02/14/02

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Action-Date: UWUCC 4/16/02
Senate 5/7/02

CURRICULUM PROPOSAL COVER SHEET
University-Wide Undergraduate Curriculum Committee

I. **CONTACT**

Contact Person **Dr. Sanwar Ali** Phone **7-7994**

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:** ___X___ Major _____ Minor ___X___ Track

_X_ New Program* **B.S. in Computer Science/ Information Assurance Track**
Program Name

_____ Program Revision* _____
Program Name

____ Program Deletion* _____
Program Name

____ Title Change _____
Old Program Name

_____
New Program Name

III. **Approvals** (signatures and date)

Sanwar Ali
Department Curriculum Committee

Gary L Bertenthal
Department Chair

02/19/02
College Curriculum Committee

College Dean

+Director of Liberal Studies (where applicable)

*Provost (where applicable)

Part I. New Track proposal:
Bachelor of Science- Computer Science/Information Assurance Track (NEW)
The Department of Computer Science is proposing a new track for the majors to enable them to specialize as information security officers, a new and growing career field in our discipline. This requires a minor catalog description change (pp. 118 of Undergraduate Catalog).

Current Catalog Description

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 software systems
    b. better graphical user interfaces
    c. better languages for communicating with computers
    d. better web-based interfaces and databases
    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

Proposed Catalog Description

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.

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   c. better languages for communicating with computers
   d. better web-based interfaces and databases
   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
7. **to increase awareness of information assurance education and issues.**

Part II. Description of Curricular Change

1. Track description

A detailed description of this new track including credit requirements, sequencing and restrictions are attached. Separate proposals for new courses are also attached.

2. Rationale/justification.

When Internet browsers began to grow and evolve in the early 90's, the focus was on making these new tools as user friendly as possible. We taught our students how to design better graphical interfaces to simplify the tasks of making connections and exchanging email. Standards and languages evolved. No one anticipated that in less than ten years the number of users would rise from a few hundred to over 200 million worldwide. Our curriculum has had to change to include all the new technologies and languages emerging to support this worldwide information flow. As electronic commerce came on line, it became much more critical to protect the integrity of the data being exchanged over these worldwide networks.

The rise in computer assisted crime and the new emerging threat of cyberterrorism has resulted in an urgent need to carry out research and modify our curriculum to include risk analysis of potential threats and vulnerability assessment of our software and systems. In responding to this need we have obtained grant funding to develop the curriculum proposed here. Eight faculty have been

funded for ¼ release each to develop this new curriculum and we have already offered 3 five-day faculty workshops to help bring the faculty up to speed with three more scheduled for this summer.

3. Credit Requirements (see also attached summary)
A student who registers for the Information Assurance track will first complete the 27 credits in the Computer Science core, then they will take 2 required courses, COSC 316 Cybersecurity Basics and COSC 356 Network security. From there they will select one controlled elective and one upper level elective from the lists provided. Then they will take their 4sh internship or practicum where they work on real life projects under the supervision of the faculty. This will make 42 credits in the major. In addition we are requiring them to take a minor in the Criminology Department with courses that relate to cybercrime and enroll in an Ethics course as part of their Liberal Studies requirement.

A. New Courses developed for this new track

1. COSC 316 Cybersecurity Basics (NEW)
Prerequisite: COSC 110 or equivalent programming course, junior standing and permission of instructor.
a. Course Description
This course will provide an introduction to the theory and concepts of computer security in networked systems. The course will look at security issues and policies with regard to hardware, software development, databases, operating systems and networks as well as the use of encryption. The more common attacks on systems will be covered. Vulnerability assessment tools and techniques for defending systems will be explored in various projects.

b. Rationale:
Students need an overview and introduction to the major concepts involved in the field of information assurance as well as some background on the evolution of this aspect of computer science. There are a number of major standards and risk analysis models with which they need to familiarize themselves. This is a very specialized and rapidly growing area of computer science. It is assumed that these students are juniors and have the maturity and programming skills to learn how various forms of computer attacks on servers are carried out and more importantly the appropriate countermeasures.

2. COSC 356 Network Security (NEW)
Prerequisite: COSC 316 or COSC /IFMG 352
a. Course Description

This course explores mechanisms for protecting networks against attacks. The course emphasizes network security applications that are used on the Internet and for corporate networks. It investigates various networking security standards and explores methods for enforcing and enhancing those standards.

b. Rationale:
Students will be exposed to principles of Network Security. To be effective as information assurance professionals it is not enough to know how to protect their servers, they need to know

about network perimeter defenses, the importance of demilitarized zones, and how to protect their internal networks from hackers and cyberterrorists. This course builds on the concepts introduced in the Basics course but focuses on a much more in depth analysis of techniques for hardening networks.

