**CYBERSECURITY (CYB)**

**CYB 110 Cybersecurity and Privacy (3 credits)**  

**CYB 210 Cybersecurity Architectures and Management (3 credits)**  
Introduces the components in an information technology system and their roles in system operation. Teaches students how to use these components to develop plans and processes for a holistic approach to cybersecurity for an organization.  
**Prereqs:** CYB 110

**CYB 220 Secure Coding and Analysis (3 credits)**  
Describes the characteristics of secure programs and the ability to implement programs that are free from vulnerabilities. Practice evaluating software, including adding security mechanisms into software and testing software for vulnerabilities. Two lectures and one 2-hour lab per week.  
**Prereqs:** CS 121

**CYB 310 Cybersecurity Technical Foundations (3 credits)**  
Provides students with basic information about the various threats that may be present in the cyber realm and introduces architectural mitigation strategies including cryptography.  
**Prereqs:** CYB 110, CS 240

**CYB 330 Networking and Control Systems (3 credits)**  
Covers common network protocols, how network components interact, and how networks evolve over time. Students expand their familiarity with network vulnerabilities.  
**Prereqs:** CYB 210, CS 240

**CYB 331 Control System Fundamentals (2 credits)**  
Introduces the basics of industrial control systems, where they are likely to be found, and vulnerabilities they are likely to have.

**CYB 340 Network Defense (3 credits)**  
Covers concepts used in defending a network and the basic tools and techniques that can be taken to protect a network and communication assets from cyber threats. Provides students with knowledge and skills related to detecting and analyzing vulnerabilities and threats and taking steps to mitigate associated risks.  
**Prereqs:** CYB 310, CYB 330

**CYB 350 Operating System Defense (3 credits)**  
This course provides fundamentals of secure operating system administration and hardening. Provides students with an understanding of the authorities, roles, and steps associated with cyber operations.  
**Prereqs:** CYB 310

**CYB 380 Cybersecurity Lab I (3 credits)**  
This hands-on laboratory class allows students to get practical experience related to cybersecurity threats, mitigations, and scenarios they have been introduced to in other courses. This includes classic buffer overflow and SQL injection style vulnerabilities, network monitoring, as well as Windows and Linux security configurations. 6 hours of lab per week.  
**Prereqs:** CS 240  
**Coreqs:** CYB 310, CYB 330

**CYB 381 Cybersecurity Lab II (3 credits)**  
This hands-on laboratory class allows students to get practical experience related to cybersecurity threats, mitigations, and scenarios they have been introduced to in other courses. This course builds on CYB 380 by focusing on more advanced threats and mitigations. 6 hours of lab per week.  
**Prereqs:** CYB 310, CYB 380  
**Coreqs:** CYB 340, CYB 350

**CYB 400 Seminar (1-16 credits)**  
**CYB 401 Cybersecurity as a Profession (1 credit)**  
Ethical, legal, social, and intellectual property issues; current research topics; and other issues of importance to the professional cybersecurity researcher. Graded P/F.  
**Prereqs:** Senior Standing in Computer Science

**CYB 404 (s) Special Topics (1-4 credits)**  
Joint-listed with CYB 504

Special topic courses in the subject are often offered to allow students to learn topics of current interest that are not covered in permanent courses in the corresponding subject. Special topic courses cover topics and have learning outcomes and required academic activities and deliverables that are specific to each course offering. Cybersecurity (CYB) special topic courses at the undergraduate level may be chosen as electives toward a Bachelor of Science (BS) in Cybersecurity (CYB), Computer Science (CYB), or Computer Engineering (CE) degree. For students in all colleges, some special topic courses may be used to complement a student's interdisciplinary degree plan. Cybersecurity (CYB) special topic courses at the graduate level are usually used to complement the graduate study plan for students pursuing a Master's (MS) or Doctoral degree (PhD) in Cybersecurity (CYB) or Computer Science (CS). They may also be used to complement graduate study plans for students in the College of Engineering or graduate students in other colleges pursuing a multidisciplinary graduate degree. Significant additional work and performance required for graduate-level credit.  
**Prereqs:** Junior standing or graduate standing or instructor permission

**CYB 420 Digital Forensics (3 credits)**  
Cross-listed with CS 447

Joint-listed with CS 547, CYB 520. This course covers modern procedures, techniques, and best practices for digital forensic data acquisition, analysis, and case building. Covered topics and knowledge areas include (a) Applicable laws, policies, rules, procedures and best practices, and selected digital forensics techniques and tools (DFS); (b) Processes, techniques, tools, and best practices for static digital forensic data acquisition, analysis, and reporting from different host systems (HOF) and raw media (MEF). At the end of the course, students should have the knowledge, skills, and abilities to be able to appropriately prepare, perform, and record digital forensic investigation tasks on a selected set of media and hosts, of varied types. This including knowledge, skills, and abilities to: (1) Identify and describe applicable laws, policies, procedures, and static acquisition and analysis techniques and best practices for digital forensic investigations; (2) Identify the appropriate tools for a given forensic task on a given type of media, host, or image; and (3) Select and successfully use a variety of digital forensic tools for acquiring, analyzing, and recording case information. Hands-on and/or laboratory work is an essential component in this course. Significant additional work and performance required for graduate-level credit.  
**Prereqs:** CYB 310
**Prereqs:** CYB 220, CYB 310

