Bachelor of Science Degree in Interdisciplinary Studies - Cyber Operations Major

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Cyber Operations is an interdisciplinary major encompassing the entire scope of cyberspace and related operations that are both technical and non-technical (i.e., ethical, legal, human-centered, etc.) in nature. Cyber Operations is a complementary discipline to Cybersecurity. Cyber Operations places a particular emphasis on technologies and techniques applicable to all operational and system levels. Coursework in Cyber Operations balances theory, practice and hands-on labs inspired by real-life scenarios. Skills and competencies emphasized are in system attack, infiltration, exploitation, defense, mitigation, and recovery.

Graduates of the Bachelor of Science degree in Interdisciplinary Studies with the Cyber Operations major will have the skills and proficiencies that are critical to intelligence, military and law enforcement organizations authorized to perform these specialized operations. Therefore, they will play a role in the enhancement of the national security posture of the nation.

### Code | Title | Hours
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**Lower-Division General Education**
Written Communication |  | 6
Oral Communication |  | 3
Mathematics (MATH 211 and MATH 212 required) |  | 8
Language and Culture | 0-6 | 
Information Literacy and Research |  | 3
Human Creativity |  | 3
Interpreting the Past |  | 3
Literature |  | 3
Philosophy and Ethics (met in the major by PHIL 355E) |  | 
The Nature of Science |  | 8
Impact of Technology (IT 200T or CYSE 200T recommended) |  | 3
Human Behavior (CRJS 215S or SOC 201S required) |  | 3
**Prerequisites**
CS 170 | Introduction to Computer Architecture I | 3
CS 250 | Problem Solving and Programming II | 4
CS 252 | Introduction to Unix for Programmers | 1
CS 381 | Introduction to Discrete Structures | 3
ECE 241 | Fundamentals of Computer Engineering | 4
ECE 304 | Probability, Statistics, and Reliability | 3
**Technical Base**
CS 150 | Problem Solving and Programming I | 4
CS 270 | Introduction to Computer Architecture II | 3
CS 361 | Data Structures and Algorithms | 3
CS 390 | Introduction to Theoretical Computer Science | 3
ECE 346 | Microcontrollers | 3
ECE 355 | Introduction to Networks and Data Communications | 3
**Interdisciplinary Studies Core**
IDS 300W | Interdisciplinary Theory and Concepts (grade of C or higher required) **
CYSE 368 or CYSE 494 | Cybersecurity Internship **
IDS 493 | Entrepreneurship in Cybersecurity **
**Major Coursework**
CS 464 | Networked Systems Security | 3
CS 465 | Information Assurance | 3
CS 471 | Operating Systems | 3
CS 495 | Topics in Computer Science (Software Reverse Eng) | 3
CYSE 301 | Cybersecurity Techniques and Operations | 3
CYSE/CRJS 406 | Cyber Law | 3
ECE 416 | Cyber Defense Fundamentals | 3
ECE 455 | Network Engineering and Design | 3
PHIL 355E | Cybersecurity Ethics | 3
**Approved Program Electives (Choose two)**
CS 462 | Cybersecurity Fundamentals | 6
CS 476 | Systems Programming | 
CYSE 407 | Digital Forensics | 
ECE 483 | Embedded Systems | 
IT 417 | Management of Information Security | 
MSIM 470 | Foundations of Cyber Security | 
**Total Hours** 122-128

* Grade of C or better required in both written communication courses and in ENGL 110C before declaring major. ENGL 231C is recommended as the second written communication course.
** Junior standing and completion of IDS 300W are required for enrollment in CYSE 368, CYSE 494 and IDS 493.
+ Other courses may be substituted with the approval of the program coordinator.

### Upper-Division General Education
Met through 300/400-level prerequisite courses.

### Requirements for Graduation
Requirements for graduation include a minimum cumulative grade point average of 2.00 overall and in the major, 120 credit hours, which must include both a minimum of 30 credit hours overall and 12 credit hours of upper-level courses in the major program from Old Dominion University, completion of ENGL 110C, ENGL 211C or ENGL 221C or ENGL 231C, and the writing intensive (W) course in the major with a grade of C or better, and completion of Senior Assessment.

