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Submission Date: _____
Action-Date: App 10/9/01 and 10/16/01 Senate App 12/4/01

CURRICULUM PROPOSAL COVER SHEET
University-Wide Undergraduate Curriculum Committee

I. CONTACT

Contact Person Tia Watts / Charles Shubra Phone 724 - 357 - 4492

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

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___ 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

____X___ **PROGRAM:** ___X___ Major _____ Minor __X____ Track

Rev.

___ New Program* _____
Program Name

_X_ Program Revision* Computer Science
Program Name

___ Program Deletion* _____
Program Name

___ Title Change _____
Old Program Name

_____
New Program Name

III. Approvals (signatures and date)

Tia Watts
Department Curriculum Committee

G. L. Bastenbeyer
Department Chair

02/08/07
College Curriculum Committee

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
The programs in Computer Science at IUP leading to a B.S. or B.A. degree 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 some have gone on 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 the fundamentals and breadth of the discipline with sufficient supervised practice so that our graduates are productive at the time they graduate and are also 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 to complete a Computer Science minor.

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

1. program well, both in design and implementation phases, and document what they have programmed
2. analyze real-world problems in preparation for program design and implementation
3. manage activities that are strongly computer dependent
4. 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. advance the fundamental theory of digital information processors
6. remain current in a rapidly changing discipline.

Bachelor of Arts-Computer Science

Liberal Studies: As outlined in Liberal Studies section with the following specifications: **Mathematics:** MATH 123 (or MATH 121-122) **Liberal Studies Electives:** MATH 216 (or MATH 214 or 217), no courses with COSC prefix	**55-58**
Major:	**36**
Required Courses:	
COSC 105 Fundamentals of Computer Science	3sh
COSC 110 Problem Solving and Structured Programming	3sh
COSC 210 Object Oriented and GUI Programming	3sh
COSC 220 Applied Computer Programming	4sh
COSC 300 Assembly Language Programming	3sh
COSC 310 Data Structures and Algorithms	3sh
COSC 341 Data Base Management	3sh
COSC 380 Seminar on the Computer Profession	1sh
COSC 480 Seminar on Technical Topics	1sh
Controlled Electives: Select 6sh (1)	
COSC 250 Introduction to Numerical Methods	3sh
COSC 304 Interactive Internet Programming with Java	3sh
COSC 319 Software Engineering Concepts	3sh
COSC 320 Software Engineering Practice	3sh
COSC 344 Productivity Tools and 4th Generation Languages	3sh
COSC 345 Data Communications	3sh
COSC/IFMG 354 Testing and Controlling LANs	3sh
COSC 355 Computer Graphics	3sh
COSC 360 IBM Job Control Language	1sh
COSC 362 Unix Systems	3sh
COSC 481 Special Topics in Computer Science (as approved for majors)	1-4sh
COSC 482 Independent Study	1-4sh
COSC 493 Internship in Computer Science	12sh (2)
IFMG 455 Data Warehousing and Mining	3sh
Upper-level Electives by Categories Computer Architecture: COSC 410 Theory of Languages: COSC 419, 420, 424, 460 Systems Programming: COSC 430, 432 Numerical Methods: COSC 450, 451 Artificial Intelligence: COSC 405 Data Base Management: COSC 415	6sh (3)

Other Requirements:	**6-22**
Additional Writing:	
ENGL 322 Technical Writing	3sh
Foreign Language Intermediate Level	0-6sh (4)
Additional Mathematics:	3-13sh (5)
MATH 123 Calculus I for Physics, Chemistry and Mathematics (MATH 121 and 122 may be substituted)	
MATH 216 Probability and Statistics for Natural Sciences (MATH 363 and 364, MATH 214 and 417, or MATH 217 and 417 may be substituted)	
MATH 219 Discrete Mathematics	
Free Electives:	**8-27**
Total Degree Requirements:	**124**

(1) Select at least 6sh from the list of controlled electives and/or the list of upper-level electives. Note: Only 4sh of COSC 493 may be counted toward these 6sh.

(2) COSC 493 may be selected in either the second semester of the junior year or the first semester of the senior year. If COSC 493 is selected and approved, COSC 380 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 MATH 123 and 216. The thirteen-credit maximum applies to students who take the MATH 121-122 calculus option and the MATH 363-364 statistics option.