3. COSC 427 Cryptography (NEW)
Prerequisite: COSC 310, MATH 122 or 123

a. Course Description:
Fundamental concepts of encoding and/or encrypting information, cryptographic protocols and techniques, various cryptographic algorithms, and security of information will be covered in depth.

b. Rationale:
Encryption is a critical means of protecting data. There are many different algorithms for creating coded messages and then decoding them. Students must become familiar with the underlying mathematical algorithms and understand the various issues involved in authentication, key signatures and other means of ensuring the integrity and confidentiality of the data involved.

4. CRIM 321 Cybersecurity and Loss Prevention (NEW)
This new Criminology course has been developed by the Criminology Department. The department has already cleared its College Curriculum Committee and is waiting for our proposal before being sent on to the Senate.

5. CRIM 323 Cybersecurity and the Law (NEW)
This new Criminology course has been submitted by the Criminology Department. The department has already cleared its College Curriculum Committee and is waiting for our proposal before being sent on to the Senate.

Part III. Implementation

1. How will the proposed new tracks affect students already in the existing program?

   The proposed new tracks will not affect the existing students in other two tracks, Language and Systems and Applied Computer Science. However, students in the existing tracks may take courses from new track as electives.

2. How will the proposed new track affect faculty teaching loads? Have additional faculty been authorized? If you are adding requirements, how will adequate seats be provided?

   a. Faculty teaching loads: The program may need to hire additional faculty to help meet the demands imposed by this interdisciplinary minor.

b. Authorization: We have a letter supporting the hiring of additional faculty if the need arises (see attachment).

c. Provision of seats: The required laboratory for supporting this program has been set up in Stright. The laboratory machines were purchased using funds from the NSF Cybersecurity grant.

3. Are other resources adequate? (Space, equipment, supplies, travel funds)

a. Space: The needed laboratory has been set up on the first floor of Stright hall.

b. Equipment: Servers needed for the lab have been purchased with NSF funding.

c. Supplies: None

d. Travel Funds: No travel funds are needed for faculty training in the near future. The NSF funded Cybersecurity Workshop provided training for the current faculty. The grant includes another training workshop scheduled for the summer of 2002.

4. Do you expect an increase or decrease in the number of students as a result of these revisions? If so, how will the department adjust?

We expect increases in the number of students as a result of instituting this track. We are willing to offer more sections of the courses involved when the expected increases occur. A letter of support for additional faculty as needed is attached (see attachment)

Part IV. Course Proposals

Attached

Part V. Letters of Support

Letters of support from:
1. Dean Eck, supporting need for additional complement, should the need arise.
2. Louise Burkey, MIS Department Chair, supporting the use of IFMG 382 in this new program are attached.

Bachelor of Science- Computer Science/ Information Assurance Track

Liberal Studies: As outlined in Liberal Studies section with the following specifications:			**56-58**
Mathematics: MATH 123 (or MATH 121-122)			
Liberal Studies Electives:			
MATH 216 (or MATH 217 and 417), no course with COSC prefixes			
Major:			
Required courses:			**42-43**
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	Database Management	3sh	
COSC 380	Seminar on the Computer Profession	1sh	
COSC 480	Seminar on Technical Topics	1sh	
Information Assurance required courses:			
COSC 316	Cybersecurity Basics	3sh	
COSC 356	Network Security	3sh	
Select one of the following:			
COSC 493	Internship (Information Assurance)	12sh (1)	
or			
COSC 320	Software Engineering Practice	3sh	
Track Controlled Electives:			
Select 3sh			
COSC 345	Data Communications	3sh	
COSC/IFMG 354	Testing and Controlling LANs	3sh	
COSC 362	Unix Systems	3sh	
COSC 481	Special Topics in Computer Science (as approved for majors in this track)	3sh	
IFMG 382	Auditing for EDP Systems	3sh	
Upper Level Electives:			
Select 3sh			
COSC 415	Internet Architecture and Programming	3sh	
COSC 432	Operating Systems	3sh	
COSC 427	Cryptography	3sh	
COSC 482	Independent Study	3sh	
COSC 400-level course with department approval		3sh	
A minor in Criminology			**15**
Other Requirements:			
Additional writing:			**6-19**
ENGL 322	Technical Writing	3sh	
Foreign Language Intermediate Level		0-6sh (2)	
Additional Mathematics:		8-10sh (3)	
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 217 and 417 may be substituted)		
MATH 219	Discrete Mathematics		
Free Electives:			**0-5**
Total Degree Requirements:			**124**

Notes:

(1) Only 4sh of COSC 493 may be counted towards the major. 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.

