

4-29-1991

## Computer Science Changes

The College at Brockport, College Senate

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John E. Van de Wetering  
President

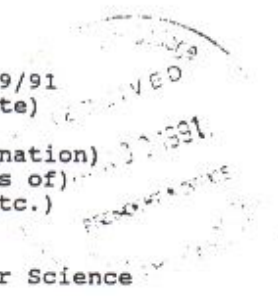
Resolution # 30 1990-91

TO: President John E. Van de Wetering

FROM: The Faculty Senate Meeting on 4/29/91  
(Date)

RE: X I. Formal Resolution (Act of Determination)  
II. Recommendation (Urging the fitness of)  
III. Other (Notice, Request, Report, etc.)  
For your information

SUBJECT: Proposed changes to the Major in Computer Science



Signed Thomas J. Kelly  
(For the Senate)

Date Sent 4/30/91

TO: The Faculty Senate

FROM: President John E. Van de Wetering

RE: I. Decision and Action Taken on Formal Resolution

- a. Accepted. Effective Date Fall 91
- b. Deferred for discussion with the Faculty Senate on \_\_\_\_\_
- c. Unacceptable for the reasons contained in the attached explanation

II, III.

- a. Received and acknowledged
- b. Comment:

DISTRIBUTION: Cover page only to attached list  
Sec-Faculty Senate for full copy.

Distribution Date 5/1/91 Signed: J. E. Van de Wetering  
(President of the College)

State University of New York  
College at Brockport  
Brockport, New York 14420  
Department of Computer Science  
(716) 395-2194

February 28, 1991

TO: Senate Undergraduate Curriculum Committee  
FR: Dr. T.M. Rao, Chair  
Department of Computer Science *T.M. Rao*  
RE: Computer Science Major and Minor Programs

**NOTE:** This was submitted to the Undergraduate Curriculum Committee in Fall '90. Items 1, 2 and 3 were approved and Item 4 was referred back to our department. We have now revised the item 4 and submitted for the committee's approval.

After careful consideration of the requirements of our major and minor programs, the faculty of the Department of Computer Science have formulated the following policies. We consider these changes to be of a minor nature and are forwarding them to your committee for consideration and approval.

1. **Pre-requisites for the major programs:** The pre-requisites for the first course in the major, CSC 203, are 3-1/2 years of college preparatory mathematics (or MTH 122) and an introductory programming course in a high level language such as BASIC, FORTRAN or Pascal. Students can satisfy the programming pre-requisite by taking the new course: CSC 120: Introduction to Computer Science. This course is especially recommended for those students who are interested in majoring or minoring in Computer Science (as opposed to those who want to take CSC 203 as a Computer Literacy course.)

2. **Credit by Portfolio Assessment (New Policy):** The request for such credit must be initiated by the student. The request must be for a specific CSC course listed in the handbook, but excluding Internship (CSC 492), Topics in Computer Science (CSC 495) and Independent Study (CSC 499). The student will normally be required to pass an examination and/or complete assignments before credit can be awarded. A maximum of six credits can be awarded based on portfolio assessment.

3. **Credit by Examination (New Policy):** The request for such credit must be initiated by the student. Credit may be requested for specific CSC courses listed in the handbook but excluding Internship (CSC 492), Topics in Computer Science (CSC 495) and Independent Study (CSC 499). The procedures for Credit by Examination as determined by the college, including the payment of any fees by the student, shall be followed. A maximum of six credits can be awarded in this category.

4. **Minimum Credit Requirement at Brockport (New Policy):** At least 18 of the credits used to satisfy the major requirements in Computer Science must be earned at Brockport. In case of Computer Science minor at least 9 credits must be earned at Brockport.