Bachelor of Science-Computer Science/
Applied Computer Science Track

Liberal Studies: As outlined in Liberal Studies section with the following specifications: **Mathematics:** MATH 123 (or MATH 121-122) **Liberal Studies Electives:** MATH 216 (or MATH 214 or 217), no courses with COSC prefix	**54-58**
Major:	**39**
Required Courses:	
COSC 105 Fundamentals of Computer Science	3sh
COSC 110 Problem Solving and Structured Programming	3sh
COSC 210 Object Oriented and GUI Programming	3sh

COSC 220	Applied Computer Programming	4sh
COSC 300	Assembly Language Programming	3sh
COSC 310	Data Structures and Algorithms	3sh
COSC 319	Software Engineering Concepts	3sh
COSC 341	Data Base Management	3sh
COSC 380	Seminar on the Computer Profession	1sh
COSC 480	Seminar on Technical Topics	1sh

Select one of the following two courses: (1)

COSC 304	Interactive Internet Programming with Java	3sh
COSC 344	Productivity Tools and 4th Generation Languages	3sh

Select one of the following two courses: (2)

COSC 320	Software Engineering Practice	3sh
COSC 493	Internship in Computer Science	12sh (3)

Controlled Electives: Select 3sh (4)

COSC 250	Introduction to Numerical Methods	3sh
COSC 345	Data Communications	3sh
COSC/IFMG 354	Testing and Controlling LANs	3sh
COSC 355	Computer Graphics	3sh
COSC 360	IBM Job Control Language	1sh
COSC 362	Unix Systems	3sh
COSC 481	Special Topics in Computer Science (only sections approved for majors)	1-4sh
COSC 482	Independent Study	1-4sh
IFMG 455	Data Warehousing & Mining	3sh

Upper Level Electives by Categories: Select 3sh (5)

Computer Architecture: COSC 410
Data Base Management: COSC 415
Theory of Languages: COSC 419, 420, 424, 460
Systems Programming: COSC 430, 432
Numerical Methods: COSC 450, 451
Artificial Intelligence: COSC 405

Other Requirements: **6-22**

Additional Writing:

ENGL 322	Technical Writing	3sh
Foreign Language Intermediate Level		0-6sh (6)
Additional Mathematics:		3-13sh (7)

MATH 123 Calculus I for Physics, Chemistry and Mathematics
(MATH 121 and 122 may be substituted)
MATH 216 Probability and Statistics for Natural Sciences
(MATH 363 and 364, MATH 214 and 417, or MATH 217 and 417 may be substituted)
MATH 219 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:	**0-19**
Total Degree Requirements:	**124**

(1) Credit for both COSC 304 Interactive Internet Programming with Java and COSC 344 Productivity Tools and 4th Generation Languages may be counted toward the degree, but only one will be counted toward the major requirements.
(2) Credit for both COSC 320 and COSC 493 may be counted toward the degree, but only one will be counted toward the major requirements.
(3) COSC 493 may be selected in either the second semester of the junior year or the first semester of the senior year. If COSC 493 is selected and approved, COSC 380 may be taken in the immediately preceding semester.
(4) Select at least 3sh from the list of controlled electives and/or the list of upper-level electives.
(5) Select at least one additional course from the list of upper-level electives.
(6) Foreign Language intermediate-level courses are counted as Liberal Studies electives.
(7) 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 MATH 123 and 216. The thirteen-credit maximum applies to students who take the MATH 121-122 calculus option and the MATH 363-364 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: MATH 123 (or MATH 121-122)
Liberal Studies Electives: MATH 124, no course with COSC prefix

Major:

Required Courses:		**42**
COSC 105	Fundamentals of Computer Science	3sh
COSC 110	Problem Solving and Structured Programming	3sh
COSC 210	Object Oriented and GUI Programming	3sh
COSC 220	Applied Computer Programming	4sh

COSC 300	Assembly Language Programming	3sh
COSC 310	Data Structures and Algorithms	3sh
COSC 319	Software Engineering Concepts	3sh
COSC 341	Data Base Management	3sh
COSC 380	Seminar on the Computer Profession	1sh
COSC 410	Processor Architecture and Micro Programming	3sh
COSC 420	Modern Programming Languages	3sh
COSC 432	Introduction to Operating Systems	3sh
COSC 480	Seminar on Technical Topics	1sh
Controlled Electives:		
Select 6sh from: (1)		
COSC 250	Introduction to Numerical Methods	3sh
COSC 304	Interactive Internet Programming with Java	3sh (2)
COSC 320	Software Engineering Practice	3sh (3)
COSC 344	Productivity Tools and 4th Generation Languages	3sh (2)
COSC 345	Data Communications	3sh
COSC/IFMG 354	Testing and Controlling LANs	3sh
COSC 355	Computer Graphics	3sh
COSC 360	IBM Job Control Language	1sh
COSC 362	Unix Systems	3sh
COSC 405	Artificial Intelligence	3sh
COSC 415	Internet Architecture and Programming	3sh
COSC 419	Software Development and Ada	3sh
COSC 424	Compiler Construction	3sh
COSC 430	Introduction to Systems Programming	3sh
COSC 450	Applied Numerical Methods	3sh
COSC 451	Numerical Methods for Supercomputers	3sh
COSC 460	Theory of Computation	3sh
COSC 481	Special Topics in Computer Science (as approved for majors)	1-4sh
COSC 482	Independent Study	1-4sh
COSC 493	Internship in Computer Science	12sh (4)
IFMG 455	Data Warehousing & Mining	3sh
Other Requirements:		**13-25**
Additional writing:		
ENGL 322	Technical Writing	3sh
Foreign Language Intermediate Level		0-6sh (5)
Mathematics: A minor in mathematics		10-16sh (6)
including the following courses		
MATH 123	Calculus I for Physics, Chemistry and Mathematics (MATH 121-122 may be substituted)	

