Transmittal Memo, Dec 23, 1983

Faculty Senate Curriculum Committee

(2)

APPROVAL FORM

Rev: 5/82

0701.3?? [illegible]

Proposal Title: Theory of Computing and Complexity of Algorithms

Sponsor(s): KHALED AMIN, SETH FORSMAN Dept.: Math & Computer Science, Math & Computer Science

Check one: ✓ Course ___ Specialization ___ Concentration ___ Achievement Certificate

___ Minor Change ___ Major Program

(please name: deletion or credit/title/catalog change)

___ Certification Program ✓ Undergraduate ___ Graduate 3 Credit Hours

| Step 1 (Department) | Step 2 (Receipt) | Step 3 (Division CC) |
|---|---|---|
| ☒ Approved [illegible] date | SCC# 83-84-64 | Reviewed 3/15/84 date |
| ☐ Not Approved | Proposal Received 3/16/84 date | ☑ Approved |
| [illegible] Dept. CC Chairperson | | ☐ Not Approved |
| ☑ Reviewed 3.6.84 date | | Comments: |
| [illegible] Chairperson, Dept. | [illegible] Chairperson, SCC | [illegible] Chairperson, Div.Curr.Comm. |

Step 4 (Academic Dean) Comments:

Reviewed 3/16/84 date

[illegible] Signature, Dean of Division

Step 5 (SCC)

Open Hearing Date: 4/17/84 ✓ Approved by Senate Curriculum Committee _____(date)

___ Returned to sponsor(s) for the following reasons:

Step 6 (Faculty Senate)

Presented to Faculty Senate (date): 4/27/84 ✓ Approved ___ Not Approved

Notification to Vice-President Academic Affairs (date): 4/30/84

[illegible] Signature: SCC Chairperson

Step 7 (Vice-President for Academic Affairs)

Course received 5/3/84 (date)

Course approved Yes ✓ No ___

If no, reasons are as follows:

Student credit hours 3

Faculty load hours 3

Equalized credit hours 3

Official copy and approval sheet filed 7/17/84 (date)

Signature _____
(Vice-President for Academic Affairs)

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Registrar

Approved course description received _____ (date)

Hegis Taxonomy and Course Number assigned _____

Signature _____ _____
(Registrar) (Date)

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Notification forwarded: Senate Curriculum Committee Chairperson, Department Chairperson(s), Academic Dean(s), Registrar, Sponsor(s)

# Course Proposal

## Theory of Computing and Complexity of Algorithms

1. Details

   a. Course Title: Theory of Computing and Complexity of Algorithms.
   b. Sponsors: Khaled Amer, Seth Bergmann, Department of Mathematics and Computer Science.
   c. Course Level: Undergraduate (Junior or Senior).
   d. Curricular Effect: Computer Science Major Restricted elective.
   e. Prerequisites: Computer Data Structures and Algorithms (0704.322) and Calculus II (1701.131).
   f. We propose to schedule one section every academic year starting with the Spring term of 1985.
   g. There are currently 3 full-time people in the department who are well-prepared to teach this course. Computer resources required are minimal. Supplementary texts are available in the library.

2. Rationale

   The theory of computing is the theoretical basis on which all computer applications are built. A good understanding of this theory is very important to any computer scientist. The ability to analyze the complexity of algorithms is an essential skill in designing efficient algorithms. With this course the Glassboro graduates will be better able to compete with others both in graduate school and in the work place. The college also stands to gain since this course will make the computer science program more competitive with those of other institutions.

3. Essence

   a. The objectives of the course are:

      I. The students will be able to solve automata theoretic problems and will be able to apply these to many areas of Computer Science (such as lexical analysis and text editing.) Turing machines will also be studied. These machines provide a very useful tool for deciding whether or not a problem is solvable by the computer.

      II. The students will be able to solve problems in formal language theory with important applications to syntax of programming languages.

      III. The students will be able to design efficient algorithms for solving real problems that arise frequently in computer applications. They will also learn the basic principles and techniques for analyzing these algorithms.

      IV. The students will gain an understanding of NP - Complete problems and approximation algorithms for them. The frequent occurrence of this type of problem makes it important for the students to learn how to give satisfactory solutions to them without consuming an unacceptable amount of resources.

b. Topical outline

I. Models of Computers

A. Finite automata
B. Pushdown automata
C. Linear bounded automata
D. Turing machines
E. Applications

II. Formal Languages

A. Regular languages
B. Context - free languages
C. Context - Sensitive languages
D. Phrase Structure languages
E. Applications

III. Analysis of Algorithms

A. The algorithm language
B. Correctness
C. Complexity
D. Examples: Searching an ordered list, Finding the largest and second largest enteries in a list, Sorting and Order Statistics.

IV. NP - Complete Problems

A. The class P
B. The class NP
C. Examples and approximation algorithms of NP - Complete problems.

4. Consultations - Mike Guerard, Industrial Ed.
Larry Delaney, Physical Sciences

5. Additional Information

a. A text book can be chosen from the following list:

I. Baase, S. (1983). Computer Algorithms. Reading, Mass.: Addison-Wesley.

II. Borodin, A., and Munro, I. (1975). Computational Complexity of Algebraic and Numeric Problems. New York: American Elsevier.

III. Hopcroft, J. E., and Ullman, J. D. (1979). Introduction to Automata Theory, Languages, and Computation. Reading, Mass.: Addison-Wesley.

IV. Knuth, D. E. (1968). The Art of Computer Programming, Volume I: Fundamental Algorithms. Reading, Mass.: Addison-Wesley.

b. Similar undergraduate courses are offered at Rutgers, Temple, University of Pennsylvania and University of Delaware.

6. Catalog Description

~~0704.422~~*

Theory of Computing and Complexity of Algorithms.
(Prerequisites: 0704.322 and 1701.131)

This course includes Models of Computers such as finite automata and Turing machines, basics of formal languages with applications to Syntax of programming languages, design of efficient Sorting, order statistics and other algorithms and analysis of their complexity, NP - Complete problems and approximation algorithms for them are discussed.

* ~~Recommended HEGIS number~~