Cybersecurity MS-CBS Interdisciplinary-Management Track

Optical Science and Engineering, Ph.D.

Degree
Doctor of Philosophy

Program Coordinator: Robert Lindquist, Electrical and Computer Engineering

Student Services Building, 324H
Telephone: 256.824.2525
Email: robert.lindquist@uah.edu (linquis@ece.uah.edu)

Mission
The mission of the Optical Science and Engineering Program is to develop and maintain a world class graduate education and research program in the rapidly advancing and expanding fields of optical science and engineering, to provide our students with exciting opportunities to learn and to do forefront research, and to prepare these students for productive and fulfilling careers.

Overview of the OSE Program
At the dawn of the 21st century, Optics stands today as an area of major scientific and technological importance. With considerable foresight, the Optical Science and Engineering (OSE) doctoral program was formally approved at UAH in 1992. Since then the program has grown steadily. Graduates of the program have little difficulty finding employment in rewarding careers. In 2000 the OSE core curriculum was redesigned to provide students more flexibility and to accommodate those coming into the program from various disciplines.

The OSE core consists of two major parts. The first part contains the following seven courses:

1. Geometrical Optics
2. Physical Optics
3. Fourier Optics
4. Optical Testing
5. Radiometry, Detectors and Sources
6. Lasers
7. Optical Testing Laboratory

This material is normally covered in the first year of graduate study, and is the basis for the Preliminary Examination given in the fall term of the second year of study. The second part consists of three focus areas, each of which contains three courses. The student is expected to select one of these areas, and is responsible for the material contained therein. The focus areas are:

1. Optical Communications
   a. Communications Theory
   b. Optical Fiber Communications
   c. Optical Communications
2. Quantum Physics and Devices
   a. Introduction to Quantum Mechanics
   b. Quantum Mechanics II
   c. Quantum Devices
3. Optical Engineering
   a. Lens Design
   b. Opto-Mechanical Design and Fabrication
   c. Optical System Design

This unique program is highly multi-disciplinary and is followed by a wide variety of advanced coursework and research in both fundamental and applied subjects. This diversity is reflected by the OSE faculty, which is drawn from the expertise of optical scientists and engineers from the departments of Physics, Electrical and Computer Engineering, and Mechanical and Aerospace Engineering, and from the Center for Applied Optics.
Admission Requirements

In order to be unconditionally admitted to the doctoral program, a student must have satisfied the following set of requirements:

1. A bachelor's degree, or its equivalent, from an approved college or university, in one of the physical sciences or engineering, with an overall grade point average of 3.0 or better;
2. A minimum score of 1600 on the combined verbal, quantitative, and analytical sections of the Graduate Record Examination\(^1\);
3. TOEFL score greater than 550 (213) computer-based in the case of international students whose native language is not English; and

\(^1\) For GRE tests taken after October 1, 2002 the score on the analytical portion is obtained by taking the (raw score + 2) X 100

All entering students will be administered a background evaluation at admission conducted by the Optics Coordinating Committee. An applicant whose scholastic record reveals a deficiency in one or more of the first two categories above, may, upon recommendation of the Program Coordinator and the approval of the Graduate Dean, be admitted on a conditional basis, as provided by Graduate School regulations. However, that student must follow the Graduate School's policies in achieving unconditional admission status prior to taking the Preliminary Examination.

Purpose

The MS-CBS degree is a unique program in that it is an interdisciplinary program of study among three colleges: Business, Engineering, and Science. Due to this collaboration between the colleges, students will be exposed to a diversified core curriculum with a choice of 3 different elective tracks; having in-depth curriculum in their track while gaining familiarity in the other two. Upon graduation students will be able to perform: Cybersecurity Analysis of vulnerabilities and threats to network environments, Network Penetration Testing, Auditing for Certification & Accreditation, and Technical Project Management in Information Technology. Students will also be able to integrate the business and scientific underpinnings of information technology trends related to the System Development Life Cycle and understand the federal, state & local statutory requirements associated with Information and cybersecurity through the Information Assurance Technical Framework (IATF).

Program prerequisites are kept to a minimum and the program is designed to meet the needs of students with a wide variety of educational backgrounds. The admission and program requirements for those pursuing the Management track are described below.