### CYBERSECURITY Courses

**CYSE 100, Cyber Explorers and University Orientation. 1 Credit.**
This course provides an introduction to cyber hygiene and orientation to university life.

**CYSE 200T, Cybersecurity, Technology, and Society. 3 Credits.**
Students will explore how technology is related to cybersecurity from an interdisciplinary orientation. Attention is given to the way that technologically-driven cybersecurity issues are connected to cultural, political, legal, ethical, and business domains.

**CYSE 250, Basic Cybersecurity Programming and Networking. 3 Credits.**
This course introduces the cybersecurity-centric programming and networking concepts. Students will develop problem solving skills by using low-level programming languages (including C and assembly) and learn fundamentals of network protocols. This course is the technical base for students to take cybersecurity major courses. No prior knowledge of programming and networking is assumed. Prerequisite: MATH 162M or higher.
CYSE 300. Introduction to Cybersecurity, 3 Credits.
This course provides an overview of the field of cybersecurity. It covers core cybersecurity topics including computer system architectures, critical infrastructures, cyber threats and vulnerabilities, cryptography, information assurance, network security, and risk assessment and management. Students are expected to become familiar with fundamental security concepts, technologies and practices, and develop a foundation for further study in cybersecurity. Prerequisite: MATH 162M or permission of the instructor.

CYSE 301. Cybersecurity Techniques and Operations, 3 Credits.
This course introduces tools and techniques used to secure and analyze large computer networks and systems. Students will explore and map networks using a variety of diagnostic software tools, learn advanced packet analysis, configure firewalls, write intrusion detection rules, perform forensic investigation, and practice techniques for penetration testing. Prerequisite: MATH 162M or permission of the instructor.

CYSE 368. Cybersecurity Internship, 1-6 Credits.
This course allows students to volunteer to work in an agency related to cybersecurity. Students must volunteer for 50 hours per course credit and complete course assignments. Prerequisite: approval by the Director of the Center for Cybersecurity Education and Research.

CYSE 406. Cyber Law, 3 Credits.
This course tackles two major cyber law subjects. The first part of the course examines various U.S. laws and legal considerations that impact the digital and cyberspace worlds from traditional civil, and to a lesser extent, traditional criminal perspectives. The second part will familiarize cyber operations professionals about the extent of and limitations on their authorities to ensure operations in cyberspace are in compliance with U.S. law, regulations, directives and policies. The course will also introduce students to miscellaneous cybersecurity topics such as the Federal Acquisition Requirements. Prerequisite: junior standing.

CYSE 407. Digital Forensics, 3 Credits.
This course introduces the basic concepts and technologies of digital forensics. Students will learn the fundamental techniques and tools utilized for collecting, processing, and preserving digital evidence on computers, mobile devices, networks, and cloud computing environments. Students will also engage in oral and written communication to report digital forensic findings and prepare court presentation materials. Prerequisites: declared major and junior standing.

CYSE 494. Entrepreneurship in Cybersecurity, 3 Credits.
This course is designed to help students enhance their personal and professional development through innovation guided by faculty members and professionals. It offers students an opportunity to integrate disciplinary theory and knowledge through developing a nonprofit program, product, business, or other initiative. The real-world experiences that entrepreneurs provide will help students understand how academic knowledge leads to transformations, innovations, and solutions to different types of problems. The course can be delivered either as an independent project for individual students or as group projects similar to those sometimes offered in topics courses. Prerequisite: Approval by the Director of the Center for Cybersecurity Education and Research.

CYSE 495/595. Topics in Cybersecurity, 1-3 Credits.
The advanced study of selected cybersecurity topics designed to permit small groups of qualified students to work on subjects of mutual interest. These courses will appear in the course schedule, and will be more fully described in information distributed to academic advisors. Prerequisite: permission of the instructor.

CYSE 496/596. Topics in Cybersecurity, 1-3 Credits.
The advanced study of selected cybersecurity topics designed to permit small groups of qualified students to work on subjects of mutual interest. These courses will appear in the course schedule, and will be more fully described in information distributed to academic advisors. Prerequisite: permission of the instructor.

CYSE 497/597. Tutorial Work in Special Topics in Cybersecurity, 1-3 Credits.
Independent reading and study on a topic to be selected under the direction of an instructor. Conferences and papers as appropriate. Prerequisites: senior standing and approval of the Director of the Center for Cybersecurity Education and Research.