MATH 124 Calculus II for Physics, Chemistry and Mathematics
MATH 171 Introduction to Linear Algebra
MATH 216 Probability and Statistics for Natural Sciences
(MATH 363 and 364 may be substituted)
MATH 219 Discrete Mathematics

Free Electives: **0-15**

Total Degree Requirements: **124**

(1) Select at least 6sh from the list of controlled electives. Note: Only 4sh of COSC 493 may be counted toward these 6sh.
(2) Credit for both COSC 304: Interactive Internet Programming with Java and COSC 344 Productivity Tools and 4th Generation Languages may be counted toward the degree, but only one will be counted toward the major requirements.
(3) Credit for both COSC 320 and COSC 493 may be counted toward the degree, but only one will be counted toward the major requirements.
(4) COSC 493 may be selected in either the second semester of the junior year or the first semester of the senior year. If COSC 493 is selected and approved, COSC 380 may be taken in the immediately preceding semester.
(5) Foreign Language intermediate-level courses are counted as Liberal Studies electives.
(6) Credits for MATH 123 and 124 are counted in Liberal Studies.

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2. Summary of changes:

a. Table comparing old and new programs

Current	Proposed
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.	The programs in Computer Science at IUP leading to a B.S. or B.A. degree 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 some have gone on 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	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.

that new trends can more readily be followed. Our goal is to balance the fundamentals and breadth of the discipline with sufficient supervised practice so that our graduates are productive at the time they graduate and are also 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 to complete a Computer Science minor.

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

1. program well, both in design and implementation phases, and document what they have programmed
2. analyze real-world problems in preparation for program design and implementation
3. manage activities that are strongly computer dependent
4. 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. advance the fundamental theory of digital information processors
6. remain current in a rapidly changing discipline.

Bachelor of Arts - Computer Science

Liberal Studies : As outlined in Liberal Studies section with the following specifications: **Mathematics:** MATH 123 (or MATH 121-122) **Liberal Studies Electives:** MATH 216 (or MATH 214 or 217), no courses with COSC prefix	**55-58**
Major:	**35**
Required Courses:	
COSC 105 Fundamentals of Computer Science	3sh
COSC 110 Problem Solving and Structured Programming	3sh
COSC 220 Applied Computer Programming	3sh
COSC 300 Assembly Language Programming	3sh
COSC 310 Data Structures	3sh
COSC 315 Large File Organization and Access	3sh
COSC 380 Seminar on the Computer Profession	1sh
COSC 480 Seminar on Technical Topics	1sh
Controlled Electives:	
Select 9sh from: (1)	
COSC 250 Introduction to Numerical Methods	3sh
COSC 304 Interactive Internet Programming with Java	3sh
COSC 319 Software Engineering Concepts	3sh
COSC 320 Software Engineering Practice	3sh
COSC 345 Data Communications	3sh
COSC/IFMG 354 Testing and Controlling LANs	3sh
COSC 355 Computer Graphics	3sh
COSC 360 IBM Job Control Language	1sh
COSC 362 Unix Systems	3sh
COSC 481 Special Topics in Computer Science (only sections approved for majors)	1-4sh
COSC 482 Independent Study	1-4sh
COSC 493 Internship in Computer Science	2sh(2)
IFMG 455 Data Warehousing and Mining	3sh
Upper-level Electives by Categories Computer Architecture: COSC 410 Theory of Languages: COSC 419, 420, 424, 460 Systems Programming: COSC 430, 432 Numerical Methods: COSC 450, 451 Artificial Intelligence: COSC 405 Data Base Management: COSC 441, 444	6sh(3)
Other Requirements:	**6-22**
Additional Writing:	
ENGL 322 Technical Writing	3sh
Foreign Language Intermediate Level	0-6sh (4)
Additional Mathematics:	3-13sh (5)
MATH 123 Calculus I for Physics, Chemistry and Mathematics (MATH 121 and 122 may be substituted)	
MATH 216 Probability and Statistics for Natural Sciences (MATH 363 and 364, MATH 214 and 417, or MATH 217 and 417 may be substituted)	
MATH 219 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 COSC 493 may be counted toward these 9sh.

