Proposal for a Graduate Certificate in Information Assurance Education – Track 2

Submitted by the School of Technology West Lafayette Campus
MEMORANDUM

TO: Marilyn D. Geist, Graduate School
FROM: Michael J. Dyrenfurth, Assistant Dean for Graduate Studies & International
DATE: October 31, 2003
RE: Certificate Program in Information Assurance Education (Track 2)

The Graduate Education Committee of the School of Technology at its meeting of October 6, 2003 approved the Information Assurance Education certificate program (Track 2) described in the attached proposal. I ask that the Graduate Council review and approve it so that we may initiate it in the spring of 2004.

Approved:

Dennis R. Depew
Dean, School of Technology
Graduate Certificate Proposal

Information Assurance Education – Track 2

School of Technology

Purpose: In order to meet the demand for well prepared faculty to develop and teach Information Assurance programs at colleges and universities across the nation, Purdue University, Department of Computer Science has developed and implemented an 11 credit hour graduate certificate program for computer science faculty who want to develop Information Assurance (IA) programs at their institutions. This was approved by the Purdue University Graduate Council in November, 2002. However, there are a considerable number of Information Technology (IT) faculty who also need a similar program rooted in information technology. The purpose of this proposal is to develop a parallel graduate certificate, offered by the School of Technology, but targeted on IT faculty.

It should be noted, that there is existing grant support for this program. The National Security Agency has funded Purdue University to offer academic programs in Information Assurance Education for faculty members at higher education institutions across the nation. The grant proposal was submitted by Melissa Dark (Principal Investigator). However, we anticipate the graduate certificate program continuing after the completion date of the NSA project, which is 9/30/05.

This (track 2) Information Assurance Education graduate certificate will prepare IT faculty to integrate relevant IT security topics into their undergraduate and graduate IT related degree programs. (Track 1 is targeted at CS and ECE faculty; details of track one can be found in Appendix B). Track 2 will consist of 6 credit hours in computer technology courses, 3 credit hours in computer science and 2 credit hours in curriculum and instruction. Faculty from Purdue University will modify and upgrade modules and units from existing technical courses offered at Purdue University to be included in this certificate program. The graduate certificate will also address the pedagogical knowledge and skills that faculty need to develop IA instructional materials, and implement courses and modules into their academic programs. Therefore, 2 credit hours in the program will be derived from a curriculum and instruction course offered through the School of Education.

Target Audience: The target audience is faculty from colleges and universities in the areas of information systems, information science, information technology, telecommunications, and networking.

Proposed Initiation Date: May, 2004

Admission Requirements
1. Faculty participants (these are the faculty who will participate as “students” in the program) must be tenure-track or equivalent at an institution receiving accreditation by an appropriate regional accrediting body.
2. U.S. citizenship required per National Security Agency specifications (note: NSA is the program sponsor).
Completion Requirements

1. The graduate certificate will require 11 credit hours: 6 credits hour of computer technology courses, 3 credit hours of computer science, and 2 credit hours of curriculum and instruction courses.
2. Course requirements (see Appendix A for more detail):
   - CS 526 Information Security
   - TECH 581x Network Security\(^1\)
   - TECH 581y Digital Forensics\(^2\)
   - EDCI 590 Design and Development of Instructional Materials and Resources
   - Only special sections of these courses, specifically taught for the certificate program, may be used for this certificate.
3. GPA requirements – grade of B or better in every course.
4. No credits may be transferred from another institution toward this certificate.
5. No credits from undergraduate-level courses may be used toward the certificate.
6. Completion of the certificate must occur within 3 years unless special permission is granted by the Computer Technology Graduate Committee.
7. No credit hours taken prior to admission to the certificate program may be counted toward completion of the certificate. Admission to the certificate program must occur before any credit hours are earned towards the certificate.

Administration

In addition to complying with the requirements of the Purdue University Graduate School, the following administrative requirements are proposed:

1. The audit process will be the responsibility of the CPT Graduate Committee or its designee.
2. The certificate shall be awarded by the School of Technology.

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\(^1\) We are in the process of applying for a permanent graduate course number for this class. If awarded, we anticipate the number being CPT 555.

\(^2\) This course will be taught as TECH 581 for the first time in Spring 2004. Thereafter, we plan to apply for a permanent CPT number for the class.
Appendix A

Course Descriptions
CS 526 Information Security
Basic notions of confidentiality, integrity, availability; authentication models; protection models; security kernels; secure programming; audit; intrusion detection and response; operational security issues; physical security issues; personnel security; policy formation and enforcement; access controls; information flow; legal and social issues; identification and authentication in local and distributed systems; classification and trust modeling; risk assessment.

TECH 581x (CPT 555 anticipated) Network Security
This course will cover conceptual and technological aspects of network security for voice and data networks. The course will deal with the analysis, design, implementation and management issues surrounding effective network security. Technology research and presentation of research results as well as security technology implementation will be required course outcomes.

TECH 581y (CPT ZZZ anticipated) Digital Forensics
This course will introduce students to the fundamentals of computer forensics and cyber-crime scene analysis. The various laws and regulations dealing with computer forensic analysis will be discussed. Students will be introduced to the emerging international standards for computer forensic analysis, as well as a formal methodology for conducting computer forensic investigations.

EDCI 590 Design and Development of Instructional Materials and Resources
Instructional skills development; instructional analysis; instructional strategies; producing implementing, and testing instructional materials, labs, case studies, and problems; formative and summative evaluation; curriculum development; and curriculum scope and sequence.