**CYB 480 Cybersecurity Senior Capstone Design I (3 credits)**
Capstone design sequence for cybersecurity science majors. Formal development techniques applied to definition, design, coding, testing, and documentation of a comprehensive cybersecurity. Projects are customer-specified, include real-world design constraints, and usually encompass two semesters. Students work in teams. Significant lab work required.

**Prereqs:** CS 383, CYB 381, ENGL 317, Senior Standing

**CYB 481 Cybersecurity Senior Capstone Design II (3 credits)**
Continuation of CYB 480. Application of formal design techniques to development of a large cybersecurity science project performed by students working in teams. Significant lab work required.

**Prereqs:** CS 383, CYB 381, CYB 480, ENGL 317

**CYB 498 (s) Cybersecurity Internship (1-3 credits)**
This course may be used to gain academic credit for knowledge, skills, and abilities acquired, enhanced, or refined through internal or external internships. Internship objectives and expected outcomes under this subject must be related to the subject area. Internships must include the following documents and/or deliverables: (a) internship proposal and plan including objectives, weekly hours, summary of planned tasks, or an external employer offer letter; (b) significant lab work required.

**Prereqs:** Instructor permission

**CYB 499 (s) Directed Study (1-4 credits)**
Directed study courses in the subject are offered to allow students to earn academic credit for independent but guided study. Directed study courses are often offered to support students in the acquisition of prerequisite knowledge and skills or in the acquisition of knowledge and skills not usually covered by permanent courses. Directed study courses have course objectives, topics, learning outcomes, and required academic activities and deliverables that are specific to each course and section offering.

**Prereqs:** Instructor permission

**CYB 500 (s) Master’s Research and Thesis (1-10 credits)**
This course allows graduate students to earn academic credit for performing research, design, development, verification and validation, documentation, writing, and academic communication activities toward the thesis degree requirement when pursuing a Master of Science (MS) in Cybersecurity (CYB) degree with thesis option. A maximum of ten (10) credits of Master’s Research and Thesis may be used toward a Master’s degree graduate study plan. Students must be registered for a minimum of one (1) credit in each and all terms in which they are performing graduate research and thesis activities.

**Prereqs:** Graduate standing and Instructor permission

**CYB 501 (s) Cybersecurity Graduate Seminar (1-3 credits, max 6)**
This course enables colleges and departments to offer seminar-style courses in any given term and at the graduate level. Seminar-style courses in the subject are offered to allow students to learn about and discuss topics of importance to the pursued degree. Different seminar courses cover topics and have learning outcomes and required academic activities that are specific to each course offering. Examples of topics covered and discussed in seminar-style courses are: current research, discipline’s best practices, history and future of the discipline, professional practice, professional communication, ethical issues, and technological and societal implications of the discipline and its practice. Graduate-level seminar-style course offerings usually require students to read, prepare, discuss, lead, and present, orally and/or in writing on the course offering topics.

**Prereqs:** Graduate standing

**CYB 502 (s) Graduate Directed Study (1-4 credits)**
Graduate-level directed study courses in the subject are offered to allow students to earn academic credit for independent but guided study. Graduate-level directed study courses are often offered to support students in: (a) the acquisition of needed prerequisite knowledge and skills, (b) the acquisition of knowledge and skills not usually covered by permanent courses, or (c) the conduct of research not directly related to a graduate project, thesis, or dissertation. Directed study courses have course objectives, topics, learning outcomes, and required academic activities and deliverables that are specific to each course and section offering.

**Prereqs:** Instructor permission
CYB 504 (s) Special Topics (1-4 credits)
Joint-listed with CYB 404

Special topic courses in the subject are often offered to allow students to learn topics of current interest that are not covered in permanent courses in the corresponding subject. Special topic courses cover topics and have learning outcomes and required academic activities and deliverables that are specific to each course offering. Cybersecurity (CYB) special topic courses at the undergraduate level may be chosen as electives toward a Bachelor of Science (BS) in Cybersecurity (CYB), Computer Science (CYB), or Computer Engineering (CE) degree. For students in all colleges, some special topic courses may be used to complement a student’s interdisciplinary degree plan. Cybersecurity (CYB) special topic courses at the graduate level are usually used to complement the graduate study plan for students pursuing a Master’s (MS) or Doctoral degree (PhD) in Cybersecurity (CYB) or Computer Science (CS). They may also be used to complement graduate study plans for students in the College of Engineering or graduate students in other colleges pursuing a multidisciplinary graduate degree. Significant additional work and performance required for graduate-level credit.