(2) COSC 493 may be selected in either the second semester of the junior year or the first semester of the senior year. If COSC 493 is selected and approved, COSC 380 should be taken in the immediately preceding semester.

Bachelor of Arts - Computer Science

Liberal Studies: As outlined in Liberal Studies section with the following specifications: **Mathematics:** MATH 123 (or MATH 121 and 122) **Liberal Studies Electives:** MATH 216 (or MATH 214 or 217), no courses with COSC prefix	**55-58**
Major:	**36**
Required Courses:	
COSC 105 Fundamentals of Computer Science	3sh
COSC 110 Problem Solving and Structured Programming	3sh
COSC 210 Object Oriented and GUI Programming	3sh
COSC 220 Applied Computer Programming	4sh
COSC 300 Assembly Language Programming	3sh
COSC 310 Data Structures and Algorithms	3sh
COSC 341 Data Base Management	3sh
COSC 380 Seminar on the Computer Profession	1sh
COSC 480 Seminar on Technical Topics	1sh
Controlled Electives:	
Select 6sh from: (1)	
COSC 250 Introduction to Numerical Methods	3sh
COSC 304 Interactive Internet Programming with Java	3sh
COSC 319 Software Engineering Concepts	3sh
COSC 320 Software Engineering Practice	3sh
COSC 344 Productivity Tools and 4th Generation Languages	3sh
COSC 345 Data Communications	3sh
COSC/IFMG 354 Testing and Controlling LANs	3sh
COSC 355 Computer Graphics	3sh
COSC 360 IBM Job Control Language	1sh
COSC 362 Unix Systems	3sh
COSC 481 Special Topics in Computer Science (only sections approved for majors)	1-4sh
COSC 482 Independent Study	1-4sh
COSC 493 Internship in Computer Science	12sh(2)
IFMG 455 Data Warehousing and Mining	3sh
Upper-level Electives by Categories Computer Architecture: COSC 410 Theory of Languages: COSC 419, 420, 424, 460 Systems Programming: COSC 430, 432 Numerical Methods: COSC 450, 451 Artificial Intelligence: COSC 405 Data Base Management: COSC 415	6sh(3)
Other Requirements:	**6-22**
Additional Writing:	
ENGL 322 Technical Writing	3sh
Foreign Language Intermediate Level	0-6sh (4)
Additional Mathematics:	3-13sh (5)
MATH 123 Calculus I for Physics, Chemistry and Mathematics (MATH 121 and 122 may be substituted)	
MATH 216 Probability and Statistics for Natural Sciences (MATH 363 and 364, MATH 214 and 417, or MATH 217 and 417 may be substituted)	
MATH 219 Discrete Mathematics	
Free Electives:	**8-27**
Total Degree Requirements:	**124**

(1) Select at least 6sh from the list of controlled electives and/or the list of upper-level electives. Note: Only 4sh of COSC 493 may be counted toward these 6sh.

(2) COSC 493 may be selected in either the second semester of the junior year or the first semester of the senior year. If COSC 493 is selected and approved, COSC 380 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 MATH 123 and 216. The thirteen-credit maximum applies to students who take the MATH 121 and 122 calculus options and the MATH 363-364 statistics option.

Bachelor of Science -Applied Computer Science Track

Liberal Studies: As outlined in Liberal Studies section with the following specifications: **Mathematics:** MATH 123 (or MATH 121-122) **Liberal Studies Electives:** MATH 216 (or MATH 214 or 217), no courses with COSC prefix	**54-58**
Major:	**38**
Required Courses:	
COSC 105 Fundamentals of Computer Science	3sh
COSC 110 Problem Solving and Structured Programming	3sh
COSC 220 Applied Computer Programming	3sh
COSC 300 Assembly Language Programming	3s
COSC 310 Data Structures	3sh
COSC 315 Large File Organization and Access	3sh
COSC 319 Software Engineering Concepts	3sh
COSC 380 Seminar on the Computer Profession	1sh
COSC 441 Data Base Management	3sh
COSC 480 Seminar on Technical Topics	1sh
Select one of the following two courses:	
COSC 320 Software Engineering Practice	3sh(1)
COSC 493 Internship in Computer Science	12sh(2)
Controlled Electives:	
Select 6sh(3)	
COSC 250 Introduction to Numerical Methods	3sh
COSC 304 Interactive Internet Programming with Java	3sh
COSC 345 Data Communications	3sh
COSC/IFMG 354 Testing and Controlling LANs	3sh
COSC 355 Computer Graphics	3sh
COSC 360 IBM Job Control Language	1sh
COSC 362 Unix Systems	3sh
COSC 481 Special Topics in Computer Science (only sections approved for majors)	1-4sh
COSC 482 Independent Study	1-4sh
IFMG 455 Data Warehousing and Mining	3sh
Upper Level Electives by Categories: Select 3sh(4)	
Computer Architecture: COSC 410	
Data Base Management: COSC 444	
Theory of Languages: COSC 419, 420, 424, 460	
Systems Programming: COSC 430, 432	
Numerical Methods: COSC 450, 451	
Artificial Intelligence: COSC 405	
Other Requirements:	**6-22**
Additional Writing:	
ENGL 322 Technical Writing	3sh
Foreign Language Intermediate Level	0-6sh (5)
Additional Mathematics:	3-13sh (6)
MATH 123 Calculus I for Physics, Chemistry and Mathematics (MATH 121 and 122 may be substituted)	
MATH216 Probability and Statistics for Natural Sciences (MATH 363 and 364, MATH 214 and 417, or MATH 217 and 417 may be substituted)	