Prerequisites
Faculty participants (i.e., faculty students) need to have or secure the following prerequisites:

CS 503 Operating Systems
Proposal for a Graduate Certificate in Information Assurance Education

Submitted
by the
Department of Computer Sciences
West Lafayette Campus
TO: Marilyn D. Geist, Graduate School

FROM: Susanne E. Hambrusch, Head, Department of Computer Sciences

DATE: 30 September 2002

RE: Certificate Program in Information Assurance Education

The faculty of the Department of Computer Sciences at its meeting of 29 September 2002 approved the Information Assurance Education certificate program described in the attached proposal. I ask that the Graduate Council review and approve it so that we may initiate it in the summer of 2003.

Approved:

[Signature]

Jeffrey S. Vitter
Dean of the School of Science
Graduate Level Academic Credit Program

Information Assurance Education

Department of Computer Science, School of Science

Purpose: In order to meet the demand for trained faculty to develop and teach Information Assurance programs at colleges and universities across the nation, Purdue University will design, develop, and implement an 11 credit hour graduate certificate program for college and university educators who want to develop Information Assurance (IA) programs at their institutions. The National Security Agency has funded a grant program to develop capacity to offer academic programs in Information Assurance at higher education institutions across the nation. A grant proposal was submitted by Melissa Dark (Principal Investigator) and Eugene Spafford (Co-Principal Investigator) to develop a program to help address this need. Purdue University is one of three universities selected.

The Information Assurance graduate certificate will consist of 9 credit hours in computer science courses and 2 credit hours in curriculum and instruction. Purdue University already has relevant graduate programs established (M.S. and Ph.D. degrees in Computer Science, Multidisciplinary M.S. degree in Information Security, M.A. and Ph.D. degrees in Curriculum and Instruction). Faculty from Purdue University will modify and upgrade modules and units from existing technical courses offered at Purdue University to be included in this certificate program. The graduate certificate will also address the pedagogical knowledge and skills that faculty need to develop IA instructional materials, and implement courses and modules into their academic programs. Therefore, 2 credit hours in the program will be derived from a curriculum and instruction course offered through the School of Education.

Target Audience: The target audience is faculty from colleges and universities in the areas of computer sciences, mathematics, computer engineering, statistics, and/or physics.

Relation to Other Certificate Programs: None of the students in this program will be concurrently working toward a graduate degree.

Proposed Initiation Date: May, 2003

Admission Requirements
1. Faculty participants (these are the faculty who will participate as “students” in the program) must be tenure-track at an institution receiving accreditation by an appropriate regional accrediting body.
2. Faculty should be from the following departments: computer sciences, mathematics, computer engineering, information science, statistics, and/or physics.
3. This program is closed to non-faculty applicants. Therefore, students who are currently admitted to a degree program will NOT be eligible to earn a certificate.
Completion Requirements
1. The graduate certificate will require 11 credit hours: 9 credits hour of computer science courses and 2 credit hours of curriculum and instruction courses.
2. Course requirements (see Appendix A for more detail):
   - CS 526
   - CS 555
   - CS 626
   - EDCI 590
3. GPA requirements – grade of B or better in every course.
4. No credits shall be transferred from another institution.
5. No credits from undergraduate-level courses may be used toward the certificate.
6. Completion of the certificate must occur within 3 years unless waived by the Computer Science Graduate Committee.
7. Courses may NOT be applied toward more than this certificate.
8. No credit hours taken prior to admission to the certificate program may be counted toward completion of the certificate. Admission to the certificate program must occur before any credit hours are earned towards the certificate.

Administration
In addition to complying with the requirements of the Purdue University Graduate School, the following administrative requirements are proposed:
1. The audit process will be the responsibility of the CS Graduate Committee or its designee.
2. The certificate shall be awarded by the CS Graduate Committee or its designee.
Appendix A

Course Descriptions

CS 526 Information Security
Basic notions of confidentiality, integrity, availability; authentication models; protection models; security kernels; secure programming; audit; intrusion detection and response; operational security issues; physical security issues; personnel security; policy formation and enforcement; access controls; information flow; legal and social issues; identification and authentication in local and distributed systems; classification and trust modeling; risk assessment.

CS 555 Cryptography
Concepts and principles of cryptography and data security. Cryptography (secret codes): principles of secrecy systems; classical cryptographic systems, including Vigenère and Vernam ciphers; the Data Encryption Standard (DES); public-key encryption; privacy-enhanced email; digital signatures. Proprietary software protection; information theory and number theory; complexity bounds on encryption; key escrow; traffic analysis; attacks against encryption; basic legal issues; e-commerce; the role of protocols.

CS 626 Advanced Information Assurance
Advanced topics in information assurance, including selections from the following: penetration testing, formal verification of systems, formal models of information flow and protection, distributed system authentication, protocol design and attack, computer viruses and malware, intrusion and anomaly detection models, multi-level security, active defenses, investigation and forensics, network firewalls, anonymity and identity, e-commerce support, database security models and mechanisms.

EDCI 590 Design and Development of Instructional Materials and Resources
Instructional skills development; instructional analysis; instructional strategies; producing implementing, and testing instructional materials, labs, case studies, and problems; formative and summative evaluation; curriculum development; and curriculum scope and sequence.

Prerequisites
Faculty participants (i.e., faculty students) need to have the following prerequisites:

- CS 354<sup>3</sup> or equivalent.
- MA 351 or equivalent.
- CS 251 or equivalent.
- CS 381 or equivalent.
- CS 426 or equivalent.

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<sup>3</sup> According to S. Fahmy regarding CS 503 as a prerequisite for 526, if students do not need TCP/IP code and the experience building an operating system, then CS 354 would be a sufficient prerequisite for CS 526. According to M. Atallah, this is not required in CS 526. Therefore, for this program, CS 354 should be a sufficient prerequisite for CS 526.