TMR/rht

xc: Dr. Gemmett

**SUMMARY OF REQUIREMENTS OF PROPOSED ACCREDITED TRACK MAJOR IN  
COMPUTER SCIENCE**

line 1	<b>General Education</b>		
	APS		1
	Com Skills		3
	CNT/Statistics		3
	Breadth Components:	F, P	6
		H, H (C, W, T also)	6
		S, S (C, W, T also)	6
		N, L	7
	Computer literacy		4
	Issues		3
line 11	<b>Subtotal for General Education</b>		<b>39</b>
line 12	<b>Major in Computer Science</b>		
	required courses in computer science	31	[4 credits counted above in general education T]
	electives in computer science	12	
	<b>Subtotal for major department</b>	<b>43</b>	
	required courses in Mathematics	15	[3 credits counted above in general education N]
	required elective courses in sciences	14-16	[4 credits counted above in general education L]
line 18	<b>Subtotal for specified by major</b>	<b>61-63</b>	
line 19	<b>Electives</b>	<b>18-20</b>	
	<b>TOTAL CREDITS</b>	<b>120</b>	(sum of lines 11, 18, and 19)

Compiled by J. Emory Morris

DEPARTMENT OF COMPUTER SCIENCE  
A PROPOSAL TO CREATE TWO TRACKS  
IN THE COMPUTER SCIENCE MAJOR

APRIL 1991

I. INTRODUCTION

The purpose of this document is to propose the establishment of two separate tracks in the Computer Science major.

The first track would be called "Major in Computer Science and Information Systems (CSIS-major)" and the other would be called "Major in Computer Science (CS-major)". The CSIS-major is essentially the same as the currently existing Computer Science major, except that some new courses are allowed as electives. The proposed new CS-major has more science and math requirements in addition to those required by CSIS-major. In fact, CSIS-major is a subset of the CS-major.

There are several reasons that motivated us to propose these changes in our major. The most important among them is our desire to establish a major program that would be accredited by our national accrediting agency (Computer Science Accreditation Board - CSAB). All the changes that are being proposed here are in-line with the CSAB recommendations. Although having a CSAB-accredited program is advantageous to both students and the college, we feel that we should also continue to offer the existing program. Thus, it is proposed that we would have two tracks: CSIS-major (same as the currently existing Computer Science major) and the new CS-major. The rest of this document describes the new CS-major in detail. Initially, a brief historical background for the development of Computer Science curricula is presented. This is followed by a description of the standards as required by the accrediting agency and our proposed revised program.

Computer science is a rapidly changing discipline. Although electronic digital computers have existed for about forty years now, Computer science has been recognized as a separate discipline for not more than the past twenty-five years. SONY Brockport's Computer Science program was established in 1974. Traditionally Computer Science departments have grown out of Electrical Engineering, Mathematics or Business departments. Thus, curricula in the area of computing have developed in the directions of Computer Engineering, Computer Science, or Computer Information Systems, depending on the origin of the program.

Every ten years or so, the field of Computer Science seems to redefine itself. This is almost unavoidable because of the rapidly with which technical changes are taking place in the

field. For example, in earlier years computer hardware resources were at a premium. Thus it was considered very clever if one could invent tricks to save a few bytes of main memory or a few seconds of computer time; it was considered secondary if this made the implementation obscure. Today, human costs dominate the cost of producing software. It is more important to make programs readable by humans, and therefore, courses on Software Engineering must now emphasize this view. Furthermore, new subfields within Computer Science continue to emerge from time to time (Neural Networks, parallel and Distributed computing etc.) and a Computer Science curriculum has to respond to these changes.

## 2. ACM CURRICULUM-68

The first serious effort to standardize the Computer Science curriculum was initiated by the Association for Computing Machinery (ACM), one of the leading organizations of computing professionals in the world. The ACM set up a "Curriculum Committee on Computer Science," which produced a report [1] now known as "Curriculum-68." Some highlights of this report are:

### Major requirements:

#### Core courses:

- B1: Introduction to Computing
- B2: Computers and Programming
- B3: Introduction to Discrete Structures
- B4: Numerical Calculus
- I1: Data Structures
- I2: Programming Languages
- I3: Computer Organization
- I4: Systems Programming

#### Electives (at least 2 courses required):

- I5: Compiler Construction
- I6: Switching Theory
- I7: Sequential Machines
- I8: Numerical Analysis I
- I9: Numerical Analysis II

The major consisted of 30 credits of course work with 24 credits in the core and 6 credits in electives (assuming 3 credits per course). Brockport's Computer Science program, as introduced in 1974, was modeled after Curriculum-68.