(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 MATH 123 and 216. The thirteen-credit maximum applies to students who take the MATH 121and 122 calculus options and the MATH 363-364 statistics option.

Bachelor of Science- Applied Computer Science Track

Liberal Studies: As outlined in Liberal Studies section with the following specifications: **Mathematics:** MATH 123 (or MATH 121 and 122) **Liberal Studies Electives:** MATH 216 (or MATH 214 or 217), no courses with COSC prefix	**54-58**
Major:	**39**
Required Courses:	
COSC 105 Fundamentals of Computer Science	3sh
COSC 110 Problem Solving and Structured Programming	3sh
COSC 210 Object Oriented and GUI Programming	3sh
COSC 220 Applied Computer Programming	4sh
COSC 300 Assembly Language Programming	3sh
COSC 310 Data Structures and Algorithms	3sh
COSC 319 Software Engineering Concepts	3sh
COSC 341 Data Base Management	3sh
COSC 380 Seminar on the Computer Profession	1sh
COSC 480 Seminar on Technical Topics	1sh
Select one of the following two courses: (1)	
COSC 304 Interactive Internet Programming with Java	3sh
COSC 344 Productivity Tools and 4th Generation Languages	3sh
Select one of the following two courses: (2)	
COSC 320 Software Engineering Practice	3sh
COSC 493 Internship in Computer Science	12sh(3)
Controlled Electives:	
Select 3sh(4)	
COSC 250 Introduction to Numerical Methods	3sh
COSC 345 Data Communications	3sh
COSC/IFMG 354 Testing and Controlling LANs	3sh
COSC 355 Computer Graphics	3sh
COSC 360 IBM Job Control Language	1sh
COSC 362 Unix Systems	3sh
COSC 481 Special Topics in Computer Science (only sections approved for majors)	1-4sh
COSC 482 Independent Study	1-4sh
IFMG 455 Data Warehousing and Mining	3sh
Upper Level Electives by Categories: Select 3sh(5)	
Computer Architecture: COSC 410	
Data Base Management: COSC 415	
Theory of Languages: COSC 419, 420, 424, 460	
Systems Programming: COSC 430, 432	
Numerical Methods: COSC 450, 451	
Artificial Intelligence: COSC 405	
Other Requirements:	**6-22**
Additional Writing:	
ENGL 322 Technical Writing	3sh
Foreign Language Intermediate Level	0-6sh (6)
Additional Mathematics:	3-13sh (7)
MATH 123 Calculus I for Physics, Chemistry and Mathematics (MATH 121 and 122 may be substituted)	
MATH 216 Probability and Statistics for Natural Sciences (MATH 363 and 364, MATH 214 and 417, or MATH 217 and 417 may be substituted)	

MATH 219 Discrete Mathematics

Complete a minor from one of the following areas:	**6-18sh**
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 COSC 320 Software Engineering Practice and COSC 493 Internship in Computer Science may be counted toward the degree, but only one will be counted toward the major requirements.

(2) COSC 493 may be selected in either the second semester of the junior year or the first semester of the senior year. If COSC 493 is selected and approved, COSC 380 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 MATH 123 and 216. The thirteen-credit maximum applies to students who take the MATH 121-122 calculus option and the MATH 363-364 statistics option.

MATH 219 Discrete Mathematics

Complete a minor from one of the following areas:	**6-18sh**
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:	**0-19**
Total Degree Requirements:	**124**

(1) Credit for both COSC 304 Interactive Internet Programming with Java and COSC 344 Productivity Tools and 4th Generation Languages may be counted toward the degree, but only one will be counted toward the major requirements.

(2) Credit for both COSC 320 Software Engineering Practice and COSC 493 Internship in Computer Science may be counted toward the degree, but only one will be counted toward the major requirements.

(3) COSC 493 may be selected in either the second semester of the junior year or the first semester of the senior year. If COSC 493 is selected and approved, COSC 380 may be taken in the immediately preceding semester.