Degree Requirements

Prerequisites

Program prerequisites include a bachelor's degree in any field and demonstration of competency in each of the following three areas:

1. Computer Applications Competency. Students must demonstrate this competency by passing an on-line computer applications competency exam or by successful completion of the IS 146 or its equivalent. IS 146 or its equivalent will not count towards the requirements of the MS-CBS degree.
2. Computer Programming Competency. Students must demonstrate this competency by passing an on-line computer programming competency exam or by successful completion of the IS 210 or its equivalent. IS 210 or its equivalent will not count towards the requirements of the MS-CBS degree.
3. Computer Science and Networks competencies. Students must be competent to be enrolled in graduate level core courses including those in computer science and networks. If a student does not have these competencies, s/he may be required to either self-prepare by reviewing online tutorials and passing a competency exam or to register for additional courses which will not count towards the 30 credit hours required for this degree.

The MS-CBS program consists of 30 semester hours of graduate coursework. The coursework includes a five-course core that is required of all students, 9 credit hours of management track required courses, and 6 credit hours of electives. The directed elective choices are designed to provide students a broader understanding of multiple cybersecurity functions normally expected in an organization.

IS 692 (http://catalog.uah.edu/search/?P=IS%20692)/CPE 692 (http://catalog.uah.edu/search/?P=CPE%20692)/CS 692 (http://catalog.uah.edu/search/?P=CS%20692) is the capstone course and should be taken toward the end of the student’s program. Students must earn a grade of B or better in the capstone course.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Semester Hours</th>
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</table>
CS 585 (http://catalog.uah.edu/search/?P=CS%20585) | INTRO TO COMPUTER SECURITY
---|---
IS 692 (http://catalog.uah.edu/search/?P=IS%20692) | CYBERSECURITY PRACTICUM
or CPE 692 (http://catalog.uah.edu/search/?P=CPE%20692) | CYBERSECURITY CAPSTONE
or CS 692 (http://catalog.uah.edu/search/?P=CS%20692) | COMPUTER SECURITY

### Management Track-required Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>IS 560 (<a href="http://catalog.uah.edu/search/?P=IS%20560">http://catalog.uah.edu/search/?P=IS%20560</a>)</td>
<td>TELECOMMUNICATIONS &amp; NETWORKING</td>
</tr>
<tr>
<td>IS 577 (<a href="http://catalog.uah.edu/search/?P=IS%20577">http://catalog.uah.edu/search/?P=IS%20577</a>)</td>
<td>NETWORK DEFENSE &amp; OPERATING SYSTEMS</td>
</tr>
<tr>
<td>IS 670 (<a href="http://catalog.uah.edu/search/?P=IS%20670">http://catalog.uah.edu/search/?P=IS%20670</a>)</td>
<td>BUSINESS CONTINGENCY PLANNING</td>
</tr>
</tbody>
</table>

