University of Wisconsin-Stout
Menomonie, WI

Applied Mathematics and Computer Science Program

Diane Christie (Program Director)
Terry Mason and Radi Teleb
UW-Stout

- Menomonie, WI
  - I-94 (~40 miles into Wisconsin)
- 8,000 Students (Mostly Undergraduate)
- Polytechnic Institution
  - Arts and Sciences College
  - STEM College
    - Science, Technology, Engineering, and Math
- July 1, 2008
Applied Math and Computer Science Program

- Combines core of Math and CS
- Six concentrations
  - Actuarial Science
  - Bioinformatics
  - Business Management
  - Software Development
  - Game Design and Development (2008)
- Concentrations easy, programs hard
Student Data

One year snapshot

By Concentration
- Actuarial Science – 10%
- Bioinformatics – 5%
- Business Management – 11%
- Software Development – 29%
- AMCS (not declared) – 50%

Other facts
- Approximately 125 students in program
- 21 Women (16%)

Roughly 75% of graduates start in a CS type of career.
Information Assurance & Cyber Security

CS Courses

**Computer Science**
- CS 144 Computer Science 1
- CS 145 Computer Science 2
- CS 244 Data Structures
- CS 245 Intro to Computer Organization
- CS 248 Web and Internet Programming
- CS 441 Computer Architecture
- CS 442 Systems Programming
- CS 443 Database Systems
- CS 480 Intro to Computer Security

**Network**
- TSC 131 Network Operating System Fundamentals
- TSC 145 Intro to Network Infrastructures
- TSC 383 Intro to Network Security
Information Assurance & Cyber Security
Math Foundation

Mathematics/Statistics

- MATH 156 Calc & Analytic Geometry 1
- MATH 157 Calc & Analytic Geometry 2
- MATH 158 Calculus 3
- MATH 275 Linear Algebra
- MATH 370 Modern Algebra 1
- MATH 380 Cryptography
- MATH 371 Modern Algebra 2
- MATH 450 Real Analysis 1
- STAT 330 Prob & Stats for Engineering & Sciences OR
- STAT 331 Probability & Math Stats 1 and STAT 332 Probability & Math Stats 2
Information Assurance & Cyber Security
Other Departments and New Courses

Concentration Specific
- MSCS 449 Co-op experience
- ENG 415 Technical Writing
- TSC 131 Network Operating System Fundamentals
- TSC 145 Intro to Network Infrastructures
- TSC 383 Intro to Network Security
- CS 480 Intro to Computer Security
- MATH 380 Cryptography
- Selectives
  - Other Math, Statistics, or CS courses
Integrate Concepts into Current Courses (SD and CSIA)

- CS1 and CS2
- Data Structures
- Web and Internet Programming
- Database Systems
- Systems Programming
- Software Engineering
- Computer Architecture
CS1, CS2, and Data Structures

**CS1 and CS2**
- Java programming
- Introduce topics
- Create a lab or two to engage in topic

**Data Structures**
- C++ and Linux
  - Users in Linux
  - Boundary Conditions
  - Buffer Overflow
Web and Internet Programming
Sophomore Level

Yikes! What to cover here?
– Need to teach how to program on the web.
– How much time to teach of challenges?
– What depth?

Challenge: Some students will not take much more higher level CS, but will work in CS.
– May be only Database exposure
– SQL Injection?
Database Systems

- SQL grant permissions to users
- Project with a web interface
  - Focus on the database design
  - Not on security of interface
- Add a module on Database Security
Software Engineering

- Add a component for securing each stage of the software development life cycle
- Develop modules to test vulnerabilities for each phase of the development process
New Courses for Concentration

- CS-480 Computer Security
- MATH – 380 Cryptography
1. Understand computer and system security and value its importance.
2. Recognize good computing security practice.
3. Identify and detect security violations.
4. Understand and apply intrusion detection techniques.
5. Know information flow policies.
6. Recognize computer and network security policies that identify the threats and define the requirements for ensuring a secure system.
7. Understand the security mechanisms of how to detect and prevent attacks and how to recover from those that succeed.
8. Analyze the security of a system and the mechanisms that enforce the security policy.
9. Identify the related assumptions and trust that leads to the threats and the degree to which they may be realized.
10. Discover the role of risk analysis and acquire the knowledge to design better mechanisms and policies to neutralize these threats.
11. Recognize that policies and procedures must take people into account and know that the weakest link in the security mechanisms of any system is the human beings.
12. Identify the differences between cryptography, computer security, and information assurance.
1. Understand the foundations of cryptography
2. Explain several public-key and symmetric-key cryptosystems
3. Understand the mathematics behind various cryptosystems
4. Analyze cryptographic algorithms for security strengths and weaknesses
5. Implement a cryptographic algorithm
6. Analyze digital signature algorithms
7. Explore the importance and applications of cryptography in today’s society
8. Apply cryptography to information assurance and computer security