major curriculum change: Updating the curriculum (including the development of new courses) of the specialization in computer science within the M.A. in Higher Education.


This important change will enhance the quality of the program, and I urge the College Curriculum Committee to approve it. Should you require additional information, please contact me.

TCM/jlr



Educational Leadership

TO: Jennifer Kay, Computer Science Department

FROM: Thomas C. Monahan, Educational Leadership Department 

RE: Revisions to the Curriculum Proposal for the Modifications to the
Computer Science Specialization within the M.A. in Higher Education
Program (Instructional Track)

I have received the revisions that your department has made to the proposal. These seem to be in line with what we learned from the College of Education Curriculum Committee when we attended the open hearing. I believe that the changes that you have made, particularly with regard to the new courses that are being proposed, will help to strengthen the specialization and make it both more beneficial and more attractive to students. I support the revisions that you have made, and I trust that the College of Education Curriculum Committee will approve.



Department of Computer Science

Memo To Whom It May Concern

From: Seth Bergmann
Department Chair

Date: February 1, 2001

Subject: Changes to Master's in Higher Ed, Computer Science Specialization

This memo is to confirm the department of Computer Science's support for the proposed changes to the M.A. in Higher Education with a specialization in Computer Science.

The primary rationale for these changes include the fact that Computer Science is a rapidly changing and evolving discipline. While there aspects of algorithms and theory which will never change, there are tools, software, hardware, user interfaces, embedded systems, and applications which are undergoing development continuously. If our curriculum does not reflect the latest in computer technology, our graduates will be poorly prepared for the workforce.

Most of the changes to the curriculum involve elimination of courses which have become outdated or are now considered too elementary to be offered at the graduate level (Advanced Basic, CS I, CS II, CS III). The other major change to the curriculum involves replacing the Mathematics Education Problems 6 credit course with a Computer Science Thesis 6 credit course. This is certainly more appropriate for this specialization. Many of the elective Mathematics courses have been replaced with elective Computer Science courses. Now that Computer Science has grown considerably since its inception, we will not need to rely on the Mathematics department as heavily to cover this curriculum.



Mathematics Department

MEMO

TO: Tom Monahan
Educational Leadership

FROM: Ron Czocho, Chair *Ronald J. Gordon*
Mathematics Dept

DATE: April 3, 2001

RE: Change in final experience for Higher Ed masters degree in Computer Science

Thank you for the opportunity to comment on the proposed change for the final experience for students pursuing a master's degree in Higher Ed. with a specialization in Computer Science. The current requirements for the degree are an artifact of the past when Computer Science was a part of the Mathematics Department. We taught a final experience in a two-semester sequence called Problems in Math Ed. I and II and all students taking graduate courses in math and computer science were required to take this.

Ever since the development of the M.A. in Mathematics this course is now devoted to students interested in a masters degree in the teaching of mathematics and it is not appropriate for those interested in mathematics or computer science in general. I therefore support the proposed change that requires students in computer science to replace this course requirement with a graduate research requirement. This is appropriate and should not have a detrimental effect in the ability to offer the Problems in Math Ed. I and II course.



Dean of The Graduate School

To: Dr. Thomas Monahan
From: Dr. Marion Rilling *M. R.*
Subject: Support for the update for the Computer Science Specialization in the M.A. in Higher Education program
Date: December 13, 2000

Thank you for providing me the opportunity to review the proposal to update the Computer Science Specialization within the M.A. in Higher Education and keeping me and Graduate Council continuously aware of your efforts and progress. As you know, I have also discussed this proposal with Dean Harper (Liberal Arts & Sciences) who indicated his awareness of this proposal and his approval. It is important that we engage in ongoing review of our programs to assure that they are current and state-of-the-art. I appreciate your efforts and the efforts of all faculty involved in this proposal to do this on behalf of our students and wish to indicate my full support.

Best personal regards.

Happy Holidays!