### Elective, select two courses from the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tr>
<td>IS 571 (<a href="http://catalog.uah.edu/search/?P=IS%20571">http://catalog.uah.edu/search/?P=IS%20571</a>)</td>
<td>BUSINESS INTELLIGENCE &amp; ANALYSIS</td>
</tr>
<tr>
<td>IS 640 (<a href="http://catalog.uah.edu/search/?P=IS%20640">http://catalog.uah.edu/search/?P=IS%20640</a>)</td>
<td>DATA MANAGEMENT AND DATA MINING</td>
</tr>
<tr>
<td>IS 691 (<a href="http://catalog.uah.edu/search/?P=IS%20691">http://catalog.uah.edu/search/?P=IS%20691</a>)</td>
<td>INFORMATION SYSTEMS STRATEGY AND APPLICATIONS</td>
</tr>
<tr>
<td>CPE 534 (<a href="http://catalog.uah.edu/search/?P=CPE%20534">http://catalog.uah.edu/search/?P=CPE%20534</a>)</td>
<td>OPERATING SYSTEMS</td>
</tr>
<tr>
<td>CPE 548</td>
<td></td>
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<tr>
<td>CPE 647 (<a href="http://catalog.uah.edu/search/?P=CPE%20647">http://catalog.uah.edu/search/?P=CPE%20647</a>)</td>
<td>UBIQUITOUS COMPUTING</td>
</tr>
<tr>
<td>CPE 648 (<a href="http://catalog.uah.edu/search/?P=CPE%20648">http://catalog.uah.edu/search/?P=CPE%20648</a>)</td>
<td>ADVANCED COMPUTER NETWORKS</td>
</tr>
<tr>
<td>CS 687 (<a href="http://catalog.uah.edu/search/?P=CS%20687">http://catalog.uah.edu/search/?P=CS%20687</a>)</td>
<td>DATA BASE SYSTEMS</td>
</tr>
<tr>
<td>CS 553 (<a href="http://catalog.uah.edu/search/?P=CS%20553">http://catalog.uah.edu/search/?P=CS%20553</a>)</td>
<td>CLIENT/SERVER ARCHITECTURES</td>
</tr>
<tr>
<td>CS 617 (<a href="http://catalog.uah.edu/search/?P=CS%20617">http://catalog.uah.edu/search/?P=CS%20617</a>)</td>
<td>DES &amp; ANALYSIS OF ALGORITHMS</td>
</tr>
<tr>
<td>CS 650 (<a href="http://catalog.uah.edu/search/?P=CS%20650">http://catalog.uah.edu/search/?P=CS%20650</a>)</td>
<td>SOFTWARE ENGINEERING PROC</td>
</tr>
<tr>
<td>CS 670 (<a href="http://catalog.uah.edu/search/?P=CS%20670">http://catalog.uah.edu/search/?P=CS%20670</a>)</td>
<td>COMPUTER NETWORKS</td>
</tr>
<tr>
<td>CS 690 (<a href="http://catalog.uah.edu/search/?P=CS%20690">http://catalog.uah.edu/search/?P=CS%20690</a>)</td>
<td>ADVANCED OPERATING SYSTEMS</td>
</tr>
<tr>
<td>CPE 649 (<a href="http://catalog.uah.edu/search/?P=CPE%20649">http://catalog.uah.edu/search/?P=CPE%20649</a>)</td>
<td>ADVANCED CYBERSECURITY ENGINEERING</td>
</tr>
<tr>
<td>CPE 645 (<a href="http://catalog.uah.edu/search/?P=CPE%20645">http://catalog.uah.edu/search/?P=CPE%20645</a>)</td>
<td>COMPUTER NETWORK SECURITY</td>
</tr>
<tr>
<td>CPE 646 (<a href="http://catalog.uah.edu/search/?P=CPE%20646">http://catalog.uah.edu/search/?P=CPE%20646</a>)</td>
<td>MOBILE &amp; WIRELESS NETWORKS</td>
</tr>
<tr>
<td>CS 565 (<a href="http://catalog.uah.edu/search/?P=CS%20565">http://catalog.uah.edu/search/?P=CS%20565</a>)</td>
<td>NETWORK SECURITY</td>
</tr>
<tr>
<td>CS 570 (<a href="http://catalog.uah.edu/search/?P=CS%20570">http://catalog.uah.edu/search/?P=CS%20570</a>)</td>
<td>INTRO TO COMPUTER NETWORKS</td>
</tr>
<tr>
<td>CS 685 (<a href="http://catalog.uah.edu/search/?P=CS%20685">http://catalog.uah.edu/search/?P=CS%20685</a>)</td>
<td>COMPUTER SECURITY</td>
</tr>
</tbody>
</table>

**Total Semester Hours**: 30
MS-CBS students whose previous studies include the undergraduate equivalents of IS 560 (http://catalog.uah.edu/search/?P=IS%20560) and IS 577 (http://catalog.uah.edu/search/?P=IS%20577) must substitute a 3-credit-hour graduate-level IS course for each of the latter.

Students are required to satisfy the prerequisites for any elective they choose. Students who wish to substitute some other courses as directed electives may seek prior approval for such a substitution by contacting the Director of Graduate Programs in UAH College of Business Administration.

Additional Information

Thesis Option

A thesis option is available. Students interested in this option should contact the both the faculty member who the student wants to serve as the thesis advisor and the Director of Graduate Programs in the College of Business before completing 12 hours of graduate study. If selected, the student will register for the IS 699 (http://catalog.uah.edu/search/?P=IS%20699) Master’s Thesis course for 6 credit hours in lieu of 6 credit hours of electives.

Transfer Credit

Up to 12 semester hours of graduate credit taken at other universities may be transferred to meet MS-CBS degree requirement. Inquiries about the transferability of specific courses should be directed to the College of Business Director of Graduate Programs, who will consult with the IS faculty to determine whether the content of the class will be accepted for transfer credit.