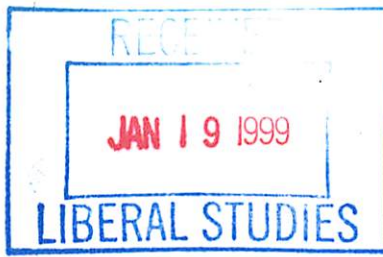


LSC Use Only
Number: _____
Submission Date: _____
Action-Date: _____



UWUCC USE Only
Number: 99-22a
Submission Date: 98-43a
Action-Date: UWUCC App 12/14/99
Senate App 2/29/00

CURRICULUM PROPOSAL COVER SHEET
University-Wide Undergraduate Curriculum Committee

I. CONTACT

Contact Person Jim Wolfe Phone 7-6104
Department Computer Science

II. PROPOSAL TYPE (Check All Appropriate Lines)

 COURSE _____ Suggested 20 character title

 New Course* _____ Course Number and Full Title

 Course Revision _____ Course Number and Full Title

 Liberal Studies Approval+ _____
for new or existing course Course Number and Full Title

 Course Deletion _____ Course Number and Full Title

 Number and/or Title Change _____
Old Number and/or Full Old Title

_____ New Number and/or Full New Title

 Course or Catalog Description Change _____
Course Number and Full Title

PROGRAM: Major Minor Track

 New Program* _____ Program Name

Program Revision* Computer Science _____
Program Name

 Program Deletion* _____ Program Name

 Title Change _____
Old Program Name

_____ New Program Name

III. Approvals (signatures and date)

[Signature] Department Curriculum Committee [Signature] Department Chair

[Signature] College Curriculum Committee [Signature] College Dean

_____ +Director of Liberal Studies (where applicable) _____ *Provost (where applicable)



Part II. Description of Curriculum Change

1. Catalog Description for the revised program.

Department of Computer Science

Gary L. Butergaugh, Chairperson;
Ali, Cross, Cunningham, Grove, Micco, Oblitey, Shubra, Watts, Wolfe, Yang; and professor emeritus
Tompkins

The programs in Computer Science at IUP lead to the B.S. or B.A. degree and are designed primarily to prepare graduates for productive work in highly computer-dependent areas of business, government, and industry. In recent years, majors graduating from the program have attained their first jobs in business applications, programming and systems analysis, computer software development, scientific and applied mathematical programming, and other computer-related areas and have gone to graduate school.

In a rapidly developing field such as Computer Science, it is important that the graduate's education be broad and fundamental so that new trends can more readily be followed. Our goal is to balance fundamentality and breadth with sufficient supervised practice so that our graduates are productive at the time they graduate but ready and willing to change with the field.

Most applied computer scientists work in cooperation with professionals trained in other areas and with managers. Hence, the ability to work and communicate with others of different educational backgrounds is an important characteristic. To that end, we encourage Computer Science majors to take a strong minor (or area concentration) in a second area of interest. Some students may wish to double major. Majors in other disciplines at IUP are also welcome to take Computer Science courses for which they are qualified or a Computer Science minor.

Students majoring in Computer Science should set their goals beyond simple programming and should be preparing

1. to program well, both in design and implementation phases, and document what they have programmed
2. to analyze real-world problems in preparation for program design and implementation
3. to manage activities that are strongly computer dependent
4. to improve the tools that programmers and systems analysts use, i.e., to develop
 - a. better machine systems
 - b. better software systems
 - c. better languages for communicating with machines
 - d. better methods for solving intractable problems
5. to teach about computers at college or high school level
6. to advance the fundamental theory of digital information processors.

Bachelor of Arts-Computer Science

Liberal Studies: As outlined in Liberal Studies section with the following specifications: Mathematics: MA123 (or MA121-MA122) Liberal Studies electives: MA216 (or MA214 or MA217), no courses with CO prefix	55-58
Major:	35
Required courses:	
CO105 Fundamentals of Computer Science	3sh
CO110 Problem Solving and Structured Programming	3sh
CO220 Applied Computer Programming	3sh
CO300 Assembly Language Programming	3sh
CO310 Data Structures	3sh
CO315 Large File Organization and Access	3sh
CO380 Seminar on the Computer Profession	1sh
CO480 Seminar on Technical Topics	1sh
Controlled electives:	Select 9sh (1)
CO250 Introduction to Numerical Methods	3sh
CO304 Interactive Internet Programming with Java	3sh
CO319 Software Engineering Concepts	3sh
CO320 Software Engineering Practice	3sh
CO345 Data Communications	3sh
CO/IM354 Testing and Controlling LANs	3sh
CO355 Computer Graphics	3sh
CO360 IBM Job Control Language	1sh
CO362 Unix Systems	3sh
CO481 Special Topics in Computer Science (as approved for majors)	1-4sh
CO482 Independent Study	1-4sh
CO493 Internship in Computer Science	12sh (2)
IM435 Data Warehousing & Mining	3sh
Upper-level Electives by Categories	6sh (3)
Computer Architecture: CO410	
Theory of Languages: CO419, 420, 424, 460	
Systems Programming: CO430, 432	
Numerical Methods: CO450, 451	
Artificial Intelligence: CO405	
Data Base Management: CO441, 444	
Other Requirements:	6-22
Additional Writing:	
EN322 Technical Writing	3sh

Foreign Language Intermediate Level	0-6sh (4)
Additional Mathematics:	3-13sh (5)
MA123 Calculus I for Physics, Chemistry and Mathematics (MA121 and MA122 may be substituted)	
MA216 Probability and Statistics for Natural Sciences (MA363 and MA364, MA214 and MA417, or MA217 and MA417 may be substituted)	
MA219 Discrete Mathematics	

Free Electives: 9-28

Total Degree Requirements: 124

- (1) Select at least 9sh from the list of controlled electives and/or the list of upper-level electives. Note: Only 4sh of CO493 may be counted toward these 9sh.
- (2) CO493 may be selected in either the second semester of the junior year or the first semester of the senior year. If CO493 is selected and approved, CO380 should be taken in the immediately preceding semester.
- (3) Select at least two additional courses, from at least two different categories, from the list of upper-level electives.
- (4) Foreign Language intermediate-level courses are counted as Liberal Studies electives.
- (5) Any of the Mathematics options satisfy the Learning Skill requirement, and one course may be counted as a Liberal Studies elective. The three-credit minimum applies to students who take MA123 and MA216. The thirteen-credit maximum applies to students who take the MA121-MA122 calculus option and the MA363-MA364 statistics option.

