

# CYBER SYSTEMS (CYBR)

## **CYBR 800 – Exploring Computer Science Principles 3 credit hours**

This course takes a broad approach to computer science, exploring the fundamentals of programming, data, and computer networks and systems. The course places an emphasis on creative and design thinking, which is central to computer innovation. This course is intended for students majoring in business and education, as well as any other student with an interest in computer science.

## **CYBR 800P – Exploring Computer Science Principles 3 credit hours**

This course takes a broad approach to computer science, exploring the fundamentals of programming, data, and computer networks and systems. The course places an emphasis on creative and design thinking, which is central to computer innovation. This course is intended for students majoring in business and education, as well as any other student with an interest in computer science.

## **CYBR 801 – Operating Systems 3 credit hours**

Introduction to modern operating system concepts and design. Topics will include: Processes, semaphores, monitors, concurrent process management, virtual memory, file systems, scheduling algorithms, deadlocks and protection, I/O control interrupt handling, client-server model, remote procedure call and threads. Students are expected to have had a college-level Data Structures and Algorithms course prior to enrollment in this class.

## **CYBR 801P – Operating Systems 3 credit hours**

Introduction to modern operating system concepts and design. Topics will include: Processes, semaphores, monitors, concurrent process management, virtual memory, file systems, scheduling algorithms, deadlocks and protection, I/O control interrupt handling, client-server model, remote procedure call and threads. Students are expected to have had a college-level Data Structures and Algorithms course prior to enrollment in this class.

## **CYBR 802 – Management Information Systems Seminar 3 credit hours**

The course provides the application of principles of management of information systems (MIS) in various organizational functions. This course will familiarize students with the techniques for evaluating the critical roles of information and information systems in support of organizational operations, decision-making processes, quality management, and strategic activities. It also covers management of information systems functions and professionals, as well as relevant global, ethical, societal and legal/regulatory issues. Focus is placed on the impact of rapidly changing technologies, such as the Internet, on organizations leading to new paradigms, like e-commerce and business-to-business applications, and the subsequent reengineering of organizations.

## **CYBR 803 – Independent Study 3 credit hours**

The focus of this course is an independent investigation into a topic related to Cyber Systems selected by the student. Students work individually with an appropriate faculty mentor in selecting and developing a project or research study of particular interest and significance to them in the field of Cyber Systems. Permission of the Master-level program director is required for the independent study to count toward the Master-level program course requirements. A written contract specifying the topic and requirements must be submitted and approved by the department before registering for the course.

Department Consent Required

Total Credits Allowed: 6.00

## **CYBR 805P – Interactive Web Application Development 3 credit hours**

This course covers the wide range of state-of-the-art computer technologies for interactive web application development. Students will learn how to write both static web pages and dynamic web pages. This is a programming-intensive course.

Prerequisite: CYBR 834 or CYBR 834P

## **CYBR 806P – Enterprise Web Application Development 3 credit hours**

This course is designed to assist students in learning the skills necessary to design and build enterprise-level web applications. Skills and knowledge gained in this course can be applied in the development of interactive web sites, electronic commerce systems, cloud-based applications and other service-based architectures. Security of internet based information systems will also be covered. This is a programming intensive course. Students are expected to have had two college-level programming courses with depth in a single language prior to enrollment in this class.

## **CYBR 807P – Intro to Automata, Formal Languages, & Computability 3 credit hours**

A survey of the fundamental concepts and conclusions in the theory of computation. Topics cover regular languages and finite automata, context-free languages and pushdown automata, formal grammars, Chomsky hierarchy, Turing machine and computability, computational complexity. Students are expected to have had college-level calculus or a college-level discrete math course prior to enrollment in this class.

## **CYBR 810 – Big Data I 3 credit hours**

This course provides an understanding of data analytics advanced techniques to extract intelligence about organizational activities from big data sources. Managing, governing, extracting, merging, and preparing large data sets for analysis using real data are covered extensively. Students are expected to have had a college-level course in predictive modeling prior to enrollment in this class.

## **CYBR 810P – Big Data I 3 credit hours**

This course provides an understanding of data analytics advanced techniques to extract intelligence about organizational activities from big data sources. Managing, governing, extracting, merging, and preparing large data sets for analysis using real data are covered extensively. Students are expected to have had a college-level course in predictive modeling prior to enrollment in this class.

