Graduate School Form 25

(Revised 5/12)

☒ Request for New Concentration

☐ Request for Revision of Existing Concentration

☐ Request for Deletion of Existing Concentration

# PURDUE UNIVERSITY
# GRADUATE SCHOOL

## Request for a Concentration

Heads of graduate programs may request that one or more concentration(s) be established within their majors, to allow a specialized area of graduate study to be reflected on a student's final transcript.

Graduate Program (Major) __Technology__ Major Code __TECH__

Title of Concentration __Information Assurance and Security (InfoSec)__

Effective Session: __x__ Fall _____ Spring _____ Summer      Academic year: 201 __4__ - 201 __5__

Degrees to which this concentration applies:
- __x__ Master of Science
- _____ Master of Arts
- _____ Doctor of Philosophy
- _____ Other _____
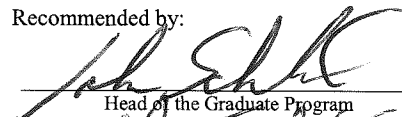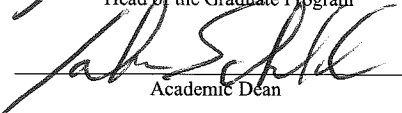
Campus(s) at which this concentration applies:
- _____ Calumet
- _____ Fort Wayne
- __x__ Indianapolis
- _____ North Central
- _____ West Lafayette

Justification: Please address the following topics (in order) when requesting a concentration: (Attach additional sheets as necessary.)
- Statement of the mission of the proposed concentration including, but not limited to, the need for the concentration, the target audience, the relationship to the major under which the concentration will be listed, and the relationship to other concentrations in the degree program
- Focus of the research or professional program
- Participating faculty, including name, academic rank, and departmental affiliation
- Currently enrolled or expected number of students
- Core courses and a description of how they fit into and support the degree program. List only the courses required for this concentration.
- Learning outcomes (e.g., unique knowledge or abilities, capacity to identify and conduct original research, ability to communicate to peer audiences, critical thinking and problem-solving skills, etc.).

Recommended by:

_____ 04/10/2014
Head of the Graduate Program      Date

_____ 04/10/2014
Academic Dean      Date

Approved by:

_____ _____
Graduate School Dean (West Lafayette)      Date

Concentration Code ___ ___ ___ ___
(To be assigned by the Office of the Registrar if this request is for a new concentration)

_____ _____
Additional Authorizing Signature (if applicable)      Date

Huanmei Wu (hw9@iupui.edu)
Contact person (& e-mail address) for questions regarding form

**Please submit this form to the Graduate School, PWL. An approved copy will be returned to the department and academic college/school at the campus recommending the request.**

**Justification to Accompany Form GS 25**

## 1. Statement of Vision and Mission of the InfoSec Graduate Concentration

> *"The nation increasingly needs professionals with highly technical cyber skills to help keep America safe today - and to help the country meet future challenges and adapt with greater agility,"* Steven LaFountain, an NSA technical leader involved with the program. (NSA, 2012)

**_Vision:_** The vision of the graduate program in InfoSec is to be the premier leader in Information Assurance and Security (IAS) education, implementation and research.

**Mission:** The mission of InfoSec Graduate Concentration is to advance the knowledge and practice of information assurance and security through the performance of state-of-the-art research, the delivery of the high quality education, and by serving as a balanced source of technology information.

**The Need for the Concentration**: Information security is one of the most important challenges confronting society in the information age. No one -- whether governments, businesses or individuals -- is exempt from the ravages of malicious cyber acts. Posing cyber conflict solely in terms of classic attackers and defenders does not fully capture the diversity and subtlety of the motivations, incentives, ethics, asymmetries, and strategies of the constituent actors and players in cyberspace. The intelligent adversary, whether human or software, learns, evolves, and co-evolves to exploit, disrupt, and overpower existing protection mechanisms. Addressing this challenge requires a coordinated multi-disciplinary approach, contributing to the body of knowledge about information security in the respective disciplines, and leading to practical usable deployable technologies.

The proposed Information Assurance and Security (InfoSec) Graduate Concentration provides both technical and innovative knowledge to help the students fully leverage InfoSec advancements, allowing external organization to move from a reactive to a proactive InfoSec approach. The program's applied approach to learning and research, coupled with its flexible curriculum, allows students to focus on InfoSec technological topics that are most important to them.

**The Target Audience**: It is widely recognized the necessities to train prospective and current professionals in information technology in Information Assurance and Security (InfoSec). The concentration will attract potential applicants with undergraduate degrees in Computer Information Technology, Computer Science, Media Art, Computing Engineering, Library Science, Computer Graphics, Informatics, and others. It also will attract trainees and professionals in an area of InfoSec specialization for those already within computer service and IT support who seek an advanced degree. Situated in downtown Indianapolis, a primary industrial, commercial and transportation center for the Midwest, IUPUI offers an ideal location for students training in InfoSec, to connect with industry learning opportunities, internships, and post-graduation employment opportunities.