## 3. ACM CURRICULUM-78

Although many schools implemented their own versions of Curriculum-68, the pace of change within the field and rapid computerization necessitated a redefinition of the curriculum. Again a committee of the ACM published a report called "Curriculum-78." [1] some of the highlights of which are:

### Major requirements:

#### Core Courses:

- CS1: Computer Programming I
- CS2: Computer Programming II
- CS3: Introduction to Computer Systems
- CS4: Introduction to Computer Organization
- CS5: Introduction to File Processing
- CS6: Operating Systems and Computer Architecture I
- CS7: Data Structures and Algorithms Analysis
- CS8: Organization of Programming Languages

#### Electives (at least 4 courses required):

- CS9: Computers and Society
- CS10: Operating Systems and Computer Architecture II
- CS11: Database Management Systems Design
- CS12: Artificial Intelligence
- CS13: Algorithms
- CS14: Software Design and Development
- CS15: Theory of programming Languages
- CS16: Automata, Computability, and Formal Languages
- CS17: Numerical Mathematics: Analysis
- CS18: Numerical Mathematics: Linear Algebra

#### Mathematics requirements:

- MA1: Introductory Calculus
- MA2: Mathematical Analysis I
- MA3: Probability
- MA4: Linear Algebra
- MA5: Discrete Structures

This recommendation not only expanded the Computer science requirements, but proposed specific Mathematics requirements as well. This model is quite popular, and the present curriculum at Brockport is a variation of Curriculum-78. The following list shows approximate equivalents between the current Brockport Computer Science Major program and Curriculum-78:

#### Core Courses:

- |           |               |
|-----------|---------------|
| Brockport | Curriculum-78 |
| CSC203    | CS1           |
| CSC205    | CS2           |
| CSC311    | CS3           |
| CSC411    | CS4, 6        |
| CSC406    | CS7           |
| CSC401    | CS8           |
| ---       | CS5           |

#### Electives:

- |              |               |
|--------------|---------------|
| Brockport    | Curriculum-78 |
| (5 required) | (4 required)  |
| CSC390       | CS9           |
| CSC412       | CS10          |
| CSC422, 411  | CS11          |
| CSC434, 435  | CS12          |
| CSC485       | CS13          |
| CSC427       | CS14          |
| CSC402       | CS15          |

Math. Requirements:		CSC483	CS16
		CSC471	CS17,18
Brockport	Curriculum-78	CSC493	Special Topics
MTH401	MA1	CSC426	CS5
--	MA2	CSC432	--
--	MA2A	CSC433	--
MTH281	MA3	CSC418	--
MTH481	MA4	CSC419	--
		CSC492	--
		CSC499	--

The above comparison reveals that the Brockport program matches Curriculum-78 favorably except for the following variations:

CS5 (CSC434) is an elective at Brockport.  
 Brockport offers many more electives than the recommended minimum.  
 Brockport's Mathematics requirement is somewhat weaker.

#### 4. ACM/IEEE CURRICULUM-88

Several years ago another committee sponsored by the ACM began working on a revised Computer Science curriculum, originally to be called Curriculum-88. However, the Committee's report called Computing Curricula '91 has just been released (March 1991). It is noteworthy that Dr. Eugene Spafford, a graduate of the Brockport Computer Science program, is a member of this committee.