**Bachelor of Science-
Computer Science/Applied Computer Science Track**

Liberal Studies: As outlined in Liberal Studies section 54-58
with the following specifications:
Mathematics: MA123 (or MA121-MA122)
Liberal Studies electives: MA216 (or MA214 or MA217),
no courses with CO prefix

Major:	38
Required courses:	
CO105 Fundamentals of Computer Science	3sh
CO110 Problem Solving and Structured Programming	3sh
CO220 Applied Computer Programming	3sh
CO300 Assembly Language Programming	3sh
CO310 Data Structures	3sh
CO315 Large File Organization and Access	3sh

CO319	Software Engineering Concepts	3sh
CO380	Seminar on the Computer Profession	1sh
CO441	Data Base Management	3sh
CO480	Seminar on Technical Topics	1sh

Select one of the following two courses:

CO320	Software Engineering Practice	3sh (1)
CO493	Internship in Computer Science	12sh (2)

Controlled electives:	Select	6sh (3)
CO250	Introduction to Numerical Methods	3sh
CO304	Interactive Internet Programming with Java	3sh
CO345	Data Communications	3sh
CO/IM354	Testing and Controlling LANs	3sh
CO355	Computer Graphics	3sh
CO360	IBM Job Control Language	1sh
CO362	Unix Systems	3sh
CO481	Special Topics in Computer Science (only sections approved for majors)	1-4sh
CO482	Independent Study	1-4sh
IM435	Data Warehousing & Mining	3sh

Upper Level Electives by Categories:	Select	3sh (4)
Computer Architecture:	CO410	
Data Base Management:	CO444	
Theory of Languages:	CO419, 420, 424, 460	
Systems Programming:	CO430, 432	
Numerical Methods:	CO450, 451	
Artificial Intelligence:	CO405	

Other Requirements:	6-22	
Additional Writing:		
EN322	Technical Writing	3sh
Foreign Language Intermediate Level	0-6sh (5)	
Additional Mathematics:	3-13sh (6)	
MA123	Calculus I for Physics, Chemistry and Mathematics (MA121 and MA122 may be substituted)	
MA216	Probability and Statistics for Natural Sciences (MA363 and MA364, MA214 and MA417, or MA217 and MA417 may be substituted)	
MA219	Discrete Mathematics	

Complete a minor from one of the following areas:	6-18
a) From any department in the College of Natural Sciences and Mathematics	6-18sh
b) From designated Business courses	18sh
c) From designated Economics courses	15sh

- d) From designated Geography courses 15sh
- e) From designated Communications Media courses 18sh

Free Electives: 0-20

Total Degree Requirements: 124

- (1) Credit for both CO320 and CO493 may be counted toward the degree, but only one will be counted toward the major requirements.
- (2) CO493 may be selected in either the second semester of the junior year or the first semester of the senior year. If CO493 is selected and approved, CO380 may be taken in the immediately preceding semester.
- (3) Select at least 6sh from the list of controlled electives and/or the list of upper-level electives.
- (4) Select at least one additional course from the list of upper-level electives.
- (5) Foreign Language intermediate-level courses are counted as Liberal Studies electives.
- (6) Any of the Mathematics options satisfy the Learning Skill requirement, and one course may be counted as a Liberal Studies elective. The three-credit minimum applies to students who take MA123 and MA216. The thirteen-credit maximum applies to students who take the MA121-MA122 calculus option and the MA363-MA364 statistics option.

**Bachelor of Science-
Computer Science/Languages and Systems Track**

Liberal Studies: As outlined in Liberal Studies section 54-58
with the following specifications:

Mathematics: MA123 (or MA121-MA122)

Liberal Studies electives: MA124, no course with CO prefix

Major:

Required courses:	41
CO105 Fundamentals of Computer Science	3sh
CO110 Problem Solving and Structured Programming	3sh
CO220 Applied Computer Programming	3sh
CO300 Assembly Language Programming	3sh
CO310 Data Structures	3sh
CO315 Large File Organization and Access	3sh
CO319 Software Engineering Concepts	3sh
CO380 Seminar on the Computer Profession	1sh
CO410 Processor Architecture and Micro Programming	3sh
CO420 Modern Programming Languages	3sh
CO432 Introduction to Operating Systems	3sh
CO480 Seminar on Technical Topics	1sh

Controlled electives:	Select 9sh (1)
CO250 Introduction to Numerical Methods	3sh
CO304 Interactive Internet Programming with Java	3sh
CO320 Software Engineering Practice	3sh (2)
CO345 Data Communications	3sh
CO/IM354 Testing and Controlling LANs	3sh
CO355 Computer Graphics	3sh
CO360 IBM Job Control Language	1sh
CO362 Unix Systems	3sh
CO405 Artificial Intelligence	3sh
CO419 Software Development and Ada	3sh
CO424 Compiler Construction	3sh
CO430 Introduction to Systems Programming	3sh
CO441 Data Base Management	3sh
CO444 Productivity Tools & 4th Generation Languages	3sh
CO450 Applied Numerical Methods	3sh
CO451 Numerical Methods for Supercomputers	3sh
CO460 Theory of Computation	3sh
CO481 Special Topics in Computer Science (as approved for majors)	1-4sh
CO482 Independent Study	1-4sh
CO493 Internship in Computer Science	12sh (3)
IM435 Data Warehousing & Mining	3sh

