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FACULTY SENATE
CURRICULUM COMMITTEE
Approval Form

Department Mathematics

Title Principles of Digital Computer Design

Sponsor(s) Don Stone, Jack Dirprich No. of Credits 3

COURSE SPECIALIZATION CONCENTRATION CERTIFICATION MAJOR PROGRAM

(Approved by the department) Graduate ()

Not recommended by the department Undergraduate (X)

Information copies forwarded: Academic Dean; Chairperson, Curriculum Committee

David J. Travis
Signature: Department Chairperson

Date April 11, 1978

DIVISION

Consultation on proposal has been held

Comments:

Nan Donagan Date 4/12/78
Signature: Academic Dean and/or Divisional Committee

CURRICULUM COMMITTEE

Proposal received 4-0-78

Open Hearing held 5-4-78

Acad. President *1 - copies of consultation*

Returned to the department for the following reason(s):

Approved by the Curriculum Committee

Presented to Executive Committee of the Faculty Senate as information

Notifications forwarded: Vice President for Academic Affairs

J. G. Mraz
Signature: Chairperson, Curriculum Committee

Date 5-4-78

Academic Dean

I have reviewed the final documents as approved and concur with same. Budget, faculty, library allocations and Academic Support Services are adequate for immediate implementation.

I have reviewed the final documents as approved and concur with same. Budget, faculty, library allocations and Academic Support Services for the current academic year are inadequate for immediate implementation or implementation in the next fiscal year. The earliest that the proposal might be implemented would be

HEGIS Taxonomy Number: _____

Alan Deane
Signature: Academic Dean

Date 7/18/78

Copies forwarded: Chairperson, Curriculum Committee, Department Chairperson,
Registrar

REGISTRAR

Approved course description received

Signature: Registrar

Date _____

Vice President for Academic Affairs

Official copy and approval sheet filed

Alan Deane
Signature: Vice President for Academic Affairs

Date 1-19-78

- Note
- 1) Course proposal format is attached
 - 2) A copy of this approval form should accompany each proposal
 - 3) A copy of a proposed catalogue description of the course must accompany the proposal as a separate page.

Glassboro State College
Department of Mathematics

New Course Proposal

I. IDENTIFICATION:

Title of the Course: Principles of Digital Computer Design

Department: Mathematics

Sponsors: Don Stone and Jack Cimprich

II. ESSENCE:

- a. Undergraduate Course
- b. Semester Hours Credit: 3
- c. Course Level: Junior/Senior
- d. Prerequisite: Computers and Programming (0704.204)
- e. Curricular Pattern: This course will be an elective for those wishing to extend their studies of computer science beyond the limited requirements of the present concentration in computer science. This course will be a requirement in a future major in computer science.
- f. Time and Scale of Implementation: It is expected that this course would be offered once a year. Enrollment might average 20 to 25.

III. OTHER DETAILS:

- a. Staff and Resources: Three members of the Mathematics Department are teaching or have taught advanced computer courses and could teach this course. Current computer facilities are adequate and will be enhanced by the projected acquisition of a microprocessor-based system with graphics capabilities.
- b. Library Resources: The department has been actively acquiring books in computer science for the library and will continue to do so. Present holdings are satisfactory.
- c. Space Needs: Can be adequately taken care of.
- d. Course Uniqueness: There is a very small amount of overlap between this course and other computer science courses (e.g., in the topic of number representation), but the emphasis in this course is on the computer structure implications or implementation of such topics. The great majority of the topics in the proposed course are not covered in any other course on campus.

- e. **Specific Student Outcomes:** Upon completion of this course a student should be able to:
1. Design an efficient combinational circuit using standard gates to realize a given function.
 2. Design sequential circuits to realize various functions, including arithmetic operations.
 3. Specify a microprogram to implement a given macroinstruction for a given computer architecture.
 4. Design an interface between a central processing unit and a specified piece of peripheral equipment.
 5. Design a microprocessor-based system to satisfy given performance objectives using components from a specified set.
- f. **Evaluation Procedures of Students:** Written examinations would be the primary means for measuring student achievement. In addition, students may be given assignments to design specific computer structures and test the designs by implementing them within a digital simulation model.

IV. TOPICAL OUTLINE:

- a. Digital computer structure
- b. Switching (Boolean) algebra, canonical expansion of functions, minimization
- c. Gates and combinational circuits
- d. Sequential circuits
- e. Number representation
- f. Arithmetic operations
- g. Codes
- h. Control unit, instruction execution cycle, microprogramming
- i. Buses
- j. Memory and addressing
- k. Input/output, interrupts, direct memory access, data channels, interface design
- l. Microprocessors
- m. Large-scale systems
- n. Parallelism and distributed computing

V. RATIONALE:

The proposed course fills an important gap in the set of computer science courses available at the college. Some understanding of computer structure is necessary for many of the more challenging computer-related jobs. Computer utilization is increasing dramatically in our society, and an increasing number of our graduates are finding employment as computer professionals. A recent survey of the Mathematics Department's graduates shows that 75% would have taken more computer science courses had they been offered and that 25% of recent Mathematics graduates have found computer-related employment.

VI. RESULTS OF CONSULTATION:

- a. The following people at the College have been consulted about the proposed course:

Lee Dinsmore and Leon Goldberg, Physical Sciences
Michael Guerard, Industrial Education and Technology
Robert Loscher, Computer Center
Barry Loigman, Psychology
Mario Tomei, Educational Administration

They have all indicated that they support the course. Some also recommended specific changes in wording which have been incorporated in this revised proposal. Several people felt that a laboratory course, allowing students to get "hands-on" experience with computer

components, would be a valuable supplement to this course, and thus the proposal has been a stimulus for the development of a possibly interdisciplinary course of this sort.

- b. The proposed course is very similar to the course "Computer Organization" in the Curriculum 68 of the Association for Computing Machinery. In addition, the topics of the proposed course are included in the minimum set of concepts listed in "Accreditation Guidelines for Bachelor's Degree Programs in Computer Science", Communications of the ACM, Nov. 1977, pp. 891-2.

VII. CATALOGUE DESCRIPTION:

Principles of Digital Computer Design (Prerequisite: 0704.204)

This course provides an introduction to the logical structure of digital computers. The topics include switching algebra, combinational and sequential circuits, the implementation of arithmetic operations, the control unit, microprogramming, buses, memory and addressing, interface design, and microprocessors.

VIII. POSSIBLE TEXTBOOKS:

Raymond M. Kline, Digital Computer Design, Prentice-Hall, 1977.

Caxton C. Foster, Computer Architecture, Second Edition, Van Nostrand Reinhold, 1976.

Abd-Elfattah M. Abd-Alla and Arnold C. Meltzer, Principles of Digital Computer Design, vol. 1, Prentice-Hall, 1976.