(4) Select at least 3sh from the list of controlled electives and/or the list of upper-level electives.

(5) Select at least one additional course from the list of upper-level electives.

(6) Foreign Language intermediate-level courses are counted as Liberal Studies electives.

(7) 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 MATH 123 and 216. The thirteen-credit maximum applies to students who take the MATH 121-122 calculus option and the MATH 363-364 statistics option.

Bachelor of Science-Languages and Systems Track

Liberal Studies: As outlined in Liberal Studies Requirements with the following specifications:	**54-58**
Mathematics: MATH 123 (or MATH 121-122)	
Liberal Studies Electives: MATH 124, no course with COSC prefix	
Major:	
Required Courses:	**41**
COSC 105 Fundamentals of Computer Science	3sh
COSC 110 Problem Solving and Structured Programming	3sh
COSC 220 Applied Computer Programming	3sh
COSC 300 Assembly Language Programming	3sh
COSC 310 Data Structures	3sh
COSC 315 Large File Organization and Access	3sh
COSC 319 Software Engineering Concepts	3sh
COSC 380 Seminar on the Computer Profession	1sh
COSC 410 Processor Architecture and Micro Programming	3sh
COSC 420 Modern Programming Languages	3sh
COSC 432 Introduction to Operating Systems	3sh
COSC 480 Seminar on Technical Topics	1sh
Controlled Electives: Select 9sh(1)	
COSC 250 Introduction to Numerical Methods	3sh
COSC 304 Interactive Internet Programming with Java	3sh
COSC 320 Software Engineering Practice	3sh(2)
COSC 345 Data Communications	3sh
COSC/IFMG 354 Testing and Controlling LANs	3sh
COSC 355 Computer Graphics	3sh

Bachelor of Science- Languages and Systems Track

Liberal Studies: As outlined in Liberal Studies section with the following specifications:	**54-58**
Mathematics: MATH 123 (or MATH 121-122)	
Liberal Studies Electives: MATH 124, no course with COSC prefix	
Major:	
Required Courses:	**42**
COSC 105 Fundamentals of Computer Science	3sh
COSC 110 Problem Solving and Structured Programming	3sh
COSC 210 Object Oriented and GUI Programming	3sh
COSC 220 Applied Computer Programming	4sh
COSC 300 Assembly Language Programming	3sh
COSC 310 Data Structures and Algorithms	3sh
COSC 319 Software Engineering Concepts	3sh
COSC 341 Data Base Management	3sh
COSC 380 Seminar on the Computer Profession	1sh
COSC 410 Processor Architecture and Micro Programming	3sh
COSC 420 Modern Programming Languages	3sh
COSC 432 Introduction to Operating Systems	3sh
COSC 480 Seminar on Technical Topics	1sh
Controlled Electives: Select 6sh(1)	
COSC 250 Introduction to Numerical Methods	3sh
COSC 304 Interactive Internet Programming with Java	3sh(2)
COSC 320 Software Engineering Practice	3sh(3)
COSC 344 Productivity Tools and 4th Generation Languages	3sh(2)
COSC 345 Data Communications	3sh

COSC 360 IBM Job Control Language	1sh
COSC 362 Unix Systems	3sh
COSC 405 Artificial Intelligence	3sh
COSC 419 Software Development and Ada	3sh
COSC 424 Compiler Construction	3sh
COSC 430 Introduction to Systems Programming	3sh
COSC 441 Data Base Management	3sh
COSC 444 Productivity Tools and 4th Generation Languages	3sh
COSC 450 Applied Numerical Methods	3sh
COSC 451 Numerical Methods for Supercomputers	3sh
COSC 460 Theory of Computation	3sh
COSC 481 Special Topics in Computer Science (as approved for majors)	1-4sh
COSC 482 Independent Study	1-4sh
COSC 493 Internship in Computer Science	12sh(3)
IFMG 455 Data Warehousing & Mining	3sh
Other Requirements:	**13-25**
Additional writing:	
ENGL 322 Technical Writing	3sh
Foreign Language Intermediate Level	0-6sh (4)
Mathematics: A minor in mathematics	10-16sh (5)
including the following courses:	
MATH 123 Calculus I for Physics, Chemistry and Mathematics (MATH 121 and 122 may be substituted)	
MATH 124 Calculus II for Physics, Chemistry, and Mathematics	
MATH 171 Introduction to Linear Algebra	
MATH 216 Probability and Statistics for Natural Sciences (MATH 363 and 364 may be substituted)	
MATH 219 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 COSC 493 may be counted toward these 9sh.

(2) Credit for both COSC 320 Software Engineering Practice and COSC 493 Internship in Computer Science may be counted toward the degree, but only one will be counted toward the major requirements.

(3) COSC 493 may be selected in either the second semester of the junior year or the first semester of the senior year. If COSC 493 is selected and approved, COSC 380 may be taken in the immediately preceding semester.

