**NORTH CAROLINA STATE UNIVERSITY**  
**GRADUATE COURSE ACTION FORM**

**NOTE:** Click once on shaded fields to type data. To check boxes, right click at box, click “Properties”, and click “Checked” under Default Values.

<table>
<thead>
<tr>
<th>DEPARTMENT/PROGRAM</th>
<th>Computer Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>COURSE PREFIX/NUMBER</td>
<td>CSC 743</td>
</tr>
<tr>
<td>PREVIOUS PREFIX/NUMBER</td>
<td>None</td>
</tr>
<tr>
<td>DATE OF LAST ACTION</td>
<td></td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Secure Data Management</td>
</tr>
<tr>
<td>ABBREVIATED TITLE</td>
<td>SECURE DATA MGMT</td>
</tr>
<tr>
<td>SCHEDULING</td>
<td>Fall ☒, Spring ☐, Summer ☐, Every Year ☒, Alt. Year Odd ☐, Alt. Year Even ☐, Other ☐</td>
</tr>
<tr>
<td>COURSE OFFERED</td>
<td>BY DISTANCE EDUCATION ONLY ☐, ON CAMPUS ONLY ☒, BOTH ON CAMPUS AND BY DISTANCE EDUCATION ☐</td>
</tr>
<tr>
<td>CREDIT HOURS</td>
<td>3</td>
</tr>
<tr>
<td>CONTACT HOURS</td>
<td>Lecture/Recitation 3, Seminar, Laboratory, Problem, Studio, Independent Study/Research, Internship/Practicum/Field Work</td>
</tr>
<tr>
<td>GRADING</td>
<td>ABCDF ☒, S/U ☐</td>
</tr>
<tr>
<td>INSTRUCTOR (NAME/RANK)</td>
<td>Ting Yu, Assistant Professor</td>
</tr>
<tr>
<td>Graduate Faculty Status</td>
<td>Associate ☐, Full ☒</td>
</tr>
<tr>
<td>ANTICIPATED ENROLLMENT</td>
<td>Per semester 20, Max. Section 20, Multiple sections Yes ☐, No ☒</td>
</tr>
<tr>
<td>PREREQUISITE(S)</td>
<td>(CSC/ECE 574 and (CSC 440 or CSC 540)) or their equivalents</td>
</tr>
<tr>
<td>COREQUISITE(S)</td>
<td></td>
</tr>
<tr>
<td>RESTRICTIVE STATEMENT</td>
<td>Background in databases and basic security concepts required</td>
</tr>
<tr>
<td>CURRICULA/MINORS</td>
<td>Required, Qualified Elective</td>
</tr>
<tr>
<td>PROPOSED EFFECTIVE DATE</td>
<td>Fall 2006</td>
</tr>
<tr>
<td>APPROVED EFFECTIVE DATE</td>
<td>__________________________</td>
</tr>
</tbody>
</table>

**CATALOG DESCRIPTION:** Advanced topics in secure data management with techniques in traditional database management systems as well as in recent advances in emerging areas. Emphasis on new security issues and challenges imposed by the Internet and the Web on cross-organization data sharing and management. Example topics include XML, data management in P2P, trust management, data authorship, and the integration of security and privacy policies with information systems.

**RECOMMENDED BY:**

<table>
<thead>
<tr>
<th>Department Head/Director of Graduate Programs</th>
<th>Date</th>
</tr>
</thead>
</table>

**ENDORSED BY:**

<table>
<thead>
<tr>
<th>Chair, College Graduate Studies Committee</th>
<th>Date</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>College Dean(s)</th>
<th>Date</th>
</tr>
</thead>
</table>

**APPROVED:**

<table>
<thead>
<tr>
<th>Dean of the Graduate School</th>
<th>Date</th>
</tr>
</thead>
</table>
Documentation Required for New Course

CSC 743 Secure Data Management

Course Justification

A. Background

Information security has become increasingly important as information systems in many of the world’s organizations are switching from the paper to the electronic media. Industry, government agencies and various other organizations are having greater demand for well-trained engineers who are prepared to secure these organizations’ information systems. The Computer Science Department recognized this demand several years ago when it created and is currently offering two regular graduate level courses, CSC 574 Information Systems Security and CSC/ECE 774 Advanced Network Security, and two undergraduate level courses, CSC 405 Introduction to Computer Security and CSC 474 Information Systems Security (piggybacked with CSC 574).

However, information security is a discipline that has been studied for several decades and has many more topics than can be covered in these courses. Many important topics were not covered in these current security courses because of the lack of faculty resources. With Dr. Jun Xu and Dr. Ting Yu joining the department in Fall 2003 and Dr. Khaled Harfoush starting to teach undergraduate level security courses, the Computer Science Department has an opportunity to offer more in information security education.