Other Requirements:	13-25
Additional writing:	
EN322 Technical Writing	3sh
Foreign Language Intermediate Level	0-6sh (4)
Mathematics: A minor in mathematics including the following courses	10-16sh (5)
MA123 Calculus I for Physics, Chemistry and Mathematics (MA121 and MA122 may be substituted)	
MA124 Calculus II for Physics, Chemistry and Mathematics	
MA171 Introduction to Linear Algebra	
MA216 Probability and Statistics for Natural Sciences (MA363 and MA364 may be substituted)	
MA219 Discrete Mathematics	

Free Electives: 0-16

Total Degree Requirements: 124

- (1) Select at least 9sh from the list of controlled electives. Note: Only 4sh of CO493 may be counted toward these 9sh.
- (2) Credit for both CO320 and CO493 may be counted toward the degree, but only one will be counted

toward the major requirements.

- (3) CO493 may be selected in either the second semester of the junior year or the first semester of the senior year. If CO493 is selected and approved, CO380 may be taken in the immediately preceding semester.
 - (4) Foreign Language intermediate-level courses are counted as Liberal Studies electives.
 - (5) Credits for MA123 and MA124 are counted in Liberal Studies.
-
-

Minor-Computer Science

Minor:	15
Required courses:	
CO electives	15sh(1)(2)(3)

- (1) The minor in Computer Science consists of 15 semester hours of CO electives. At least 9 semester hours of the 15 must be from CO courses numbered higher than 200.
 - (2) CO101 Microbased Computer Literacy is an appropriate entry course for minors or for students who wish to take only one course. However, CO101 cannot be counted as a part of a Computer Science minor by MIS majors.
 - (3) See Computer Science minor adviser for suggestions.
-

2. Summary of changes:

a. Table comparing old and new programs

Bachelor of Arts - Computer Science

Liberal Studies:

As outlined in Liberal Studies section 55-58 with the following specifications:

Mathematics: MA123 (or MA121-MA122 or MA127)

Liberal Studies electives: MA216 (or MA214 or MA217), no courses with CO prefix

Major:	35
Required courses:	
CO105 Fundamentals of Computer Science	3sh
CO110 Problem Solving and Structured Programming	3sh
CO220 Applied Computer Programming	3sh
CO300 Assembly Language Programming	3sh
CO310 Data Structures	3sh
CO315 Large File Organization and Access	3sh
CO380 Seminar on the Computer Profession	1sh
CO480 Seminar on Technical Topics	1sh

Controlled electives:	Select 9sh(1)
CO201 Internet and Multimedia	3sh
CO250 Introduction to Numerical Methods	3sh
CO319 Software Engineering Concepts	3sh
CO320 Software Engineering Practice	3sh
CO345 Data Communication	3sh
CO355 Computer Graphics	3sh
CO360 IBM Job Control Language	1sh
CO362 Unix and C	3sh
CO481 Special Topics in Computer Science (only sections approved for majors)	1-4sh
CO482 Independent Study	1-4sh
CO493 Internship in Computer Science	12sh(2)

Upper-level Electives by Categories	6sh(3)
Computer Architecture: CO410	
Theory of Languages: CO419, 420, 424, 460	

Bachelor of Arts - Computer Science

Liberal Studies:

As outlined in Liberal Studies section 55-58 with the following specifications:

Mathematics: MA123 (or MA121-MA122)

Liberal Studies electives: MA216 (or MA214 or MA217), no courses with CO prefix

Major:	35
Required courses:	
CO105 Fundamentals of Computer Science	3sh
CO110 Problem Solving and Structured Programming	3sh
CO220 Applied Computer Programming	3sh
CO300 Assembly Language Programming	3sh
CO310 Data Structures	3sh
CO315 Large File Organization and Access	3sh
CO380 Seminar on the Computer Profession	1sh
CO480 Seminar on Technical Topics	1sh

Controlled electives:	Select 9sh(1)
CO250 Introduction to Numerical Methods	3sh
CO304 Interactive Internet Programming with Java	3sh
CO319 Software Engineering Concepts	3sh
CO320 Software Engineering Practice	3sh
CO345 Data Communication	3sh
CO/IM354 Testing and Controlling LANs	3sh
CO355 Computer Graphics	3sh
CO360 IBM Job Control Language	1sh
CO362 Unix Systems	3sh
CO481 Special Topics in Computer Science (only sections approved for majors)	1-4sh
CO482 Independent Study	1-4sh
CO493 Internship in Computer Science	12sh(2)
IM435 Data Warehousing & Mining	3sh

Upper-level Electives by Categories	6sh(3)
Computer Architecture: CO410	
Theory of Languages: CO419, 420, 424, 460	

Systems Programming: CO430, 432
 Numerical Methods: CO450, 451
 Artificial Intelligence: CO405
 Data Base Management: CO441, 444

Systems Programming: CO430, 432
 Numerical Methods: CO450, 451
 Artificial Intelligence: CO405
 Data Base Management: CO441, 444

Other Requirements: 6-22
 Additional Writing:
 EN322 Technical Writing 3sh
 Foreign Language Intermediate Level 0-6sh (4)
 Additional Mathematics: 3-13sh (5)
 MA123 Calculus I for Physics, Chemistry and
 Mathematics
 (MA121 and MA122 or MA127
 may be substituted)
 MA216 Probability and Statistics for Natural
 Sciences
 (MA363 and MA364, MA214 and
 MA417, or MA217 and
 MA417 may be substituted)
 MA219 Discrete Mathematics