## **CYBR 811 – Big Data II 3 credit hours**

This course provides a set of practical and powerful tools to enhance the understanding of big data. Exposure to computerized tools facilitating the loading and cleansing of data for analysis provides an experiential learning approach to understanding big data concepts.

Prerequisite: CYBR 810

## **CYBR 811P – Big Data II 3 credit hours**

This course provides a set of practical and powerful tools to enhance the understanding of big data. Exposure to computerized tools facilitating the loading and cleansing of data for analysis provides an experiential learning approach to understanding big data concepts.

Prerequisite: CYBR 810

**CYBR 818P – E-Commerce Information Systems 3 credit hours**

This course will present, develop, explore, and illustrate the nature and use of E-commerce Information System development methodologies in an inter-organizational setting, and discuss responsibilities at all life cycle stages. It is a comprehensive study of electronic commerce, with in-depth coverage of e-commerce technologies and e-commerce business models including business-to-consumer models, business-to-business models, consumer-to-consumer models, peer-to-peer models, and mobile commerce. It introduces global e-commerce, security and encryption issues, and ethical, social and political issues related to e-commerce. E-commerce interface designs for electronic storefronts, malls, catalogs, shopping carts, search engines, auctions, e-payment systems, e-learning, and e-government will be covered. Consumer interactions with payment processing mechanisms and relationships to information technology development and support will be studied.

Prerequisite: CYBR 802 or CYBR 810 or CYBR 834P or TE 870 or TE 877

**CYBR 821P – Business Process Redesign and ERP Systems 3 credit hours**

This course provides an understanding of business processes and usage of various methods and computerized tools to redesign these processes. The redesigned processes will assist organizations in providing cost-effective quality products and services to consumers. Further, this course provides an overview of the Enterprise Resource Planning (ERP) Systems which are widely used by corporations for automation of their processes.

**CYBR 825 – Applied Database Management Systems 3 credit hours**

This is an interdisciplinary course designed for non-technical majors. This course is a comprehensive study of database concepts. The relational database along with proper database design will be emphasized. However, all types of databases will be studied. Additional concepts covered will be the normalization process and forms; structured query language (SQL); and various database management systems.

**CYBR 825P – Applied Database Management Systems 3 credit hours**

This is an interdisciplinary course designed for non-technical majors. This course is a comprehensive study of database concepts. The relational database along with proper database design will be emphasized. However, all types of databases will be studied. Additional concepts covered will be the normalization process and forms; structured query language (SQL); and various database management systems.

**CYBR 830 – Protecting & Defending Networks & Systems 3 credit hours**

This course will cover all the concepts necessary for defense-in-depth of an enterprise network and system (blue team). A case study will be incorporated to achieve a strong understanding of the design, implementation and overall security of a large network. Hands-on labs will be conducted using a variety of networking and systems equipment. Students with a strong command of the concepts presented will be prepared to sit for specific industry certification exams. This course presents a comprehensive study of needs and characteristics of a global internetwork and the issues encountered on such a network. Topics studied will include security, servers, user identity, and wireless. Hands-on labs will be conducted using a variety of network equipment. Students are expected to have had a college-level course in Advanced Networks & Systems prior to enrollment in this class. Students are also expected to either complete CYBR 858 or have had a college-level course in Computer Security prior to enrollment in this class.

**CYBR 830P – Protecting & Defending Networks & Systems 3 credit hours**

This course will cover all the concepts necessary for defense-in-depth of an enterprise network and system (blue team). A case study will be incorporated to achieve a strong understanding of the design, implementation and overall security of a large network. Hands-on labs will be conducted using a variety of networking and systems equipment. Students with a strong command of the concepts presented will be prepared to sit for specific industry certification exams. This course presents a comprehensive study of needs and characteristics of a global internetwork and the issues encountered on such a network. Topics studied will include security, servers, user identity, and wireless. Hands-on labs will be conducted using a variety of network equipment. Students are expected to have had a college-level course in Advanced Networks & Systems prior to enrollment in this class. Students are also expected to either complete CYBR 858 or have had a college-level course in Computer Security prior to enrollment in this class.

**CYBR 834 – Information Technology Teaching Methods 3 credit hours**

This course will include information technology curriculum development and instruction, with a focus on applying programming concepts to education. Intended only for students in a Master of Science in Education program.

Prerequisite: TE 810 or TE 870 or TE 886P

**CYBR 834P – Information Technology Teaching Methods 3 credit hours**

This course will include information technology curriculum development and instruction, with a focus on applying programming concepts to education. Intended only for students in a Master of Science in Education program.