MR/klh
c: Dean Harper
Dean Sisco

APPENDIX C

New Course Proposals

**Rowan University
Department of Computer Science**

Course Proposal

Mathematical Foundations of Computer Science 67111

1. Details

- a. Course Title: Mathematical Foundations of Computer Science
- b. Sponsor: Nancy Tinkham, Department of Computer Science
- c. Credit Hours: 3
- d. Course Level: Graduate
- e. Curricular Effect: This course will be a requirement for students in the Master of Arts in Higher Education program who are specializing in computer science
- f. Prerequisites: Permission of instructor
- g. Suggested Time, Implementation: Offered every semester
- h. Resources: The course can be taught with existing faculty, equipment, and library resources.

2. Rationale

Theory of computing is a central area of computer science, providing the mathematical foundation for proving properties of programs, analyzing the efficiency of programs, and determining the limits of what can be computed. This course provides an introduction to the theory of computing for graduate students who have not had previous exposure to this area.

In practice, this course will frequently be offered concurrently with the existing undergraduate course *Foundations of Computer Science*, however the expectations for graduate students in this course, in terms of both the quality and the quantity of their work, will be greater than that for undergraduate students. Additional assignments for graduate students could include, for example, a paper and/or oral presentation on a more advanced topic in theoretical computer science such as uncomputability or NP-completeness.

3. Essence of the course

a. Objectives in relation to student outcomes

At the end of this course, students will be able to construct finite automata, regular expressions, grammars, push-down automata, and Turing machines to recognize languages. They will also be able to evaluate propositional and first-order logic expressions, and to write simple proofs using these formalisms.

b. Topic outline

- I. Finite automata and regular expressions
- II. Context-free grammars and push-down automata
- III. Turing machines
- IV. Formal logic: the propositional calculus and an introduction to the first order predicate calculus
- V. Applications of the above topics to computer science problems

c. Evaluation and grading procedures for students

Students will be evaluated based on a combination of written homework assignments, and exams. In courses taught concurrently with undergraduates, this evaluation will include the additional assignments required of graduate students.

d. Course evaluation

The department curriculum committee will evaluate this course based on student evaluations, colleague observations, and review of curricular materials.

4. Consultation

Consultations for this course proposal were internal, that is, between the Computer Science Department and the Educational Leadership Department.

5. Additional information

Suggested reading/text:

Hein, Theory of Computation: An Introduction , Jones and Bartlett, 1996.

6. Catalog description

Mathematical Foundations of Computer Science 3 s.h.

(Prerequisite: Permission of instructor)

This course provides a graduate-level introduction to the theoretical foundations of computer science, including finite automata, context-free grammars, Turing machines, and formal logic.

Suggested Hegis #: 0707.510

**Rowan University
Department of Computer Science**

Course Proposal

Advanced Design and Analysis of Algorithms

1. Details

- a. Course Title: Advanced Design and Analysis of Algorithms
- b. Sponsor: Nancy Tinkham, Department of Computer Science
- c. Credit Hours: 3
- d. Course Level: Graduate
- e. Curricular Effect: This course will be an elective for students in the Master of Arts in Higher Education program who are specializing in computer science.
- f. Prerequisites: Data Structures (0704.222) and Mathematical Foundations of Computer Science (0707.5xx); or permission of instructor
- g. Suggested Time, Implementation: Offered once per semester
- h. Resources: The course can be taught with existing faculty, equipment, and library resources.

2. Rationale

The design and analysis of algorithms is of central importance in computer science, since the creation of software is primarily the design and implementation of algorithms to solve problems. Currently, there is no course in the theory of computing available to graduate students. This course will help to fill that gap.

The computer science department already has an undergraduate (junior-level) theory of computing course. This is the graduate counterpart. In practice, the graduate course will frequently be offered concurrently with the undergraduate course, however, the expectations for graduate students in this course, in terms of both the quality and the quantity of their work, will be greater than that for undergraduate students. Additional assignments for graduate students could include, for example, researching a higher class of algorithms and presenting the results to the class; doing an empirical comparison of several more complex algorithms to solve the same problem and writing a paper summarizing the results; or studying computational complexity theory in more detail than is normally covered in the course and presenting the results either orally or in a paper.