**Relationships with the Major Program and Other Concentration**: The proposed concentration will award the degree of Master of Science in Technology with the transcript noting specialization in *Information Assurance and Security (InfoSec)* from the School of Engineering and Technology on the IUPUI campus. This new concentration will exist under the current Master of Science in Technology as offered at IUPUI. It will complement the existing Bachelor of Science degree in Computer Information Technology (CIT), as currently offered at IUPUI.

This new concentration fits well alongside the other concentrations in the Master of Science in Technology program, sharing a few pertinent courses with other concentrations, but adding new courses specific to the InfoSec Specialization. This concentration would be the first comprehensive program in Information Assurance and Security for technology. As far as can be determined, no other concentration program exists within the IUPUI campus that presents the same content or delivery method as this proposed InfoSec concentration. In addition, our existing CIT students working on information assurance and network come from many other states and countries, which are outside the normal population from which IUPUI traditional draws. Based on the widespread interest of such a program, the proposed InfoSec concentration will be able to draw new students to the university without impacting other programs.

## 2. Focus of the InfoSec MS Concentration

There are many new challenges in information technology and securing these technologies has becoming paramount. For example, working via mobile devices, cloud computing and other technologies bring connectedness and exciting opportunities for innovation. But coupled with emerging cyber threats, these opportunities may also place vital data and intellectual property in vulnerable positions. CIT proposes the InfoSec graduate concentration to educate professionals to overcome or combat these challenges.

Completion of the InfoSec concentration will prepare participants for jobs in information assurance and security. This concentration will provide students with the theoretical and practical aspects to protect information assets.

CIT at IUPUI is recognized by the National Security Agency of Centers of Academic Excellence and is a leader in experiential learning, incorporated andragogical learning throughout the curriculum. The concentration will focus on the interdisciplinary nature of InfoSec and will seek collaboration with other entities on Purdue/IU/IUPUI campus, e.g. Informatics and SPEA.

The *focus areas* of the InfoSec MS Concentration include:
1) Provide the graduate education opportunity for students to develop deeper technical knowledge of emerging threats and mitigation strategies for reducing the risk.

2) Empower faculty and research staff from diverse disciplines to address InfoSec problems, formulate research and education solutions, and secure funding and support.

3) Discover, develop, and transfer technologies, methods, and information that enhance practice in the field.

4) Engage industry, government, and other academic institutions as awareness, education, and research partners.

5) Strengthen meaningful partnerships with Purdue CERIAS center and IU CACR center.

6) Establish and advance the technology and scientific rigor of the field.

This concentration will target the National Security Agency (NSA) initiatives of cyber security protection and mitigation. Completion of the IAS will prepare participants for jobs in IAS.

**3. Participating Faculty**
The faculty from Computer & Information Technology, Electrical and Computing Engineering, and Computer Sciences will be participating in supervising and teaching for students in this certificate program

*Table 1: Participating Faculty (in the alphabetical order of the last names)*

| Faculty | Title | Expertise |
|---------|-------|-----------|
| Eugenia Fernandez | Associate Professor & Chair of Computer Information & Graphics Technology | Secure database design; object-oriented programming; assessment |
| Connie Justice | Clinical Assistant Professor of CIT | Risk assessment, vulnerability and penetration testing, digital forensics, network security |
| Brian King | Associate Professor & Acting Chair of ECE | Computer and network security, wireless security, cryptography, algorithms, and applied mathematics |
| Feng Li | Assistant Professor of CIT | Computer networks, wireless security, social network and cloud security |
| Hongbo Liu | Assistant Professor of CIT | Cyber security and privacy, smart grid, big data and cloud computing, mobile computing and wireless networks |
| Huanmei Wu | Associate Professor of CIT and Informatics | Database security, information privacy, data mining, bioinformatics, medical imaging |
| Xukai Zou | Associate Professor of CS | Communication networks and security, applied cryptography, security and reliability for grid computing |

**4. Expected Enrollment**
The proposed InfoSec MS Concentration will complement the existing IUPUI BS program in CIT, for those who wish to continue with advanced studies. The CIT undergraduates have shown significant interest in network security and information assurance, which has attracted students to IUPUI. With the growing recognition on the part of the industry, academia and professional societies, **InfoSec** in engineering and technology education are destined to be on the increase. The expected number of graduate students will be **25** per annum.