Other Requirements: 6-22
 Additional Writing:
 EN322 Technical Writing 3sh
 Foreign Language Intermediate Level 0-6sh (4)
 Additional Mathematics: 3-13sh (5)
 MA123 Calculus I for Physics, Chemistry and
 Mathematics
 (MA121 and MA122 may be substituted)
 MA216 Probability and Statistics for Natural
 Sciences
 (MA363 and MA364, MA214 and
 MA417, or MA217 and MA417
 may be substituted)
 MA219 Discrete Mathematics

Free Electives: 9-28

Free Electives: 9-28

Total Degree Requirements: 124

Total Degree Requirements: 124

- (1) Select at least 9sh from the list of controlled electives and/or the list of upper-level electives. Note: Only 4sh of CO493 may be counted toward these 9sh.
- (2) CO493 may be selected in either the second semester of the junior year or the first semester of the senior year. If CO493 is selected and approved, CO380 should be taken in the immediately preceding semester.
- (3) Select at least two additional courses, from at least two different categories, from the list of upper-level electives.
- (4) Foreign Language intermediate-level courses are counted as Liberal Studies electives.
- (5) Any of the Mathematics options satisfy the Learning Skill requirement, and one course may be counted as a Liberal Studies elective. The three-credit minimum applies to students who take MA123 and MA216. The thirteen-credit

- (1) Select at least 9sh from the list of controlled electives and/or the list of upper-level electives. Note: Only 4sh of CO493 may be counted toward these 9sh.
- (2) CO493 may be selected in either the second semester of the junior year or the first semester of the senior year. If CO493 is selected and approved, CO380 should be taken in the immediately preceding semester.
- (3) Select at least two additional courses, from at least two different categories, from the list of upper-level electives.
- (4) Foreign Language intermediate-level courses are counted as Liberal Studies electives.
- (5) Any of the Mathematics options satisfy the Learning Skill requirement, and one course may be counted as a Liberal Studies elective. The three-credit minimum applies to students who take MA123 and MA216. The thirteen-credit

maximum applies to students who take the MA121-MA122 calculus option and the MA363-MA364 statistics option.

maximum applies to students who take the MA121-MA122 calculus option and the MA363-MA364 statistics option.

Bachelor of Science
(Applied Computer Science Track)

Liberal Studies:

As outlined in Liberal Studies section 54-58 with the following specifications:

Mathematics: MA123 (or MA121-MA122 or MA127)

Liberal Studies electives: MA216 (or MA214 or MA217), no courses with CO prefix

Major:	38
Required courses:	
CO105 Fundamentals of Computer Science	3sh
CO110 Problem Solving and Structured Programming	3sh
CO220 Applied Computer Programming	3sh
CO300 Assembly Language Programming	3sh
CO310 Data Structures	3sh
CO315 Large File Organization and Access	3sh
CO319 Software Engineering Concepts	3sh
CO380 Seminar on the Computer Profession	1sh
CO441 Data Base Management	3sh
CO480 Seminar on Technical Topics	1sh

Select one of the following two courses:

CO320 Software Engineering Practice	3sh(1)
CO493 Internship in Computer Science	12sh(2)

Controlled electives:	Select 6sh(3)
CO201 Internet and Multimedia	3sh
CO250 Introduction to Numerical Methods	3sh
CO345 Data Communications	3sh
CO355 Computer Graphics	3sh
CO360 IBM Job Control Language	1sh
CO362 Unix and C	3sh
CO481 Special Topics in Computer Science (only sections approved for majors)	1-4sh
CO482 Independent Study	1-4sh

Bachelor of Science
(Applied Computer Science Track)

Liberal Studies:

As outlined in Liberal Studies section 54-58 with the following specifications:

Mathematics: MA123 (or MA121-MA122)

Liberal Studies electives: MA216 (or MA214 or MA217), no courses with CO prefix

Major:	38
Required courses:	
CO105 Fundamentals of Computer Science	3sh
CO110 Problem Solving and Structured Programming	3sh
CO220 Applied Computer Programming	3sh
CO300 Assembly Language Programming	3sh
CO310 Data Structures	3sh
CO315 Large File Organization and Access	3sh
CO319 Software Engineering Concepts	3sh
CO380 Seminar on the Computer Profession	1sh
CO441 Data Base Management	3sh
CO480 Seminar on Technical Topics	1sh

Select one of the following two courses:

CO320 Software Engineering Practice	3sh(1)
CO493 Internship in Computer Science	12sh(2)

Controlled electives:	Select 6sh(3)
CO250 Introduction to Numerical Methods	3sh
CO304 Interactive Internet Programming with Java	3sh
CO345 Data Communications	3sh
CO/IM354 Testing and Controlling LANs	3sh
CO355 Computer Graphics	3sh
CO360 IBM Job Control Language	1sh
CO362 Unix Systems	3sh
CO481 Special Topics in Computer Science (only sections approved for majors)	1-4sh
CO482 Independent Study	1-4sh
IM435 Data Warehousing & Mining	3sh

Upper Level Electives by Categories:
 Select 3sh(4)
 Computer Architecture: CO410
 Data Base Management: CO444
 Theory of Languages: CO419, 420, 424, 460
 Systems Programming: CO430, 432
 Numerical Methods: CO450, 451
 Artificial Intelligence: CO405

Other Requirements: 6-22
 Additional Writing:
 EN322 Technical Writing 3sh
 Foreign Language Intermediate Level 0-6sh (5)
 Additional Mathematics: 3-13sh (6)
 MA123 Calculus I for Physics, Chemistry and
 Mathematics
 (MA121 and MA122 or MA127
 may be substituted)
 MA216 Probability and Statistics for Natural
 Sciences
 (MA363 and MA364, MA214 and
 MA417, or MA217 and
 MA417 may be substituted)
 MA219 Discrete Mathematics