#### 5. ACCREDITATION OF COMPUTER SCIENCE PROGRAMS

In the mid-1980's, with the advent of microcomputers and rapid computerization in industry, a large demand for computer scientists developed. In response to this demand many schools instituted new Computer Science programs. In a further effort to ensure the quality of Computer Science programs, the ACM and Institute of Electrical and Electronics Engineers --- Computer Society (IEEE-CS) jointly set up a committee called the Computer Science Accreditation Board (CSAB). The purpose of this board is to act as an accrediting agency: to set and apply standards in the field, visiting college campuses and assessing programs along the same lines as the Accreditation Board for Engineering and Technology (ABET). Accreditation of engineering programs has been a standard practice in the U.S. for many decades, but it is new to programs in Liberal Arts. Initially there was considerable resistance to the idea of accreditation in Computer Science. It was thought of as a concept specifically appropriate to career training in engineering, medicine, law, and other professions; and there was fear that it might lead to the licensing of Computer Science faculty, a standard practice in the professions but unheard of in Liberal Arts disciplines. In spite of these fears, CSAB persisted and has now gained wide

acceptance. Many schools with Computer Science programs have found it advantageous to go through the process of accreditation, including our neighbors RIT, SUNY Plattsburgh, and Canisius College. According to CSAB, a program was accredited in 1985, 24 in 1987, 26 in 1987, 15 in 1988, 15 in 1989 and 14 in 1990 (95 in total).

We at Brockport think that accreditation is a good idea. The proposal to seek accreditation for our program has been debated thoroughly in the department and we are determined to go through the process and gain this "seal of approval." This accreditation will be important as a recognition of the quality of our program, thereby allowing us to compete favorably for quality students and faculty over the coming years.

#### 6. CSAB ACCREDITATION REQUIREMENTS

The CSAB accreditation document(2) specifies numerous requirements, ranging from curricula to equipment to secretarial and institutional support. As a first and most important step towards accreditation, we are proposing changes in our major requirements to meet the specified standards. The CSAB curricula specifies the following requirements:

- 40 credits in Computer Science
- 15 credits in Mathematics
- A 2-semester sequence (6 credits) in a laboratory science for science/engineering majors

Two additional one-semester courses each of which is a course in science or a course that enhances the student's abilities in application of the scientific method. Each of the latter two courses should be a course for science/engineering majors or a course with a strong emphasis on quantitative methods.

In contrast, the current Computer Science program at Brockport requires:

- 33 credits in Computer Science
- 9 credits in Mathematics

Clearly, in order to meet the CSAB standards, our program needs a substantial increase in its requirements.

7. PROPOSED CURRICULUM CHANGES

In an effort to establish a track that would meet the CSAB standards, we propose a new track to be called "Major in Computer Science" with the following requirements:

NEW TRACK: Major in Computer Science  
CS-major

Course	Title	Credits
CSC103	Fundamentals of Computer Science I	4*
CSC105	Fundamentals of Computer Science II	4*
CSC111	Assembly Language	4*
CSC106	Advanced Data Structures	4*
CSC101	Theory of Programming Languages	3
CSC111	Computer Architecture	3
CSC112	Operating Systems	3
CSC127	Software Systems Development	3
CSC143	Theory of Computation	3
Total Core		31

\* These are currently 3-credit courses. It is proposed to upgrade them to four credits. See the last paragraph in this section.

Electives:

The number of courses required as major electives would be reduced from five to four (12 credits). These four would be subject to the following restrictions:

1. At most one may be chosen from the programming language group (presently CSC117, CSC118 AND CSC119).
2. At most 6 credits allowed at the 490 level (independent studies).

Total Elective 12

Mathematics Co-requisites:

Course	Title	Credits
MTH201	Calculus I	3
MTH202	Calculus II	3
MTH281	Discrete Mathematics I	3
MTH346	Probability and Statistics I	3
MTH491	Discrete Mathematics II	3
Total Mathematics		15

6

Science Co-requisites:

- (i) A two-semester sequence in a laboratory science for science/engineering majors. For example, PHS 201-202, CHH 205-206, BIO 201-202, ESC 201-211
- (ii) Two one-semester courses in a science subject for science/engineering majors. For example, two chosen from PHS 301, PHS 309, CHH 301, CHH 305 etc.