3. Essence of the course

a. Objectives in relation to student outcomes

- Students will demonstrate a knowledge of commonly-used algorithms for sorting, searching, and other application areas through an appropriate method of course assessment, e.g., examination, paper, class presentation.
- Students will be able to design efficient algorithms to solve programming problems
- Students will be able to analyze the efficiency of algorithms, using big-O notation.

b. Topic outline

I. Survey of algorithms

II. Methods for designing algorithms

III. Analysis of algorithm efficiency

A. Big-O notation

B. NP-Completeness

C. Techniques for improving algorithm efficiency

c. Evaluation and grading procedures for students

Students will be evaluated based on a combination of written homework assignments, and exams. In courses taught concurrently with undergraduates, this evaluation will include the additional assignments required of graduate students.

d. Course evaluation

The department curriculum committee will evaluate this course based on student evaluations, colleague observations, and review of curricular materials.

4. Consultation

Consultations for this course proposal were internal, that is, between the Computer Science Department and the Educational Leadership Department.

5. Additional information:

Suggested reading/text: Cormen, Leiserson, & Rivest, Introduction to Algorithms, MIT Press, 1990.

6. Catalog description

Advanced Design and Analysis of Algorithms 3 s.h.

(Prerequisites: Data Structures (0704.222), and either Foundations of Computer Science (0707.210) or Mathematical Foundations of Computer Science (0707.5xx); or permission of instructor)

Students in this course will study efficient algorithms for sorting, searching, graphs, sets, matrices, and other applications, and will learn to design and analyze new algorithms. Students will also learn to recognize and prove NP-Completeness.

Suggested Hegis #: 0707.540

**Rowan University
Department of Computer Science**

Course Proposal

Computer Science Thesis I

1. Details

- a. Course Title: Computer Science Thesis I
- b. Sponsor: Jennifer Kay and Ganesh Baliga,
Computer Science Department
- c. Credit Hours: 3
- d. Course Level: Graduate
- e. Curricular Effect: This course will be required for students in the Master of Arts Higher Education program who are specializing in computer science.
- f. Prerequisites: permission of instructor
- g. Suggested Time: As required (typically independent study)
- h. Resources: Each thesis will be supervised by a faculty member in the computer science department who will receive one credit of load. Based on current enrollments in this program (currently 3 students in total), we do not anticipate needing any additional resources.

2. Rationale

Historically, students in the M.A. program in Higher Education with a computer science emphasis have written their theses as part of the “Problems in Mathematics Education” course sequence offered by the Mathematics Department. Given the differences between the mathematics and computer science disciplines, this is no longer appropriate. A separate research sequence in computer science is required. (see Czocho letter in Appendix B)

3. Essence of the course

a. Objectives in relation to student outcomes

In consultation with the instructor, students will identify and research a specific area of computer science or computer science education. Students will define a thesis project and develop a formal specification of their intended project for completion in Computer Science Thesis II.

b. Topic outline

No general topical outline can be defined. The outline of this proposed course will essentially follow the proposed research topic of the student.

c. Evaluation and grading procedure of students

Students will be graded based on the quality of their research proposal and a formal project specification.

d. Course evaluation

This Computer Science Department curriculum committee will evaluate this course based on instructor and student feedback and evaluations.

4. Consultation

Consultations for this course proposal were internal, that is, between the Computer Science Department and the Educational Leadership Department.

5. Additional information

Suggested reading and texts are dependent on the area of research.

5. Catalog Description

0707.5XX Computer Science Thesis I 3 s.h.
(Prerequisite: permission of instructor)

In consultation with the instructor, students will identify and research a specific area of computer science or computer science education. Students will define a thesis project and develop a formal specification of their intended project for completion in Computer Science Thesis II.