Prerequisite: TE 810 or TE 870 or TE 886P

**CYBR 835 – Thinking like an Adversary: Systems Side Security 3 credit hours**

This course will cover all the concepts necessary to play offense against different types of enterprise networks and systems (red team). Different scenarios will be "played out" utilizing a series of hands-on labs with the idea that students will learn the concept of "thinking like an adversary". In this manner, the students will learn how to better defend networks by understanding the offensive playbook. Students are expected to have had a college-level course in Advanced Networks & Systems prior to enrollment in this class. Students are also expected to either complete CYBR 858 or have had a college-level course in Computer Security prior to enrollment in this class.

**CYBR 835P – Thinking like an Adversary: Systems Side Security 3 credit hours**

This course will cover all the concepts necessary to play offense against different types of enterprise networks and systems (red team). Different scenarios will be "played out" utilizing a series of hands-on labs with the idea that students will learn the concept of "thinking like an adversary". In this manner, the students will learn how to better defend networks by understanding the offensive playbook. Students are expected to have had a college-level course in Advanced Networks and Systems prior to enrollment in this class. Students are also expected to either complete CYBR 858 or have had a college-level course in Computer Security prior to enrollment in this class.

**CYBR 840P – Systems Audit 3 credit hours**

This course provides an understanding of many types of audit needs, such as organizational IT audits (management control over IT), technical IT audits (infrastructure, data centers, data communication), application IT audit (business, financial, operational), development/implementation IT audits (specification/requirements, design, development, and post development phases), and compliance IT audits involving national and international standards.

**CYBR 841P – Artificial Intelligence 3 credit hours**

An in-depth study of intelligent agents, tree and search methods, constraint satisfaction problems, optimization problems, game-playing, logical analysis, and uncertainty modeling. Machine learning techniques are introduced. Applications to robotics, psychology, business intelligence and data mining are also discussed. Students are expected to have had two college-level programming courses with depth in a single language prior to enrollment in this class.

Additional Course Fee Required

**CYBR 844 – Software Reverse Engineering 3 credit hours**

This course provides students with the opportunity to standard techniques used to Reverse Engineer software systems. These techniques will allow students to understand the process involved in program compilation, such that they can deduce the functionality of a program and recreate a programs source code without the original source. Students are expected to have had a college-level Data Structures and Algorithms course prior to enrollment in this class.

**CYBR 848 – System Administration 3 credit hours**

This course provides an overview of how to manage a server and its users. Topics include but not limited to installing server operating system, creating user and group accounts, setting up policies, adding and configuring devices and drivers, managing data storage, setting up security evaluating performance, trouble shooting, and virtualization. Prior to enrollment in this class, students are expected to have had of one the following: one college-level programming course, a college-level networking course, or an IT Teaching Methods course, such as CYBR 834P.

**CYBR 848P – System Administration 3 credit hours**

This course provides an overview of how to manage a server and its users. Topics include but not limited to installing server operating system, creating user and group accounts, setting up policies, adding and configuring devices and drivers, managing data storage, setting up security evaluating performance, trouble shooting, and virtualization. Prior to enrollment in this class, students are expected to have had one of the following: one college-level programming course, a college-level networking course, or an IT Teaching Methods course, such as CYBR 834P.

**CYBR 850P – Software Quality Assurance 3 credit hours**

This course will provide students with the knowledge and skills to define and implement software quality management. We will explore ways to develop a quantifiably effective software quality management function and measure the success of QA plans, teams and tools. The course will explore the latest industry standards, tools and approaches, and will explore the challenges of managing the QA function for modern software application environments. Students are expected to have had a college-level course in Systems Analysis & Design prior to enrollment in this class.

**CYBR 858 – Computer Security 3 credit hours**

This course provides an overview of security issues associated with the development and deployment of information systems. Topics include authentication, encryption, firewalls, security standards and protocols, attack prevention, detection, and recovery. Prior to enrollment in this class, students are expected to have had one of the following: two college-level programming courses with depth in a single language, a college-level networking course, or a course in System Administration, such as CYBR 848P.

**CYBR 858P – Computer Security 3 credit hours**

This course provides an overview of security issues associated with the development and deployment of information systems. Topics include authentication, encryption, firewalls, security standards and protocols, attack prevention, detection, and recovery. Prior to enrollment in this class, students are expected to have had one of the following: two college-level programming courses with depth in a single language, a college-level networking course, or a course in System Administration, such as CYBR 848P.