Total Science 14-16

Total Credits for the major

72

OLD TRACK: Chge of Title  
MAJOR in Computer Science and Information Systems  
CSIS-major

The existing major in Computer Science will continue to be offered with a change of title to "Major in Computer Science and Information Systems" and the change of credits for some of the core courses. The requirements for the CSIS-major will be essentially the same as our old CSC-major:

Core Requirements:

Course	Title	Credits
CSC203	Fundamentals of Computer Science I	4*
CSC205	Fundamentals of Computer Science II	4*
CSC111	Assembly Language	4*
CSC106	Advanced Data Structures	4*
CSC101	Theory of Programming Languages	4*
CSC111	Computer Architecture	3
Total Core		32

\* These are currently 3-credit courses. It is proposed to upgrade them to four credits. See Section 6.

Electives:

Five courses (15 credits) at 300-400 level required with the following restrictions:

1. At most one may be chosen from the programming language group (presently CSC117, CSC118 AND CSC119).
2. At most 6 credits allowed at the 490 level (independent studies).

Total Elective 15

7

Mathematics Co-requisites:

Course Title	Credits
MTH481 Discrete Mathematics II	3
Needed because of pre-requisite structure	
MTH201 Calculus I	3
MTH281 Discrete Mathematics I	3
Total Mathematics	9
Total Credits for the major	46

8. CHANGING COURSE CREDITS

At present all scheduled Computer Science courses, including CSC105, CSC105, CSC311, and CSC406, are 3-credit courses. However, these four in particular require extensive programming, with students spending 10 or more hours per week on the computer to complete the projects, in a way quite similar to laboratory work in other sciences. We propose that this work be recognized and that these four courses be changed from 3 to 4 credits.

9. OBSERVATIONS ON THE PROPOSED NEW PROGRAM

The new program will require 43 credits in Computer Science, 3 more than the minimum specified by CSAB. We would feel uncomfortable having the absolute minimum number of credits.

A student who begins as a freshman and completes the major would automatically satisfy 13 of the 37 credits (APS: 1, COM: 3, QMR: 3, Breadth Component: 24, Contemporary Issues: 3 and Computer Literacy: 3) required by the General Education program, specifically:

Quantitative Skills: 3 (MTH 146)  
 Computer Literacy: 4 (CSC 203)  
 Natural Sciences: 6 (MTH 201, FHS 201 OR CHM 205)

Transfer students present a special problem. Students presently attending community or other two-year colleges and planning to complete their Bachelor's Degree at Brockport in two years may find that the Computer Science requirements make this difficult to do so unless they come in with some course work in Computer Science. This situation needs to be made clear to them through their advisors at the two-year institutions. However, there is always the option of completing the CSIS-track.

10. RESOURCES TO IMPLEMENT THE NEW TRACK

All the courses that are required and elective for the new track are regularly offered. The implementation of this new track does not require any new personnel resources for the current number of students. Currently, there are approximately 190 majors in Computer Science and we do not expect any significant change in the number as a result of this implementation. We expect that initially only a small number of students will opt for the new track. This new track, if approved by the senate, will be the candidate for CSAB accreditation. After the award of CSAB accreditation and appropriate advertisement of the award, we expect that our major enrollment will increase.

11. REFERENCES

- [1] ACM Education Board, "ACM Recommended Curricula for Computer Science and Information Processing Programs in Colleges and Universities, 1968-71." A Publication of the Association for Computing Machinery, 1981.
- [2] Computer Sciences Accreditation Board, "Criteria for Accreditating Computer Science Programs in the United States," August, 1990



SUMMARY OF  
THE  
PROPOSED CHANGES TO THE MAJOR IN  
COMPUTER SCIENCE

APRIL 1991

OBJECTIVE: To bring the major requirements at Brockport up to par with those recommended by the Computer Science Accreditation Board (CSAB). CSAB, a committee set up by the Association for Computing Machinery (ACM) and Institution of Electrical and Electronic Engineers-Computer Society (IEEE-CS), is a national accrediting agency for Computer Science programs. We are proposing to create two different tracks: Computer Science and Information Systems Major (CSIS-major - a new title for the existing CSC-major with some minor changes) and a new track to be called Computer Science Major (CS-major) which has additional requirements and which meets the CSAB standards.