(4) Foreign Language intermediate-level courses are counted as Liberal Studies electives.

(5) Credits for MATH123 and 124 are counted in Liberal Studies.

COSC/IFMG 354 Testing and Controlling LANs	3sh
COSC 355 Computer Graphics	3sh
COSC 360 IBM Job Control Language	1sh
COSC 362 Unix Systems	3sh
COSC 405 Artificial Intelligence	3sh
COSC 415 Internet Architecture and Programming	3sh
COSC 419 Software Development and Ada	3sh
COSC 424 Compiler Construction	3sh
COSC 430 Introduction to Systems Programming	3sh
COSC 450 Applied Numerical Methods	3sh
COSC 451 Numerical Methods for Supercomputers	3sh
COSC 460 Theory of Computation	3sh
COSC 481 Special Topics in Computer Science (as approved for majors)	1-4sh
COSC 482 Independent Study	1-4sh
COSC493 Internship in Computer Science	12sh(4)
IFMG 455 Data Warehousing and Mining	3sh
Other Requirements:	**13-25**
Additional writing:	
ENGL 322 Technical Writing	3sh
Foreign Language Intermediate Level	0-6sh (5)
Mathematics: A minor in mathematics	10-16sh (6)
including the following courses	
MATH 123 Calculus I for Physics, Chemistry, and Mathematics (MATH 121 and 122 may be substituted)	
MATH 124 Calculus II for Physics, Chemistry, and Mathematics	
MATH 171 Introduction to Linear Algebra	
MATH 216 Probability and Statistics for Natural Sciences (MATH 363 and 364 may be substituted)	
MATH 219 Discrete Mathematics	
Free Electives:	**0-15**
Total Degree Requirements:	**124**

(1) Select at least 6sh from the list of controlled electives. Note: Only 4sh of COSC 493 may be counted toward these 6sh.

(2) Credit for both COSC 304 Interactive Internet Programming with Java and COSC 344 Productivity Tools and 4th Generation Languages may be counted toward the degree, but only one will be counted toward the major requirements.

(3) Credit for both COSC 320 Software Engineering Practice and COSC 493 Internship in Computer Science may be counted toward the degree, but only one will be counted toward the major requirements.

(4) COSC 493 may be selected in either the second semester of the junior year or the first semester of the senior year. If COSC 493 is selected and approved, COSC 380 may be taken in the immediately preceding semester.

(5) Foreign Language intermediate-level courses are counted as Liberal Studies electives.

(6) Credits for MATH 123 and 124 are counted in Liberal Studies.

b. List of all associated course changes:

New Courses:

COSC 210 Object Oriented and GUI Programming.

COSC 415 Internet Architecture and Programming.

Course Revisions:

COSC 220 Applied Computer Programming - credit change and content update.

COSC 310 Data Structures and Algorithms - name change, prerequisite change, and content update.

COSC 319 Software Engineering Concepts - prerequisite change.

COSC 341 Data Base Management - course number change (was 441) and content update.

COSC 344 Productivity Tools and 4th Generation Languages - course number change was 444.

Course Status Changes:

COSC 315 Large File Organization and Access - no longer required for major.

COSC 341 Data Base Management - now required for all tracks.

COSC 304 Interactive Internet Programming with Java - alternate requirement (with COSC344) for the Applied Computer Science track.

COSC 344 Productivity Tools and 4th Generation Languages - alternate requirement (with COSC 304) for the Applied Computer Science track.

Miscellaneous:

Credits required for major is increased by 1 for each track.

3. Rationale for changes

a. Add COSC 210, Object Oriented and GUI Programming, to the lists of required courses in each degree path.

Rationale:

Since its introduction in the early 1980's, the Object Oriented Programming (OOP) paradigm has grown to become an industry standard. Addition of this course will ensure that our curriculum includes both procedural and object oriented programming. An introduction to the

Graphical User Interface (GUI) paradigm is included to further reinforce the OOP concepts. This course is a prerequisite to COSC 310, Data Structures and Algorithms.

b. Add COSC 415, Internet Architecture and Programming, to the appropriate lists of controlled or upper level electives for each degree path.

Rationale:
This course is designed to enhance the Computer Science curriculum with an advanced web-based development component, and is to be taken by junior or senior level Computer Science majors or students with equivalent training in Computer Science. Given the high demand for computer programmers who are capable of developing Internet-based software applications, this course will provide the Computer Science majors an opportunity to learn the state-of-the-art technology of web development and architecture.

c. Change the content and number of credits for COSC 220, Applied Computer Programming, from 3sh to 4sh.