**Rowan University
Department of Computer Science**

Course Proposal

Computer Science Thesis II

1. Details

- a. Course Title: Computer Science Thesis II
- b. Sponsor: Jennifer Kay & Ganesh Baliga, Computer Science Department
- c. Credit Hours: 3
- d. Course Level: Graduate
- e. Curricular Effect: This course will be required for students in the Master of Arts Higher Education program who are specializing in computer science.
- f. Prerequisites: Computer Science Thesis I (0707.5XX)
- g. Suggested Time: As required (typically independent study)
- h. Resources: Each thesis will be supervised by a faculty member in the computer science department who will receive one credit of load. Based on current enrollments in this program (currently 3 students in total), we do not anticipate needing any additional resources.

2. Rationale

Historically, students in the M.A. program in Higher Education with computer science emphasis have written their theses as part of the “Problems in Mathematics Education” course sequence offered by the Mathematics Department. Given the differences between the mathematics and computer science disciplines, this is no longer appropriate. A separate research sequence in computer science is required. (see Czochoor letter in appendix B)

3. Essence of the course

a. Objectives in relation to student outcomes

Students will follow their formal project specification developed in Computer Science Thesis I to research a specific area of computer science or computer science education and produce a written thesis.

b. Topic outline

No general topical outline can be defined. The outline of this proposed course will essentially follow the proposed research topic of the student.

c. Evaluation and grading procedure of students

Students will be graded based on the quality of their research and thesis.

d. Course evaluation

The Computer Science Department curriculum committee will evaluate this course based on instructor and student feedback and evaluations.

4. Consultation

Consultations for this course proposal were internal, that is, between the Computer Science Department and the Educational Leadership Department.

5. Additional information

Suggested reading and texts are dependent on the area of research.

6. Catalog Description

0707.5XX Computer Science Thesis II 3 s.h.
(Prerequisites: Computer Science Thesis I)

Students will follow their formal project specification developed in Computer Science Thesis I to research a specific area of computer science or computer science education and produce a written thesis.

0051

Rowan University
Department of Computer Science

Course Proposal

Advanced Computer Graphics

1. Details

- a. Course Title: Advanced Computer Graphics
- b. Sponsor: Jianning Xu, Computer Science Department
- c. Credit Hours: 3
- d. Course Level: Graduate
- e. Curricular Effect: This course will be an elective for students in the Master of Arts Higher Education program who are specializing in computer science.
- f. Prerequisites: Linear Algebra (1701.210) and Programming Languages (0704.315); or permission of instructor
- g. Suggested Time: One section each year
- h. Resources: The course can be taught with existing faculty, equipment, and library resources.

2. Rationale

Computer Graphics is concerned with producing pictures or images using a computer. The applications of computer graphics include scientific visualization, computer-aided design, simulation and virtual reality, user interface design, and computer games and entertainment. Currently, there is no course in computer graphics available to graduate students. This course will help to fill that gap.

In practice, this course will frequently be offered concurrently with the existing undergraduate course Computer Graphics. However, the expectations for graduate students in this course, in terms of both the quality and the quantity of their work, will be greater than that for undergraduate students. For example, they will be given more challenging versions of homework and projects, and when we discuss basic graphics algorithms in the class, they will be asked to research additional algorithms and compare them with the ones covered in the class. For programming projects, they will be asked to implement additional functions and features that are not required of undergraduate students. They will also receive additional assignments to explore topics that are not covered in detail in the class.

3. Essence of the course

a. Objectives in relation to student outcomes

Students will demonstrate the use of a graphics package. Further, they will demonstrate, through appropriate course assignment strategies, a knowledge of algorithms necessary to implement graphic packages. Such algorithms are expected to include: the generation of basic graphics primitives; geometrical transformations in 2- and 3-D; viewing in 2- and 3-D; representation of curves and surfaces; hidden line and surface removal; light and shading; and animation.

b. Topic outline

Overview of computer graphics applications

Computer graphics systems

Drawing of 2-D primitives

2-D transformation and viewing

3-D transformation and viewing

Representing curves and surfaces

Hidden line and surface algorithms

Illumination and shading

Animation

c. Evaluation and grading procedure of students

Students will be evaluated based on homework, programming assignments, one or more in-term examinations, and a final examination. In courses taught concurrently with undergraduates, this evaluation will include the additional assignments required of graduate students.

d. Course evaluation

The department curriculum committee will evaluate this course based on student evaluations, colleague observations, and review of curricular materials.