CYSE 498/598. Tutorial Work in Special Topics in Cybersecurity, 1-3 Credits.
Independent reading and study on a topic to be selected under the direction of an instructor. Conferences and papers as appropriate. Prerequisites: senior standing and approval of the Director of the Center for Cybersecurity Education and Research.

INTERDISCIPLINARY STUDIES Courses

IDS 300W. Interdisciplinary Theory and Concepts, 3 Credits.
An examination of the history, concepts and application of interdisciplinary study. This course includes an analysis of similarities and differences in academic disciplines and the application of interdisciplinary approaches to a specific topic of study. This is a writing intensive course. Prerequisites: a grade of C or better in ENGL 211C, ENGL 221C or ENGL 231C.

IDS 307T. Digital Writing, 3 Credits.
This course introduces students to issues of writing in various digital environments like web pages, email, blogs, wikis, and discussion boards. It also introduces fundamentals of hypertext authoring, digital and visual rhetoric, and image manipulation. Prerequisites: ENGL 110C and ENGL 211C or ENGL 221C or ENGL 231C.

IDS 368. Internship in Interdisciplinary Studies, 1-6 Credits.
An opportunity to integrate service and applied learning experience with interdisciplinary perspectives. Prerequisite: junior standing and permission of individualized interdisciplinary studies program coordinator.

IDS 369. Internship in Conservation Leadership, 3-6 Credits.
As part of the Conservation Leadership minor, this graded internship will provide an opportunity to integrate service and applied learning experience with interdisciplinary perspectives. 200 hours are required for the 3-credit option, and 400 hours are required for the 6-credit option. Prerequisites: BIOL/OEAS/IDS 466W and BIOL/OEAS/IDS 467.

IDS 397. Independent Study, 1-6 Credits.

IDS 398. Independent Study, 1-6 Credits.

IDS 400/500. Study Abroad, 0 Credits.

IDS 466W. Introduction to Mitigation and Adaptation Studies, 3 Credits.
Students will be introduced to the science underpinning mitigation of human-induced changes in the Earth system, including but not limited to climate change and sea level rise, and adaptation to the impacts of these changes. The course will cover the environmental hazards and the opportunities and limitations for conservation, mitigation and adaptation. This is a writing intensive course. Cross listed with BIOL 466W and OEAS 466W. Prerequisites: BIOL 291 or permission of instructor.

IDS 467. Sustainability Leadership, 3 Credits.
In this class, students will discover what makes a leader for sustainability. They will consider a range of global and local crises from a leadership point of view in the context of sustainability science, which addresses the development of communities in a rapidly changing social, economic, and environmental system-of-systems environment. The course will be based on taking a problem motivated and solution-focused approach to the challenges considered. The course includes a service learning project focusing on a leadership experience in solving a real-world environmental problem. Prerequisite: BIOL 466W or OEAS 466W or IDS 466W.

IDS 493. IDS Electronic Portfolio Project, 3 Credits.
The preparation of an electronic portfolio integrating the student's academic study, work experiences, skill identification and work products. Alternative formats are used for varying uses of the portfolio. Prerequisites: IDS 300W and senior standing.
IDS 494. Entrepreneurship in Interdisciplinary Studies. 3 Credits.
This course is designed to help students enhance their personal and professional development through innovation guided by faculty members and professionals. It offers students an opportunity to integrate disciplinary theory and knowledge through developing a nonprofit program, product, business, or other initiative. The real-world experiences that entrepreneurship provide will help students understand how academic knowledge leads to transformations, innovations, and solutions to different types of problems. Prerequisite: IDS 300W and approval of the program coordinator.

IDS 495. Topics in Integrative Studies. 3 Credits.
Focused study of selected topics linking perspectives, research and applications from a variety of disciplines. Emphasis is on disciplinary synthesis. Prerequisite: IDS 300W.

IDS 497. IDS Individualized Senior Project. 3 Credits.
This course is a vehicle for the execution of the senior project requirement of the Interdisciplinary Studies Program. The project will be negotiated between the student, faculty sponsors, and the program. Open only to individualized integrative studies majors. Prerequisites: IDS 300W, permission of the instructor and an approved individualized integrative studies curriculum plan.