(2) Foreign language intermediate-level courses are counted as Liberal Studies electives.

(3) Any of the Mathematics options satisfy the Learning Skill requirement, and one course may be counted as a Liberal Studies elective. The 8sh minimum applies students who take the MATH 123 and 216. The 10sh maximum applies to students who take MATH 121-122 calculus option and MATH 217-417 statistics option only.

College of Natural Sciences and Mathematics

305 Weyandt Hall

October 21, 2001

TO: Mary Micco

FROM: John S. Eck

RE: Cyber security Curriculum

In the meeting with President Pettit and Provost Staszkiewicz on October 19, they agreed that as the needs developed for new complement to meet student demand for the cyber security major or minor, these needs would be met.

Cc: Dr. Mark Staszkiewicz, Provost

Indiana University of Pennsylvania

Department of Special Education and Clinical Services
Davis Hall, Room 203
570 South Eleventh Street
Indiana, Pennsylvania 15705-1087

724-357-2450
Fax: 724-357-7716
Internet: *http://www.iup.edu*

November 13, 2001

To Whom It May Concern:

As Chairperson of the University Senate of the Indiana University of Pennsylvania, I am often consulted on curriculum matters, as an ex officio member of our curriculum committees. In the role, I am aware of the efforts of the Criminology and Computer Science departments in preparing a program in the area of CyberSecurity. I believe that our departments are uniquely qualified to offer such a program, and I strongly support the concept. As they proceed through the curriculum approval process, I am sure there will be appropriate input from all levels to optimize the quality of such a program.

Sincerely,

Richard C. Nowell, Chair
IUP University Senate

MEMORANDUM

TO: Gary Buterbaugh

FROM: Rich Nowell

RE: CyberSecurity Program

DATE: 11/13/01

Gary:

I don't have any power as Chair of the Senate to make any recommendations on curriculum approval, but I am attaching a letter of support, for what it's worth. I am sure the committee will give it a quick review to provide the necessary signature from them. Let me know if there is anything else I can do. I will be out of the country the rest of the week, but I'll be available after the holiday, and by e-mail in the interim, I hope.

Indiana University of Pennsylvania

Department of Management Information Systems
The Eberly College of Business and Information Technology
664 Pratt Drive, Room 203
Indiana, Pennsylvania 15705-1087

724-357-2929
Fax: 724-357-4831
Internet: *http://www.eberly.iup.edu/im/*

Date: December 10, 2001

To: Dr. William Oblitey
Computer Science Department

From: Dr. Louise Burky
MIS & Decision Sciences Department

RE: MIS Minor

Dear Bill,

Please consider this a letter of approval for your Cybersecurity/Information Assurance minor which would be available to our majors. At the present time, I can only commit to one course in that area, namely IFMG 382 Auditing for EDP Systems. I could offer it once every two or three semesters. If we are able to hire more faculty, and that is a big if, other possibilities may come into being.

Along with this, is my implied approval for your entire endeavor along the lines of cybersecurity.

Sincerely,

Louise Burky

Louise Burky, Chair
MIS and Decision Sciences Department

cc: Mary Micco

Statement Of Support For
Joint Minor In Cyber Security
Cyber Track in the BS Degree in Computer Science
APSCUF

IUP-APSCUF believes that should this proposal clear the curriculum committee as written, IUP-APSCUF would allow the proposal to be forwarded to the IUP Council of Trustees.

Approved: Patricia I. Heilman
Signature

Patricia I. Heilman
Printed Name

President, IUP-APSCUF
Title

12-10-01
Date

Indiana University of Pennsylvania

College of Humanities and Social Sciences
McElhaney Hall, Room 201
441 North Walk
Indiana, Pennsylvania 15705-1079

724-357-2280
Fax: 724-357-4842
Internet: *http://www.iup.edu*

December 7, 2001

To Whom It May Concern:

The interdisciplinary Cyber Security Minor received provisional approval by the College of Humanities and Social Sciences Curriculum Committee on November 14, 2001. Two new courses that will be required for the minor were approved unanimously also.

Given the discussion at the College Curriculum Committee, I am confident that the Committee will also approve the Cyber Security Track proposal in the Computer Science B.S. Degree Program.

I applaud the development of this interdisciplinary program and look forward to its implementation.

Sincerely,

Brenda L. Carter, Dean
College of Humanities and Social Sciences