4. Consultation

Consultations for this course proposal were internal, that is, between the Computer Science Department and the Educational Leadership Department.

5. Additional information

Suggested reading/texts:

D. Hearn & M. Baker, Computer Graphics, C Version, Prentice Hall, 1997.

F. Hill, Computer Graphics Using OpenGL, Prentice Hall, 2001.

6. Catalog Description

0707.5XX Advanced Computer Graphics 3 s.h.

(Prerequisites: 1701.210 Linear Algebra and 0704.315 Programming Languages, or permission of instructor)

Students will study the use and implementation of graphics packages. Techniques and algorithms for implementing graphics systems will be covered. They include drawing of 2-D primitives; 2- and 3-D transformation and viewing; representing curves and surfaces; hidden line and surface removal; illumination and shading; and animation. Programming projects on writing graphics applications and implementing graphics algorithms will be assigned.

Rowan University
Department of Computer Science

15812

Course Proposal

Topics in Computer Architecture

1. Details

- a. Course Title: Topics in Computer Architecture
- b. Sponsor: Jianning Xu, Computer Science Department
- c. Credit Hours: 3
- d. Course Level: Graduate
- e. Curricular Effect: This course will be an elective for students in the Master of Arts Higher Education program who are specializing in computer science.
- f. Prerequisites: Principles of Digital Computers (0706.370); or permission of instructor
- g. Suggested Time: One or two sections each year
- h. Resources: The course can be taught with existing faculty, equipment, and library resources.

2. Rationale

Computer Architecture deals with structure, function, and design of computer systems. Knowledge of computer hardware systems and interaction between hardware and software provides a framework for understanding the fundamentals of computing. Currently, there is no course in computer architecture available to graduate students. This course will help to fill that gap.

In practice, this course will frequently be offered concurrently with the existing undergraduate course Advanced Computer Architecture. However, the expectations for graduate students in this course, in terms of both the quality and the quantity of their work, will be greater than that for undergraduate students. For example, they will be given the more challenging versions of homework and projects, and they will also receive additional assignments. Moreover, they will be required to do an independent research project, not required of the undergraduate students to examine one or two contemporary computers.

3. Essence of the course

- a. Objectives in relation to student outcomes

Students will demonstrate a knowledge of different advanced architectural features of modern computers. They will learn and be able to demonstrate their knowledge

on various performance enhancement techniques such as DMA, I/O processor, RAID, cache memory, virtual memory, RISC, pipelining, and superscalar processors. Students will also learn and be able to demonstrate their knowledge on various advanced parallel architectures such as array processors, vector processors, shared-memory multiprocessors, and message-passing multicomputers.

b. Topic outline

Memory system enhancement:

Cache memory, virtual memory, and memory hierarchy design.

I/O system enhancement:

DMA, I/O processor, and RAID.

Processing unit enhancement:

Pipelining, RISC processors, and Superscalar processors.

Advanced parallel architectures:

Array processors, vector processors, shared-memory multiprocessors, and message-passing multicomputers.

Detailed examination of one or two contemporary computers.

c. Evaluation and grading procedure for students

Students will be evaluated based on homework, programming assignments, one or more in-term examinations, a final examination, and independent research projects. In courses taught concurrently with undergraduates, this evaluation will include the additional assignments required of graduate students.

d. Course evaluation

The department curriculum committee will evaluate this course based on student evaluations, colleague observations, and review of curricular materials.

4. Consultation

Consultations for this course proposal were internal, that is, between the Computer Science Department and the Educational Leadership Department.