Rationale:
Due to the increase of topics and subject areas in the computing discipline, we have found it necessary to combine most of the contents of COSC 220 and COSC 315 to enable us address the important topics that students need without extending the total number of credits required.

d. Change the course name and contents of COSC 310 to Data Structures and Algorithms.

Rationale:
Since the department does not offer a separate course on Algorithm Analysis and Design, it is now necessary to revise and change the course contents of COSC 310 and rename it as *Data Structures and Algorithms*. Concepts of algorithms are essential for our students, who want to be software developers or programmers. While we have been teaching Algorithm Design in this course since its inception, changing the name of this course will ensure the position of algorithm design in our curriculum. In addition, we feel we will now be able to cover more algorithm design and analysis since we will no longer need to spend a large part of each semester introducing concepts of OOP since COSC 215 will now be the prerequisite for COSC 310.

e. Change the prerequisite for COSC 319, Software Engineering Concepts from COSC 315 to COSC 220 and 310.

Rationale:
The original prerequisite for COSC 319 was meant to assure that students had experienced enough software development to engender a sufficient level of programming maturity. COSC 315, which was a second programming course using COBOL as the programming language provided such maturity. Since COSC 315 is being eliminated from the Computer Science curriculum, another set of prerequisites has been identified to assure an acceptable level of programming maturity. Since at least 1/3 of the material originally in COSC 315 has migrated to COSC 220, it makes sense to include COSC 220 in the new prerequisites for COSC 319. However, since COSC 220 did not inherit all of the subject matter from COSC 315 an additional course has been included in the

prerequisite. That additional course is COSC 310; COSC 310 will provide both the data structures and the additional programming maturity seen as necessary by the faculty.

f. Change the course number of COSC 441, Data Base Management, to COSC 341. Add COSC 341, Data Base Management, to the required list of courses for all tracks.

Rationale:
Movement of the COSC 441 course to earlier in the student's coursework is required because of the need for computer science interns to work with data base technology. All of the interns had to work with databases but only about 50% of the interns had taken the course prior to the internship experience. Further, knowledge of databases was recommended for the COSC 319 Software Engineering Concepts and the COSC 320 Software Engineering Practice courses.

g. Remove COSC 315, Large File Organization & Access, from required courses for all majors.

Rationale:
This is a component in a series of changes necessitated by the ascent of data base technology to primary importance as the technology for the organization, storage and retrieval of large collections of information. Prior to this ascent integrated file systems constructed using indexed sequential access methods served this purpose and that technology was the subject of the COSC 315 course. The faculty in consultation with our Corporate Advisory Board formulated a change in the curriculum. The COSC 315 course will be removed from the Computer Science core. Some of the subject matter will migrate to the COSC 220 course other material will migrate to the revised COSC 441 which will be renumbered as COSC 341.

h. Change the course number of COSC 444, Productivity Tools & 4th Generation Languages to 344.
Rationale:
The number of this course is being changed to indicate that it is to be taken in the student's Junior year. This course is in the list of pre-requisites for the capstone course COSC 415, Internet Architecture and Programming.

i. Add COSC 304, Interactive Internet Programming with Java, or COSC 344, Productivity Tools and 4th Generation Languages, to the required courses for the Applied Computer Science Track.

Rationale:
Students in the Applied Computer Science degree path should take either of these courses. Both of these courses are designed to integrate Visual Programming and data base management.

j. Increase by 1 the number of required Computer Science credits in each track.

Rationale:
The field of Computer Science continues to grow by leaps and bounds. Increasing the number of credits required of our majors by a single credit will allow us to include many of the new technologies recently introduced into the discipline.

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.

   Students entering IUP in the Fall of 2001 (or after) will be required to complete the new curriculum. All other students will be able to select either the old or the new curriculum.

   Students who select the old program must complete COSC 315 by Fall 2001. COSC 341 may be substituted for COSC 441. Students who select the new program may substitute COSC 441 for COSC 341.

2. Affects on faculty teaching loads have already been addressed in the new course proposals.

3. Resources, as outlined in the course proposals, are adequate.

4. Demand for COSC 210 alnicos 415 are expected to be significant; 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 COSC 210, COSC 220, COSC 310, COSC 341, and COSC 415 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 pending.

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Honoring Yesterday
Creating Tomorrow

DATE: February 5, 2001

TO: Dr. William W. Oblitey
Computer Science Department

FROM: Richard D. Roberts
Physics Department

Richard D. Roberts

SUBJECT: Letter of Support

The Physics Department supports the addition of COSC 210 (Object Oriented and GUI Programming) to your list of required courses. It appears to me to be a significant improvement in your list of required courses.

COSC 210 is to be a prerequisite for COSC 310 and COSC 410. These are required courses in the Computer Science Track of our Applied Physics program. We need to discuss the proper sequence of courses for that track of our Applied Physics program with a representative of your department as we will need to changes in that track of our Applied Physics program.