Complete a minor from one of the following
 areas: 6-18
 a) From any department in the College of
 Natural Sciences and Mathematics 6-18sh
 b) From designated Business courses 18sh
 c) From designated Economics courses 15sh
 d) From designated Geography courses 15sh
 e) From designated Communications Media
 courses 18sh

Free Electives: 0-20

Total Degree Requirements: 124

- (1) Credit for both CO320: Software Engineering Practice and CO493: Internship in Computer Science may be counted toward the degree, but only one will be counted toward the major requirements.
- (2) CO493 may be selected in either the

Upper Level Electives by Categories:
 Select 3sh(4)
 Computer Architecture: CO410
 Data Base Management: CO444
 Theory of Languages: CO419, 420, 424, 460
 Systems Programming: CO430, 432
 Numerical Methods: CO450, 451
 Artificial Intelligence: CO405

Other Requirements: 6-22
 Additional Writing:
 EN322 Technical Writing 3sh
 Foreign Language Intermediate Level 0-6sh (5)
 Additional Mathematics: 3-13sh (6)
 MA123 Calculus I for Physics, Chemistry and
 Mathematics
 (MA121 and MA122 may be substituted)
 MA216 Probability and Statistics for Natural
 Sciences
 (MA363 and MA364, MA214 and
 MA417, or MA217 and MA417
 may be substituted)
 MA219 Discrete Mathematics

Complete a minor from one of the following
 areas: 6-18
 a) From any department in the College of
 Natural Sciences and Mathematics 6-18sh
 b) From designated Business courses 18sh
 c) From designated Economics courses 15sh
 d) From designated Geography courses 15sh
 e) From designated Communications Media
 courses 18sh

Free Electives: 0-20

Total Degree Requirements: 124

- (1) Credit for both CO320: Software Engineering Practice and CO493: Internship in Computer Science may be counted toward the degree, but only one will be counted toward the major requirements.
- (2) CO493 may be selected in either the

second semester of the junior year or the first semester of the senior year. If CO493 is selected and approved, CO380 may be taken in the immediately preceding semester.

- (3) Select at least 6sh from the list of controlled electives and/or the list of upper-level electives.
- (4) Select at least one additional course from the list of upper-level electives.
- (5) Foreign Language intermediate-level courses are counted as Liberal Studies electives.
- (6) Any of the Mathematics options satisfy the Learning Skill requirement, and one course may be counted as a Liberal Studies elective. The three-credit minimum applies to students who take MA123 and MA216. The thirteen-credit maximum applies to students who take the MA121-MA122 calculus option and the MA363-MA364 statistics option.

second semester of the junior year or the first semester of the senior year. If CO493 is selected and approved, CO380 may be taken in the immediately preceding semester.

- (3) Select at least 6sh from the list of controlled electives and/or the list of upper-level electives.
- (4) Select at least one additional course from the list of upper-level electives.
- (5) Foreign Language intermediate-level courses are counted as Liberal Studies electives.
- (6) Any of the Mathematics options satisfy the Learning Skill requirement, and one course may be counted as a Liberal Studies elective. The three-credit minimum applies to students who take MA123 and MA216. The thirteen-credit maximum applies to students who take the MA121-MA122 calculus option and the MA363-MA364 statistics option.

**Bachelor of Science
(Languages and Systems Track)**

Liberal Studies: As stated in Liberal Studies Requirements 54-58 with the following specifications:
 Mathematics: MA123 or MA127
 Liberal Studies electives: MA124, no course with CO prefix

Major:

Required courses:	41
CO105 Fundamentals of Computer Science	3sh
CO110 Problem Solving and Structured Programming	3sh
CO220 Applied Computer Programming	3sh
CO300 Assembly Language Programming	3sh
CO310 Data Structures	3sh
CO315 Large File Organization and Access	3sh
CO319 Software Engineering Concepts	3sh
CO380 Seminar on the Computer Profession	1sh

**Bachelor of Science
(Languages and Systems Track)**

Liberal Studies: **As outlined in Liberal Studies section 54-58** with the following specifications:
 Mathematics: MA123 (or MA121-MA122)
 Liberal Studies electives: MA124, no course with CO prefix

Major:

Required courses:	41
CO105 Fundamentals of Computer Science	3sh
CO110 Problem Solving and Structured Programming	3sh
CO220 Applied Computer Programming	3sh
CO300 Assembly Language Programming	3sh
CO310 Data Structures	3sh
CO315 Large File Organization and Access	3sh
CO319 Software Engineering Concepts	3sh
CO380 Seminar on the Computer Profession	1sh

CO410 Processor Architecture and Micro Programming 3sh
 CO420 Modern Programming Languages 3sh
 CO432 Introduction to Operating Systems 3sh
 CO480 Seminar on Technical Topics 1sh

Controlled electives: Select 9sh(1)
 CO201 Internet and Multimedia 3sh
 CO250 Introduction to Numerical Methods 3sh
 CO320 Software Engineering Practice 3sh(2)
 CO345 Data Communications 3sh
 CO355 Computer Graphics 3sh
 CO360 IBM Job Control Language 1sh
 CO362 Unix and C 3sh
 CO405 Artificial Intelligence 3sh
 CO419 Software Development and Ada 3sh
 CO424 Compiler Construction 3sh
 CO430 Introduction to Systems Programming 3sh
 CO441 Data Base Management 3sh
 CO444 Productivity Tools & 4th Generation Languages 3sh
 CO450 Applied Numerical Methods 3sh
 CO451 Numerical Methods for Supercomputers 3sh
 CO460 Theory of Computation 3sh
 CO481 Special Topics in Computer Science (as approved for majors) 1-4sh
 CO482 Independent Study 1-4sh
 CO493 Internship in Computer Science 12sh(3)