I. CHANGE IN THE EXISTING MAJOR (Change of Title):  
"MAJOR IN COMPUTER SCIENCE AND INFORMATION SYSTEMS"  
(CSIS - major)

It is proposed that the name of the present Major in Computer Science be changed to "Major in Computer Science and Information Systems". The requirements for this major remain the same as the existing major except that the credits for each of the four courses (indicated by \*) are to be increased to 4.

(a) Core Courses

	existing credits	proposed credits
CSC 203 Fundamentals of Comp. Sci. I	3	4 *
CSC 205 Fundamentals of Comp. Sci. II	3	4 *
CSC 311 Assembly Language Programming	3	4 *
CSC 401 Thy. of Prog. Languages	3	3
CSC 406 Advanced Data Structures	3	4 *
CSC 411 Computer Architecture	3	3

Total: 18

22

( \* = courses proposed for credit increase )

(b) Elective Courses

15

15

300-400 level courses selected under advisement. Restrictions apply.

(c) Mathematics Requirement (3 credits)

MTH 481 Discrete Mathematics II	3	3
Pre-requisites: MTH 201, MTH 291		

TOTAL: 36

40

1

II. REQUIREMENTS OF THE PROPOSED NEW TRACK:  
 "MAJOR IN COMPUTER SCIENCE"  
 (CS - major)

(a) Core Courses (31 Credits)

	Credits
CSC 203 Fundamentals of Comp. Sci. I	4 *
CSC 205 Fundamentals of Comp. Sci. II	4 *
CSC 311 Assembly Language Programming	4 *
CSC 401 Thy. of Prog. Languages	3
CSC 406 Advanced Data Structures	4 *
CSC 411 Computer Architecture	3
CSC 412 Operating Systems	3
CSC 427 Software Systems Development	3
CSC 483 Theory of Computation	3

(b) Elective Courses (12 credits) 12  
 300-400 level courses selected under  
 advisement. Restrictions apply.

(c) Mathematics Co-requisite (15 credits)

MTH 201 Calculus I	3
MTH 202 Calculus II	3
MTH 281 Discrete Mathematics I	3
MTH 346 Probability and Statistics I	3
MTH 481 Discrete Mathematics II	3

(d) Science Co-requisite (14-16 Credits)

(i) A two-semester sequence in a laboratory science for  
 science/engineering majors. For example, PHS201-  
 202, CHM205-206, BIO201-202, ESC201-211.

(ii) Two courses, each of which is a course in science  
 or a course that enhances the student's abilities  
 in application of the scientific method. Each  
 course should be a course for science/engineering  
 majors or a course with a strong emphasis on  
 quantitative methods. For example: Two courses  
 chosen from PHS301, PHS309, CHM303, CHM305, etc.

TOTAL: 72

III. INCREASE THE NUMBER OF CREDITS FOR  
CSC203, 205, 311 AND 406.

These courses require extensive programming, with students spending 10 or more hours per week on the Computer to complete the projects, in a way quite similar to laboratory work in other sciences. We propose that this work be recognized and that these courses be changed from 3 to 4 credits each.

RESOURCES TO IMPLEMENT THE NEW TRACK

All the courses that are required and elective for the new track are regularly offered. The implementation of this new track does not require any new personnel resources for the current number of students. Currently, there are approximately 190 majors in Computer Science and we do not expect any significant change in the number as a result of this implementation. We expect that initially only a small number of students will opt for the new track. This new track, if approved by the senate, will be the candidate for CSAB accreditation. After the award of CSAB accreditation and appropriate advertisement of the award, we expect that our major enrollment will increase.