The faculty currently teaching security courses (Harfoush, Ning, Xu, and Yu) propose to revise the present security courses and create two new security courses. The following gives a brief description of the proposed security courses including the revisions of the current courses.

Undergraduate Level Security Courses

- CSC 405 Introduction to Computer Security (Revised Fall 2005)
  
  This course mainly covers introductory information security techniques relevant to protecting computer systems, including access control, authentication, applied cryptography, multi-level security, physical security, etc.

- CSC 474 Network Security (Revised Fall 2005)

  This course mainly covers topics relevant to protecting networks and distributed systems, including applied cryptography, authentication, key management, authentication in distributed systems, firewalls, IPsec, transport layer security, email security, etc.

Graduate Level Security Courses

- CSC 574 Information Systems and Network Security (Revised Fall 2005)

  This course serves as the foundational information security course in the graduate program. It covers topics related to information systems and network security, including applied cryptography, authentication, access control, network and distributed security, malicious software, etc.

- CSC 716 Design of Secure and Reliable Systems (New course Fall 2005)

  The course covers advanced topics in computer system security and reliability. The course presents algorithms/techniques from both fields. The emphasis is on system level design issues, e.g., how systems fail, how algorithms can be compromised, how protocols can be attacked, and ultimately, how application
design, compiler, operating systems, and processor architectures can be enhanced to detect and mask attacks/failures.

- **CSC 743 Secure Data Management** (New course Fall 2005)
  
  This course covers advanced topics in data management security, including inference control, role-based access control, trust management, privacy policy enforcement in databases, query answering over encrypted databases, as well as anonymity and micro data release in decentralized data sharing.

- **CSC/ECE 774 Advanced Network Security** (Revised for Fall 2004)
  
  This course covers advanced topics in network security, including electronic payment systems, network intrusion detection and alert correlation, secure group communication, broadcast authentication, and security in mobile ad-hoc and sensor networks.

**B. Why this new course?**

Databases are one of the corner stones of information systems. Complex database systems are widely employed not only to store valuable information, but also to support critical corporate and national decision-making. Database security has long been recognized as one of the key areas in the research of information system security, and has a profound influence on the design of today’s secure information systems.

In recent years, due to the rapid development of a global infrastructure via the Internet, the research scope of secure data management has been greatly expanded. There is an urgent need to systematically expose students to the foundations as well as the recent advances of security in data management. The Computer Science Department security curriculum has lacked in-depth coverage of the topics given in the course descriptions above. The offering of this new course will fill part of this gap. In addition, the Department is an NSA (National Security Agency) designated CAE (National Center of Academic Excellence in Information Assurance Education). The charter of the NSA/CAE requires this important area to be covered in the Department’s security curriculum.

**Student Learning Objectives**

See syllabus.

**Enrollment for the Last Five Years**

The enrollment data from when the course was a special topics course, CSC 591D:

- Fall 2003: 13
- Fall 2004: 7
- Fall 2005: 10

**New Resources Required**

No new resources are required.

**Consultation with Other Departments**

ECE was consulted and there were no objections.
Proposed Syllabus

CSC 743 Secure Data Management

Instructor:
Dr. Ting Yu
Office: 243 Venture III, 900 Main Campus Drive
Phone: (919) 513-7578
Email: yu@csc.ncsu.edu
URL: http://www.csc.ncsu.edu/faculty/yu

Course prerequisites or restrictive statements:
CSC/ECE 574 and (CSC 440 or CSC 540) or their equivalents.
Students who have not taken the above (or equivalent) courses should consult the instructor.

Student learning outcomes:
Upon successful completion of this course, students will be able to:
1. State the basic concepts in database security, including access control models, security policies, and access control mechanisms.
2. State the difference between cascading revocation and non-cascading revocation and explain under what circumstance each of them is desired.
3. Explain the properties of discretionary access control and mandatory access control and analyze their differences.
4. Explain the concept of covert channels, list the two types of covert channels, and give an example of each type of covert channel.
5. List the four security divisions specified in TCSEC.
6. State the concept of polyinstantiation and explain why it is necessary in multilevel secure relational model.
7. State the concepts of integrity and analyze the strength and weakness of Clark-Wilson integrity model.
8. List possible attacks against statistic databases and their countermeasures.
9. Analyze the pros and cons of X.509 and PGP.
10. Explain different models of trust for decentralized systems and analyze their pros and cons.
11. Explain the query model of XML, and apply different authorization models to XML.
12. Explain the challenges in decentralized authorization and analyze the pros and cons of current trust management approaches.
13. Identify potential privacy violations in today’s information systems and analyze what techniques can be exploited to improve current Internet privacy practices.
14. Identify a research topic in the context of database security and conduct original research work through group collaboration.

Textbooks:
• Research Paper Handouts (All handouts are available on-line through NCSU library)
Handouts (All handouts are accessible on-line)


Course Organization and Scope:
(Asume each lecture takes 75 minutes. The following topics need 29 lectures (14 1/2 weeks).)