5. Additional information

Suggested reading/texts:

W. Stallings, Computer Organization and Architecture, Prentice Hall, 2000.

J. Hennessy and D. Patterson, Computer Architecture: A Quantitative Approach, Morgan Kaufmann, 1996.

6. Catalog Description

0706.5XX Topics in Computer Architecture 3 s.h.

(Prerequisites: 0706.370 Principles of Digital Computers or permission of instructor)

Students in this course will study the various performance enhancement techniques and more advanced architectural features of modern computer systems. The topics include DMA, I/O processor, RAID, cache memory, virtual memory, pipelining, RISC, superscalar processors and various advanced parallel architectures such as array processors, vector processors, shared-memory multiprocessors, and message-passing multicomputers. Students will complete independent research projects that may include detailed examination of one or two contemporary computers.

**Rowan University
Department of Computer Science**

Course Proposal

Advanced Robotics

1. Details

- a. Course title: Advanced Robotics
- b. Sponsor: Jennifer Kay, Computer Science Department
- c. Credit Hours: 3
- d. Course Level: Graduate
- e. Curricular Effect: This course will be an elective for students in the Master of Arts Higher Education program who are specializing in computer science.
- f. Prerequisite: Advanced Design and Analysis of Algorithms (0707.5XX) or permission of instructor
- g. Suggested Time: One section every other year
- h. Resources: The course can be taught with existing faculty, equipment, and library resources.

2. Rationale

This course will provide students with an introduction to one of the largest applications in the field of computer science today. In addition to learning the theory of robotics, students will gain practical experience in programming small mobile robots in a real-time real-world domain where noisy and imprecise data is commonplace

In practice, this course will frequently be offered concurrently with the existing undergraduate course System Programming and Operating System Internals. However, the expectations for graduate students in this course, in terms of both the quality and the quantity of their work, will be greater than that for undergraduate students. For example, graduate students will be required to conduct additional research on an area and present the results both as a written report and orally to the class. Areas of graduate research may include: hand/eye calibration, inverse kinematics, detailed study of advanced sensors and actuators, and the application of artificial intelligence techniques to autonomous mobile robots (these areas are beyond the scope of undergraduate work).

3. Essence of the course

a. Objectives in relation to student outcomes

Students will learn and be able to demonstrate a knowledge of the major concepts in the field of robotics, including robot manipulators, and mobile robots. Students will gain practical experience in programming “real world” systems. The research projects in which study will engage will also provide students with practical experience in working together in small groups.

b. Topic outline

Robot Manipulation
Kinematics
Sensors & Perception
Robot Vision
Cognition for Robotics
Mobile Robotics

c. Evaluation and grading procedure of students

Students will be evaluated based one or more in term examinations, one or more individual or group practical projects, performance in collaborative work groups, and a final examination. In courses taught concurrently with undergraduates, this evaluation will include the additional assignments required of graduate students.

d. Course evaluation

The department curriculum committee will evaluate this course based on student evaluations, course observations, and review of curricular materials.

4. Consultation

Consultations for this course proposal were internal, that is, between the Computer Science Department and the Educational Leadership Department.

5. Additional information

Suggested readings/texts:

Martin, Robotic Explorations, Prentice Hall 2001.

Paul, Robot Manipulators, MIT Press 1981.

Everett, Sensors for Mobile Robots, A.K. Peters 1995.

6. Catalog Description:

0707.5XX Advanced Robotics 3 s.h.

(Prerequisites: Advanced Design and Analysis of Algorithms (0707.5XX)
or permission of instructor.)

This course provides an introduction to the fundamentals of robotics. Students study robot manipulators and mobile robots, robot sensors and robot cognition. Students will also gain experience programming in small groups, and programming in a domain where noisy and imprecise data is commonplace. Familiarity with matrix multiplication and inversion is expected for this course.