**5. Core Courses and description**
The students in the InfoSec concentration need to take the required three core courses from the Master in Technology program, five required InfoSec concentration courses, and three electives. All the courses have been taught at the IUPUI campus already by the participating faculty. The required course work is listed in the following table:

| Course Area | Courses Information |
|---|---|
| Core Courses for MSTECH (3 courses; 9 credits) | TECH 50700<br>TECH 50800<br>Directed Project |
| Core Courses for InfoSec Concentration (5 courses; 15 credits) | CIT 52800 Information Security Risk Assessment<br>TECH 58100 Database Security<br>TECH 58100 Wireless Security & Technology<br>TECH 58100 Adv Network Security<br>TECH 58100 Mobile and Network Forensics |
| Selectives (3 courses; 9 credits) | CIT    55000 Org Impact on IT<br>TECH 58100 Adv Topics in Database<br>TECH 58100 Entrepreneurship in Info Tech<br>TECH 58100 Adv Mobile Computing and Applications<br>TECH 58100 Mgmt of IT Resources<br>TECH 58100 Technology From a Global Perspective<br>ECE    62700 Introduction to Cryptography and Secure Communication<br>CSCI   55500 Cryptography<br>INFO   B583 Security and Privacy Policies and Regulations in Healthcare<br>Or other graduate courses approved by academic advisors |

## 6. Learning Outcomes

The curriculum is mapped to an established a set of standards for Information Systems Security professionals. The InfoSec curriculum provides students with professional competencies from agencies such as International Information Systems Security Certification Consortium (ISC2, http://isc2.org) and NSA/DHS Committee on National Security Systems (CNSS). Upon completion of the InfoSec concentration, students will be able to:

A. Discipline Specific Knowledge and Skills
   a. Discuss key theories and research in InfoSec
   b. Construct a critical evaluation of current scientific knowledge of IAS
B. Critical, Analytical & Integrative Thinking
   a. Appropriately analyze appropriate IAS technologies and best practice to solve IAS problems.
   b. Review and critique IAS literature
   c. Explain how IAS solutions can be used to improve business security posture.
   d. Competently use information technology and IAS applications.
C. Problem Solving and Research Capability
   a. Apply knowledge to solving problems and evaluating ideas and information
   b. Select appropriate techniques to analyze IAS matters
   c. Research, recommend, and implement IAS best practices
D. Creative and Innovative
   a. Display creative thinking skills

      b. Present IAS solutions in new and creative ways

      c. Discern problems and gaps in IAS knowledge

E. Effective Communication

      a. Demonstrate scientific report writing skills

      b. Exhibit discussion and presentation skills

      c. Present ideas clearly with supporting evidence

      d. Communicate the results of analyses clearly and effectively

      e. Plan and present written arguments in coherent and documented form

F. Engaged & Ethical Local and Global Citizens

      a. Consider the ways in which values and ethical issues affect IAS

      b. Evaluate information, ideas and arguments including those of diverse countries

      c. Apply philosophical theories and concepts to other areas of social and cultural practice

G. Professional and Personal Judgment and Initiative

      a. Apply and adapt knowledge to the real world

      b. Competently undertake projects of complex nature

      c. Assess which problem solving approach is most appropriate for a particular situation and recommend a specific solution

      d. Evaluate multiple solutions to the same problem

H. Commitment to Continuous Learning

      a. Assess your own learning against best practices

      b. Reflect on how you have analyzed information and solved problems, and incorporate lessons learned into future work

The InfoSec graduate certificate program will help students to obtain the following jobs:

1) Senior leaders in the IAS field
2) Information security executives
3) Information security managers
4) Information Systems Security Officers (IAD).
5) Advanced practitioners in IAS
6) System Administration (SA) in IAS

## References

Dark, M. (n.d.). Overview of the Purdue University project. Retrieved October 1, 2003 from Purdue University, Center for Education and Research in Information Assurance and Security: http://www.cerias.purdue.edu/education/post_secondary_education/ undergrad_and_grad/faculty_development/info_assurance_education/overview_purdue.php

Foltz, C.B., & Renwick, J.S. (2011). Information systems security and computer crime in the IS curriculum: A detailed examination. *USA Journal of Education for Business,* 86, 119-125.

*Information Assurance Education Graduate Certificate Program* (n.d.) Retrieved October 2, 2003 from Purdue University, Center for Education and Research in Information Assurance and Security: http://www.cerias.purdue.edu/education/post_secondary_education/ undergrad_and_grad/faculty_development/info_assurance_education/

*National INFOSEC Education & Training Program - Information Assurance Courseware Evaluation Process.* (n.d.). Retrieved October 2, 2003 from the National Security Agency, INFOSEC website: http://www.nsa.gov/isso/programs/nietp/corseval.htm

*Overview of the NSA IAATREP Program.*(n.d.). Retrieved October 1, 2003 from Purdue University, Center for Education and Research in Information Assurance and Security: http://www.cerias.purdue.edu/education/post_secondary_education/undergrad_and_grad/faculty_deve lopment/info_assurance_education/overview_nsa.php

Spanninger, M.K. (2001, May). Developing security competencies through information assurance undergraduate and graduate programs.  Paper presented at the 5th National Colloquium for Information Systems Security Education, Fairfax, VA. Retrieved October 1, 2003 from. http://cisse.info/CISSE%20J/2001/Span.pdf

National Security Agency. (2012). NSA Announces New Program to Prime College Students for Careers in Cyber Ops [Press release]. Retrieved from http://www.nsa.gov/public_info/press_room/2012/new_college_cyber_ops_program.shtm