1. Access control (2 lectures)
   a. Basic access control models
   b. Discretionary access control
   c. Mandatory access control
2. Covert channels (1 lecture)
3. Multilevel secure relational databases (2 lectures)
   a. Multilevel secure relational model
   b. Multilevel secure DBMS architecture
   c. Commercial products and research prototypes
4. Integrity models and mechanisms (1 lecture)
5. Auditing in relational databases (1 lecture)
6. Security in statistic databases (1 lecture)
7. Credential infrastructure (2 lectures)
   a. X.509 and PGP
   b. Credential management
8. XML access control (1 lectures)
   a. XML authorization model
   b. XML access control system
   c. XML authorization enforcement
   - **Midterm exam** (topic 1 – 7) (1 lecture)
9. Trust in decentralized systems (3 lectures)
   a. Trust management
   b. Role-based trust model
   c. Trust negotiation
   d. Trust in peer-to-peer systems
10. Encrypted databases (2 lectures)
    a. Encrypted data retrieval
    b. Query evaluation in encrypted databases
11. Privacy preservation (3 lectures)
    a. Privacy protection in databases
    b. Privacy policy enforcement
    c. Privacy-preservation datamining
12. Digital rights (2 lectures)
    a. Digital copyright management
    b. Database systems for digital rights management
13. Policy management (2 lectures)
14. Term project discussion and presentation (5 lectures)

Schedule of Reading Assignments:
If not specifically identified, the following essays refer to those in the textbook.
- **Topic 1: Handouts 1 and 2; essay 2.**
- **Topic 2: Essays 2 and 6.**
• Topic 3: Essays 20, 19, 23.
• Topic 4: Essay 27.
• Topic 5: Essay 25.
• Topic 6: Handout 15
• Topic 7: Handouts 3 and 4.
• Topic 8: Handouts 5, 6 and 7.
• Topic 9: Handouts 8, 9, 10, 11 and 12.
• Topic 10: Handouts 13 and 14.
• Topic 11: Handouts 16, 17 and 18.
• Topic 12: Handouts 19 and 20.
• Topic 13: Handouts 21 and 22.

Projected schedule of homework due dates, quizzes and exams:
There will be no homework in this course. Instead, there are two paper reviews due every Friday, except when term projects are due the same week. The schedule for term projects and exams is as follows:
• Proposal: due by week 5
• Mid-term exam: due by week 7
• Project midterm report: due by week 11
• Project final report: due by the last day of the semester
• Final exam: decided by the university.

Grading:
• Reviews 15%, paper presentation 10%, class participation 10%, midterm 20%, final 20 %, term project: 25%.

• The final grades are computed according to the following rules:
  o A+: >= 95%
  o A: >= 90% and < 95%
  o A-: >= 85% and < 90%
  o B+: >=80% and < 85%
  o B: >= 75% and < 80%
  o B-: >= 70% and < 75%
  o C+: >=66% and < 70%
  o C: >=63% and < 66%
  o C-: >=60% and < 63%
  o D+: >= 56% and < 60%
  o D: >= 53% and < 56%
  o D-: >= 50% and < 53%
  o F: < 50%.

Policies on incomplete grade and late assignments:
Reviews and project deadlines will be as follows: late assignments will be accepted with a 10% reduction in grade for each class period they are late. However, once an assignment is discussed in class or the solution is posted, submissions will no longer be accepted. All assignments must be turned in before the start of class on the due date.

Policies on absences (excused and unexcused) and scheduling makeup work:
The university policy on absences will be enforced. See the university policy at the following URL:
http://www.ncsu.edu/provost/academic_regulations/attend/reg.htm
• The student is responsible for discussing makeup exams with the instructor if they miss exams due to an excused absence. The instructor will choose a mutually acceptable date and time for the makeup exam.
• Late submission of homework assignments due to excused absences is not subject to the policies on late assignments.
Academic integrity:
The university, college, and department policies against academic dishonesty will be strictly enforced. You may obtain copies of the NCSU Code of Student Conduct from the Office of Student Conduct, or from the following URL.
http://www.ncsu.edu/policies/student_services/student_discipline/POL11.35.1.php
The instructor expects honesty in the completion of tests and assignments. It is the understanding and expectation of instructor that the student's signature on any test or assignment means that the student neither gave nor received unauthorized aid.

NC State policy on working with students with disabilities:
“Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with Disability Service for Students at 1900 Student Health Center, Campus Box 7509, 515-7653.

http://www.ncsu.edu/provost/offices/affirm_action/dss/
For more information on NC State’s policy on working with students with disabilities, please see
http://www.ncsu.edu/provost/hat/current/appendix/appen_k.html

Laboratory Safety or Risk Assumption: Not Applicable.
“Pass-through” Charges: Not applicable.
Statement on transportation:
Students have to provide their transportation for all class-related trips.