**Rowan University
Department of Computer Science**

Course Proposal

System Programming

04563

1. Details

- a. Course title: System Programming
- b. Sponsor: Jianning Xu, Computer Science Department
- c. Credit Hours: 3
- d. Course Level: Graduate
- e. Curricular Effect: This course will be an elective for students in the Master of Arts Higher Education program who are specializing in computer science.
- f. Prerequisite: Design and Implementation of Operating Systems (0702.560); or permission of instructor
- g. Suggested Time: One section each year
- h. Resources: The course can be taught with existing faculty, equipment, and library resources.

2. Rationale

This course covers the internal structures and algorithms of the system kernel of a modern operating system as well as the system call interface to the kernel. This course will provide students with reinforcement of basic operating system concepts, concrete examples of actual system structures and design, and the useful experiences of system level programming which deals with such important concepts as interprocess communications, concurrency, and multithreading. This course can help students better understand the relationships between user programs, system software, and machine hardware.

In practice, this course will frequently be offered concurrently with the existing undergraduate course System Programming and Operating System Internals. However, the expectations for graduate students in this course, in terms of both the quality and the quantity of their work, will be greater than that for undergraduate students. For example, they will be given more challenging versions of homework and projects, and, for programming projects, they will be asked to implement additional functions and features that are not required of undergraduate students. They will also be required to undertake additional projects in more advanced topics which require deeper exploration of concepts.

3. Essence of the course

a. Objectives in relation to student outcomes

Students will learn and be able to demonstrate their knowledge on the basic system structures and functions of a modern operating system. They will be exposed to the major functional components of the system kernel and the algorithms and data structures used in the implementations of these components. Students will also gain hands-on experience in system level programming in a modern operating system environment. They will learn how to use various system calls for basic file operations, I/O operations, and process control operations. The emphasis will be on interprocess communications and concurrency.

b. Topic outline

Introduction to kernel
The file structure and implementation
System calls for the file system
The process structure and process scheduling
System calls for process control
Memory management policies
The I/O subsystem
Primitive interprocess communication
Advanced interprocess communication

c. Evaluation and grading procedure of students

Students will be evaluated based on homework, programming assignments, one or more in-term examinations, and a final examination. In courses taught concurrently with undergraduates, this evaluation will include the additional assignments required of graduate students.

d. Course evaluation

The department curriculum committee will evaluate this course based on student evaluations, colleague observations, and review of curricular materials.

4. Consultations

Consultations for this course proposal were internal, that is, between the Computer Science Department and the Educational Leadership Department.

5. Additional information

Suggested readings/texts

K. Robbins and S. Robins, Practical UNIX Programming, Prentice Hall, 1996.
J. Gray, Interprocess Communications in UNIX, Prentice Hall, 1997.

6. Catalog Description:

0704.5XX System Programming 3 s.h.

(Prerequisites: 0702.560 Design and Implementation of Operating Systems; or permission of instructor)

This course covers the internal structures and algorithms of the system kernel of a modern operating system as well as the system call interface to the kernel. Students will gain hands-on experience in system level programming in a modern operating system environment. The emphasis will be on interprocess communications and concurrency. The concept of distributed and client/server computing will also be introduced.

Rowan University
Department of Computer Science

Course Proposal

Advanced Object Oriented Design

1. Details

Course Title	Advanced Object Oriented Design
Sponsor	Ganesh R. Baliga, Department of Computer Science.
Credit Hours	3
Course Level	Graduate
Curricular Effect	This course will be an elective for students in the Master of Arts Higher Education program who are specializing in computer science
Prerequisites	Advanced Design and Analysis of Algorithms
Suggested Time	One section per year
Resources	Faculty, advanced lab facilities and library resources are adequate

2. Rationale

Object-oriented design focuses on organizing a software solution to a real-world problem around real-world concepts. The object classes resulting from sound object oriented design tend to be reusable across software projects, thereby reducing the release time for new software products. In addition, debugging and functionality enhancement becomes easier. Thus, many organizations are adopting object-oriented programming paradigms thereby making exposure to object oriented thinking an important job skill.