Prereqs: Junior standing or graduate standing or instructor permission

CYB 507 CS and Cyber Research Methods (3 credits)
Cross-listed with CS 507

This course introduces graduate students to approaches, methods, techniques, tools, and legal and ethical rules and regulations for planning, designing, performing, evaluating, and reporting computer science and cybersecurity research and results. In this course, students should gain the needed knowledge and skills to be able to: (1) Identify appropriate publication venues and adequately perform related literature searches; (2) Critically read and interpret related research questions, methods, experiments, and results; (3) Develop a scientific research question; (4) Develop a research plan with corresponding research hypothesis and hypothesis testing experiments; (5) Analyze research experiment results; (6) Present research and results to a variety of audiences in written and oral form; (7) Identify applicable laws, such as human subjects research and conflicts of interest regulations, and ethical and non-ethical behaviors in the conduct of research.

Prereqs: Graduate standing or instructor permission

CYB 520 Digital Forensics (3 credits)
Cross-listed with CS 547

Joint-listed with CS 447, CYB 420, This course covers modern procedures, techniques, and best practices for digital forensic data acquisition, analysis, and case building
Covered topics and knowledge areas include (a) Applicable laws, policies, rules, procedures and best practices, and selected digital forensics techniques and tools (DFS); (b) Processes, techniques, tools, and best practices for static digital forensic data acquisition, analysis, and reporting from different host systems (HOF) and raw media (MEF). At the end of this course, students should have the knowledge, skills, and abilities to be able to appropriately prepare, perform, and record digital forensic investigation tasks on a selected set of media and hosts, of varied types. This including knowledge, skills, and abilities to: (1) Identify and describe applicable laws, policies, procedures, and static acquisition and analysis techniques and best practices for digital forensic investigations; (2) Identify the appropriate tools for a given forensic task on a given type of media, host, or image; and (3) Select and successfully use a variety of digital forensic tools for acquiring, analyzing, and recording case information. Hands-on and/or laboratory work is an essential component in this course. Significant additional work and performance required for graduate-level credit.

Prereqs: CYB 310

CYB 536 Advanced Information Assurance Concepts (3 credits)
Cross-listed with CS 536

This course covers theory, approaches, techniques, and best practices for (a) Secure and resilient system and network architectures (IAA); (b) Cybersecurity compliance (IAC); (c) Cybersecurity standards (IAS); and (d) Security risk analysis (SRA). At the end of this course, given examples of cyber system models and scenarios, architectures, and implementations of different types and of varied complexity, students should have the knowledge, skills, and abilities to be able to: (1) Understand organizational and/or cyber-system requirements, architecture, design, and implementation; (2) Describe and analyze the system with appropriate detail; (3) Develop a threat model; (4) Identify potential vulnerabilities; (5) Identify appropriate risk analysis processes and standards; (6) Perform risk analysis and assessment; (7) Identify, evaluate, design, apply, and document security and resiliency enhancements and risk removal or mitigation approaches, tasks, and security controls. Such approaches, tasks, and controls including a combination of the following types: organizational, policy, technical, human factors, processes, protocols, techniques, and documents as appropriate.

Prereqs: Graduate standing and instructor permission

CYB 540 Advanced Networking & Security (3 credits)

Cross-listed with CS 540

This course covers the following topics and knowledge areas: (a) Advanced networking technology, algorithms, and protocols, and their cybersecurity implications (ANT) and (b) Wireless and mobile device algorithms, technologies, and protocols, and their cybersecurity implications (MOT). At the end of this course, students should have the knowledge, skills, and abilities to be able to: (1) Identify, classify, and describe, with detail, key modern networking and security algorithms, technologies, and protocols at and across several layers of the networking stack and for wired and wireless media; (2) Identify, classify, and describe advanced approaches, technologies, and protocols for secure and private digital networking within an enterprise and across federated domains, this including the IT, IoT, and mobile device realms. Several advanced and/or state-of-the-art networking and security technologies, algorithms, and protocols will be investigated in great depth and include lab-based hands-on implementations, investigations, and/or experiments.

Prereqs: Graduate standing and Instructor permission

CYB 599 (s) Non-thesis Master's Research (1-6 credits, max 30)

This course allows graduate students to earn academic credit for performing research, design, development, verification and validation, documentation, writing, and academic communication activities toward the non-thesis research or graduate project degree requirement when pursuing a Master of Science (MS) in Cybersecurity (CYB) degree with non-thesis option. A maximum of six (6) credits of CYB 599 may be used toward a Master's degree study plan. A minimum grade of B is required for all credits within a graduate study plan. Students must be registered for a minimum of one (1) credit in each and all terms in which they are performing non-thesis graduate research or project activities.

Prereqs: Graduate standing and Instructor permission