Other Requirements: 13-21
 Additional writing:
 EN322 Technical Writing 3sh
 Foreign Language Intermediate Level 0-6sh (4)
 Mathematics: A minor in mathematics 10-12sh (5)(6)

including the following courses
 MA123 Calculus I for Physics, Chemistry and Mathematics
 (MA127 may be substituted)
 MA124 Calculus II for Physics, Chemistry and Mathematics
 (MA128 may be substituted)

CO410 Processor Architecture and Micro Programming 3sh
 CO420 Modern Programming Languages 3sh
 CO432 Introduction to Operating Systems 3sh
 CO480 Seminar on Technical Topics 1sh

Controlled electives: Select 9sh(1)
 CO250 Introduction to Numerical Methods 3sh
CO304 Interactive Internet Programming with Java 3sh
 CO320 Software Engineering Practice 3sh(2)
 CO345 Data Communications 3sh
CO/IM354 Testing and Controlling LANs 3sh
 CO355 Computer Graphics 3sh
 CO360 IBM Job Control Language 1sh
 CO362 Unix Systems 3sh
 CO405 Artificial Intelligence 3sh
 CO419 Software Development and Ada 3sh
 CO424 Compiler Construction 3sh
 CO430 Introduction to Systems Programming 3sh
 CO441 Data Base Management 3sh
 CO444 Productivity Tools & 4th Generation Languages 3sh
 CO450 Applied Numerical Methods 3sh
 CO451 Numerical Methods for Supercomputers 3sh
 CO460 Theory of Computation 3sh
 CO481 Special Topics in Computer Science (as approved for majors) 1-4sh
 CO482 Independent Study 1-4sh
 CO493 Internship in Computer Science 12sh(3)
IM435 Data Warehousing & Mining 3sh

Other Requirements: 13-25
 Additional writing:
 EN322 Technical Writing 3sh
 Foreign Language Intermediate Level 0-6sh (4)
 Mathematics: A minor in mathematics 10-16sh (5)

including the following courses
 MA123 Calculus I for Physics, Chemistry and Mathematics
 (MA121 and MA122 may be substituted)
 MA124 Calculus II for Physics, Chemistry and Mathematics
 MA171 Introduction to Linear Algebra

MA171 Introduction to Linear Algebra
 MA216 Probability and Statistics for Natural Sciences

(MA363 and MA364, MA214 and MA417, or MA217 and MA417 may be substituted)

MA219 Discrete Mathematics

Free Electives: 5-23

Total Degree Requirements: 124

- (1) Select at least 9sh from the list of controlled electives. Note: Only 4sh of CO493 may be counted toward these 9sh.
- (2) Credit for both CO320: Software Engineering Practice and CO493: Internship in Computer Science may be counted toward the degree, but only one will be counted toward the major requirements.
- (3) CO493 may be selected in either the second semester of the junior year or the first semester of the senior year. If CO493 is selected and approved, CO380 may be taken in the immediately preceding semester.
- (4) Foreign Language intermediate-level courses are counted as Liberal Studies electives.
- (5) Credit for MA123/MA127 and MA124/MA128 counted in Liberal Studies.
- (6) Any of the Mathematics options satisfy the Learning Skill requirement, and one course may be counted as a Liberal Studies elective. The three-credit minimum applies to students who take MA123 and MA216. The thirteen-credit maximum applies to students who take the MA121-MA122 calculus option and the MA363-MA364 statistics option.

Minor-Computer Science

Minor: 15
 Required courses:

MA216 Probability and Statistics for Natural Sciences

(MA363 and MA364 may be substituted)

MA219 Discrete Mathematics

Free Electives: 0-16

Total Degree Requirements: 124

- (1) Select at least 9sh from the list of controlled electives. Note: Only 4sh of CO493 may be counted toward these 9sh.
- (2) Credit for both CO320: Software Engineering Practice and CO493: Internship in Computer Science may be counted toward the degree, but only one will be counted toward the major requirements.
- (3) CO493 may be selected in either the second semester of the junior year or the first semester of the senior year. If CO493 is selected and approved, CO380 may be taken in the immediately preceding semester.
- (4) Foreign Language intermediate-level courses are counted as Liberal Studies electives.
- (5) Credits for MA123 and MA124 are counted in Liberal Studies.

Minor-Computer Science

Minor: 15
 Required courses:

CO electives

15sh(1)(2)

- (1) The minor in Computer Science consists of 15 semester hours of CO electives. At least 9 semester hours of the 15 must be from CO courses numbered higher than 200.
- (2) CO101 Microbased Computer Literacy is an appropriate entry course for minors or for students who wish to take only one course.
- (3) See Computer Science minor adviser for suggestions.

CO electives

15sh(1)(2)(3)

- (1) The minor in Computer Science consists of 15 semester hours of CO electives. At least 9 semester hours of the 15 must be from CO courses numbered higher than 200.
- (2) CO101 Microbased Computer Literacy is an appropriate entry course for minors or for students who wish to take only one course. **However, CO101 cannot be counted as a part of a Computer Science minor by MIS majors.**
- (3) See Computer Science minor adviser for suggestions.

b. List of all associated course changes:

New Courses:

CO 304 Interactive Internet Programming with Java

CO/IM 352 LAN Design and Installation

CO/IM 354 Testing and Controlling LANs

IM 435 Data Warehousing & Mining

Course Revisions:

CO 362 Unix Systems - title change and content update

CO 493 Internship - correction to catalog listing

Course Status Change:

CO 201 Internet and Multimedia - no longer a controlled elective.

3. Rationale for changes

- a. Add CO 304, Interactive Internet Programming with Java, to the lists of Controlled Electives in each degree path and remove CO 201, Internet and Multimedia, from these lists.