In practice, this course will frequently be offered concurrently with the existing undergraduate course Object Oriented Design. However, the expectations for graduate students in this course, in terms of both the quality and the quantity of their work, will be greater than that for undergraduate students. For example, graduate students will be required to conduct additional research on an area and present the results in a paper as well as in a class presentation. Such topics might include case studies of object-oriented design practice in industry, comparison of features available in different object oriented design methodologies, and design and implementation of object oriented frameworks for various problem domains.

3. Essence of the course

a) Objectives in relation to student outcomes

Students will

- be able to utilize the object-oriented programming concepts such as inheritance and polymorphism
- be able to analyze a real-world problem and model it using classes that correspond to realistic concepts
- be able to identify design patterns that are applicable in typical design situations
- be able to design and implement an object-oriented solution to a reasonable sized real-world problem.

b) Topic outline

- Inheritance
- Polymorphism
- Design Patterns
- A formal notation for specifying and evaluating object-oriented design such as the Unified Modeling Language (UML) notation
- Design Evaluation
- Object-oriented design for real-world problems

c) Evaluation and grading procedure for students

Students will be evaluated based on homework, assignments and one or more tests. In courses taught concurrently with undergraduates, this evaluation will include the additional assignments required of graduate students.

d) Course Evaluation

The department curriculum committee will evaluate this course based on student evaluations, colleague observations, and review of curricular materials.

4. Consultation

Consultations for this course proposal were internal, that is, between the Computer Science Department and the Educational Leadership Department.

5. Additional information

Suggested readings/texts:

Sadr & Booch, Unified Objects : Object-Oriented Programming Using C++, IEEE Computer Society, 1997.

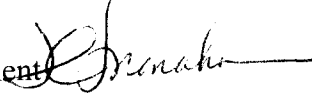
6. Catalog Description: 3 s.h.
0704.5XX Advanced Object Oriented Design
(Prerequisites: (0707.5XX) Advanced Design and Analysis of Algorithms)

This course will introduce important concepts such as inheritance and polymorphism, which are crucial tools needed for crafting object-oriented solutions to real-world problems. Design patterns that commonly occur in design situations will be covered. A formal notation for describing and evaluating object-oriented designs such as the Unified Modeling Language (UML) will be taught. Students will apply the concepts to design and implement object oriented solutions to one or more reasonably sized real-world problems.



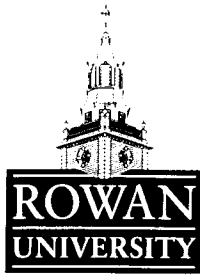
Educational Leadership

TO: Jennifer Kay, Computer Science Department

FROM: Thomas C. Monahan, Educational Leadership Department 

RE: Revisions to the Curriculum Proposal for the Modifications to the
Computer Science Specialization within the M.A. in Higher Education
Program (Instructional Track)

I have received the revisions that your department has made to the proposal. These seem to be in line with what we learned from the College of Education Curriculum Committee when we attended the open hearing. I believe that the changes that you have made, particularly with regard to the new courses that are being proposed, will help to strengthen the specialization and make it both more beneficial and more attractive to students. I support the revisions that you have made, and I trust that the College of Education Curriculum Committee will approve.



Dean of The Graduate School

To: Dr. Thomas Monahan

From: Dr. Marion Rilling *M. R.*

Subject: Support for the update for the Computer Science Specialization in the M.A. in Higher Education program

Date: December 13, 2000

Thank you for providing me the opportunity to review the proposal to update the Computer Science Specialization within the M.A. in Higher Education and keeping me and Graduate Council continuously aware of your efforts and progress. As you know, I have also discussed this proposal with Dean Harper (Liberal Arts & Sciences) who indicated his awareness of this proposal and his approval. It is important that we engage in ongoing review of our programs to assure that they are current and state-of-the-art. I appreciate your efforts and the efforts of all faculty involved in this proposal to do this on behalf of our students and wish to indicate my full support.

Best personal regards.

Happy Holidays!

MR/klh

c: Dean Harper
Dean Sisco