Rationale:

The Internet has become an important topic for Computer Science majors. In a previous program revision, CO 201 was included as a controlled elective to make it possible for Computer Science majors to take advantage of the only course the department was teaching that specifically dealt with the Internet. CO 304 represents a much more appropriate course for Computer Science majors than CO 201 in that it deals with the Internet from the programmer's perspective rather than the user's perspective. CO 304 will prepare our majors to address Internet issues at a level closer to what they are likely to encounter on the job. CO 201 can continue to focus on user issues for the non-majors.

- b. Add CO/IM 354, Testing and Controlling LANs, to the lists of Controlled Electives for each degree path.

Rationale:

Networking is another area of computing that has become more and more important. By including this cross listed course in the Controlled Electives, Computer Science students will have

the opportunity of gaining knowledge in this area as part of their major courses. CO/IM 354 has CO/IM352 as a prerequisite; however, CO/IM 352, which provides basic LAN networking experience, is not being added to the Controlled Elective lists. Computer Science students interested in pursuing networking knowledge will need to take CO/IM 352 as an elective, prior to taking CO/IM 354 as one of their Controlled Electives. The idea is to have Computer Science majors, who are interested in this area, take the complete networking sequence without using up the majority of their Controlled Electives in a single application area.

- c. Change the title and content of CO 362 from Unix and C to Unix Systems.

Rationale:

CO 110 and CO 310 have been changed to use C++ as their programming language. Consequently, it is no longer necessary to devote approximately half of CO 362 to teaching the C language. This allows the course to expand on the administrative and system features of the Unix operating system. This change will be beneficial to our majors and minors who will be able to gain greater knowledge of Unix, knowledge which is much in demand by potential employers.

- d. Change the catalog description for CO 493, Internship, to reflect current usage of the course.

Rationale:

The catalog description for CO 493 makes reference to the "30-credit major." The nature of the major has not involved 30 credits since 1991.

- e. Adjust the Mathematics requirements for each degree track to reflect the changes to the Calculus sequence made by the Mathematics department.

Rationale:

Mathematics has phased out the teaching of MA 127. All references to MA 127 need to be eliminated. Also, in the Languages and Systems Track, where MA 127 is listed as an alternative to MA 123, it should be replaced with MA 121 and MA 122 as the alternative. The MA 121 - MA 122 alternative is already listed for the Applied track and the Bachelor of Arts degree. Using MA 121 - MA 122 as an alternative for the Languages and Systems track requires an update in the credit numbers for Other Requirements and Free Electives.

- f. Eliminate the course sequences MA 214 - MA 417 and MA 217 - MA 417 as alternatives for MA 216 for students in the Languages and Systems Track.

Rationale:

This track requires students to obtain a Mathematics minor; none of MA 214, MA 217, or MA 417 can be counted in a Mathematics minor. Languages and Systems students can still use

MA 363 - MA 364 as an alternative for MA 216.

- g. Add IM 435, Data Warehousing & Mining to the lists of Controlled Electives for all degree paths.

Rationale:

Discussions with the MIS and Decision Sciences Department have concluded that this course can be a valuable addition to resumes of Computer Science students, as well as MIS students. By including the course as a Controlled Elective, Computer Science students will be encouraged to consider taking this course.

- h. Add a note to the description of the minor to exclude CO 101 for students who are MIS majors.

Rationale:

The MIS department has specifically requested that CO 101 not be counted as part of a Computer Science minor for their majors. This exclusionary note will handle that request.

- i. Correct several wording and numbering inconsistencies.

Rationale:

The description of the Liberal Studies requirement for the Languages and Systems Track should be consistent with the descriptions for the other tracks. Footnote (6) for Languages and Systems is inappropriate - it is a repetition of a footnote that applies to the Applied Track. Footnote (3) for the Minor was not previously marked in the text.

Part III. Implementation

- 1. Students already in the existing program and who have taken or will take any of the new courses will be allowed to count them in the designated categories toward their requirements for a degree.

Computer Science students who have taken CO 201 prior to the issuance of the catalog containing this program revision will be allowed to count it as one of their Controlled Electives. Computer Science students who take CO 201 after the revision is in the catalog take it only as an elective course.

Computer Science students who have taken MA 127 and/or MA 128 (or have either of these courses transferred) will be allowed to use them as alternatives for MA 123 and 124 respectively. Languages and Systems students who have taken the MA 214-417 or MA 217-417 statistics sequence will be required to take an additional MA course to complete the math minor requirement.

MIS students who have taken CO 101 prior to the issuance of the catalog with this revision will be allowed to count CO 101 in the Computer Science minor. Those who take it after the revision is in the catalog will not be able to count it as part of the minor.

2. Affects on faculty teaching loads have already been addressed in the new course proposals. Sections of CO 304 will be taught in lieu of an equivalent number of sections of CO 201 or another Controlled Elective course. The teaching of CO/IM 352 and CO/IM 354 will be shared with MIS faculty.
3. Resources, as outlined in the course proposals, are adequate.
4. Demand for CO/IM 352 is expected to be significant - it is a required course in the new MIS and Technology Support programs. Students who "get the Computer Science bug" may be attracted to our program by taking one or both of the network courses; however, we do not expect any significant increase in the number of students in our program from these changes.

Part IV. Course Proposals

The course proposals for CO 304, CO/IM 352, and CO/IM 354 are attached.

Part V. Letters of Support

Letters of support for the program revision and for the creation of the new courses from the MIS and Office Systems departments are attached. A letter of support for the adjustments in Mathematics requirements from the Mathematics department is attached also.

To: James Wolfe, Chairperson
Computer Science Curriculum Committee

From: Gerald Buriok, Chairperson *GMB*
Mathematics Department

Date: November 25, 1998

Subject: Computer Science Program Revisions

I have read the revisions your faculty are proposing for the Computer Science Department degree programs and I support the changes you are making related to mathematics courses.

During the 1997-98 academic year, the Mathematics Department received approval to phase out the three semester sequence MA127 Calculus I, MA128 Calculus II, and MA227 Calculus III. None of these courses will be offered beyond the fall semester 1998. Your deletion of references to MA127, MA128, and MA227 in Computer Science programs is the appropriate action to take. Replacing MA127 with MA121/MA122 in your Languages and Systems Track will have virtually no impact on the latter courses, and I support this action, too. You pointed out that the possibility exists that a student will begin in another track and complete MA121 before changing into the Languages and Systems Track. As your proposal is stated, this student would be expected to complete MA122 and then MA124. This is appropriate since a student completing MA121 is normally not prepared to go directly into MA124. There will be a slight overlap in content between MA122 and 124, but the level MA124 is significantly higher and will extend the students knowledge of the overlapping topics.

Eliminating the course sequences MA214-MA417 and MA217-MA417 as alternatives to MA216 for students in the Languages and Systems Track is also an appropriate action for your faculty to take. Since this track requires students to obtain a minor in Mathematics and neither MA214 nor MA217 can be counted toward this minor, students should not consider these sequences as part of their program.

Please contact me if I can be of further assistance.



Date: December 16, 1998

Subject: Letter of Support for Computer Science Curriculum Proposals

To: Dr. William Oblitey, Chair, Computer Science Department
Mr. James Wolfe, Computer Science Department

From: Kenneth L. Shildt, Chair, MIS and Decision Sciences Department *KLS*
Elizabeth M. Pierce, MIS and Decision Sciences Department *EMP*

The MIS and Decision Sciences Department supports the course proposals for CO/IM 352 Local Area Networks Design and Installation as it is being proposed as a course for Computer Science, Office Systems, and MIS majors. This course, along with CO/IM 354 Local Area Networks Administration, will enable students majoring in the area of Information Technology to gain knowledge, which will undoubtedly enhance their professional career preparation.

The dual-listing of these courses demonstrates a spirit of cooperation in the planning and implementation of curriculum which should result in more efficient utilization of the University's resources as well as more flexibility in the scheduling of courses by the majors.

The ability to share the special purpose networking lab located in the Eberly College of Business has the full approval of the MIS Faculty and Dean Robert Camp. A scheduling model will be developed by the Departments to insure that each version of the proposed courses will be given equitable delivery.

The MIS and Decision Sciences Department also supports the course proposal for CO 304 Interactive Internet Programming in JAVA. This course will enable both MIS and Computer Science majors who have had the prerequisite CO110 to learn how to write applications for the Internet. Such skills are currently in high demand in the job market and the offering of this course will benefit both our students and the organizations that recruit our students.

In addition to the new courses listed above, the Computer Science Department listing of a revised set of courses which may be utilized as controlled electives by its majors is strongly supported by the MIS and Decision Sciences Department. The interaction of Computer Science and MIS majors in classes will provide for a continuing dialogue between the Departments and result in a stronger set of courses for both majors to schedule.

Subject: Computer Science Curriculum Support

Date: Wed, 16 Dec 1998 15:34:43 -0500

From: "Mr. Kenneth Shildt" <kshildt@grove.iup.edu>

Organization: Indiana University of Pennsylvania


To: JLWOLFE@grove.iup.edu, OBLITEY@grove.iup.edu, MOORE@grove.iup.edu

Jim:

The letter of support for the Computer Science Department Curriculum Proposals can be viewed on the attached word document entitled "Support Letter?" It reflects the review by our Curriculum Committee and me. It appears that the Office Systems Department is ready to support the proposal for IM 354 as modified after yesterday's meeting.

Both Departments support a change in the title. "Testing and Controlling LAN's" appears to be an acceptable name. Let me know if this transmits successfully.


Ken Shildt


 <u>COMPSCI.SUP.doc</u>	Name: COMPSCI.SUP.doc Type: Winword File (application/msword) Encoding: base64
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Kenneth Shildt <kshildt@iup.edu>

TO: William Oblitey, Chair
Computer Science Department

Jim Wolfe, Curriculum Committee Chair
Computer Science Department

FROM: Wayne Moore, Chair 
Office Systems and Business Education Department

Cathleen Golden, Curriculum Committee Co-Chair 
Office Systems and Business Education Department

DATE: December 15, 1998

SUBJECT: CO 304, CO/IM 352, and CO/IM 354 New Course Proposals

The Office Systems and Business Education department faculty have reviewed the course proposals for CO 304, Interactive Internet Programming in JAVA, and CO/IM 352, LAN Design and Installation. CO/IM 354, Advanced Topics in Local Area Networks, is still under review. The following is a statement of our position.

The Office Systems and Business Education department supports CO 304 and CO/IM 352. We feel they are excellent courses and provide necessary coverage in the technology field. We would like our students to be able to take both courses. CO 304 is problematic in that regard since it has a prerequisite of CO 110 which our students are not likely to have taken. We ask, therefore, that the prerequisite be stated as CO 110 or equivalent to allow our students to enroll in the course.

The spirit of cooperation among the departments that led to the development of these courses strengthens our departments' programs. If you would like to discuss this further, please contact us.

c: Robert Camp, Dean, Eberly College of Business
Ken Shildt, Chair, MIS and Decision Sciences

TO: William Oblitey, Chair
Computer Science Department

Ken Shildt, Chair
Management Information Systems Department

FROM: Wayne Moore, Chair
Office Systems and Business Education Department

DATE: December 16, 1998

SUBJECT: CO/IM 354 NEW COURSE PROPOSAL

The Office Systems and Business Education department faculty have reviewed the course proposal for CO/IM 354—Testing and Controlling LAN's. The department supports this course proposal.

The content of the course is relevant to all technology majors at IUP. Students in our program will benefit by this course.

The cooperative effort that led to the development of this course strengthens the university's technology programs.

C: Robert Camp, Dean, Eberly College of Business