Prerequisite: CYBR 101 or CYBR 102 or CYBR 103 or CYBR 235 or CYBR 448 or instructor permission

**CYBR 860 – Virtualization Essentials 3 credit hours**

Examining the new world of virtualization, this technical essentials course looks at concepts such as cloud computing, virtualized hardware, networks, storage and data center concepts. Although the focus will be virtualization at the data center, these fundamentals are easily transferrable and highly needed in small to large enterprise. Topics such as hypervisors, software-defined networking and cloud architectures are discussed in-depth.

**CYBR 860P – Virtualization Essentials 3 credit hours**

Examining the new world of virtualization, this technical essentials course looks at concepts such as cloud computing, virtualized hardware, networks, storage and data center concepts. Although the focus will be virtualization at the data center, these fundamentals are easily transferrable and highly needed in small to large enterprise. Topics such as hypervisors, software-defined networking and cloud architectures are discussed in-depth.

**CYBR 868 – Advanced Security: Playing Both Sides 3 credit hours**

This course provides an introduction to advanced security topics associated with the development and deployment of information systems. Topics include WiFi and cellular networks, fuzzing, software vulnerabilities, secure development practices.

Prerequisite: CYBR 835P

**CYBR 868P – Advanced Security: Playing Both Sides 3 credit hours**

This course provides an introduction to advanced security topics associated with the development and deployment of information systems. Topics include WiFi and cellular networks, fuzzing, software vulnerabilities, secure development practices.

Prerequisite: CYBR 835P

**CYBR 875 – Graduate Internship in Cyber Systems 1-6 credit hours**

An internship is a professional or technical position in a professional environment that provides a student with sufficient practical work experience for a limited period of time, allows for career decision-making, and provides the employer valuable skills to accelerate business objectives. Internships are mutually beneficial for all involved. The student gains the opportunity to apply classroom learning to a workplace environment; the employer has the chance to work with students eager to learn and apply skills; and the university benefits from connections with business and industry, which provide potential for program development and enhancement. The learning experience is organized and supervised by the academic department, the CBT Career Center, and personnel of selected industries. All internships must be approved by the CBT Career Center. Offered in Fall, Spring, and Summer semesters. The course will be evaluated on a credit/no credit basis. One to six credits, depending on the length of the internship. May be repeated twice, for a total of 6 credits. Prior to enrollment, a student should have an overall graduate GPA 3.00; completed nine hours of 800-level core courses; completed the Intent to Intern Form, Internship Position Approval Form, and any required orientation sessions; and received department consent.

Department Consent Required

Total Credits Allowed: 6.00

**CYBR 878P – Cybersecurity for Managers & Leaders 3 credit hours**

This course has been implemented for organizational leaders and managers, who are seeking knowledge that will help develop, or improve upon, a cybersecurity framework or program for their own organization (or future organization). Cybersecurity is an enterprise-level management challenge that has far-reaching impacts on all organizational levels. This course will cover cybersecurity frameworks and vocabulary to help build the cyber leadership and management skills needed to better prepare organizations for current and future cyber threats.

**CYBR 879P – Cyber Risk and Threat Modeling 3 credit hours**

This course covers the scientific concepts cyber risk and threat modeling. In contrast to popular cybersecurity management courses covering best practices, this course equips the students with the scientific mindset and tools needed to understand dynamic networks and security that exceeds the limitations of static networks. This course opens a window into the future of strategic cybersecurity.

Prerequisite: CYBR 878P or CYBR 885P

**CYBR 885P – Information Systems Strategy and Management 3 credit hours**

To provide a set of practical and powerful tools to ensure the understanding of strategic, tactical, and operational responsibilities of the chief information officer (CIO). The strategic responsibilities include the strategic alignment among information technology and business functions of the organizations.

**CYBR 890 – Information Networking Law and Public Policy 3 credit hours**

This course provides a current and historical review of statutes, regulations, and municipal ordinances in telecommunications and information network security. Fundamental cybersecurity requirements are examined for several industry sectors. Topics also include network breach notification requirements, the NIST Risk Management Framework and NIST Cybersecurity Framework.

**CYBR 890P – Information Networking Law and Public Policy 3 credit hours**

This course provides a current and historical review of statutes, regulations, and municipal ordinances in telecommunications and information network security. Fundamental cybersecurity requirements are examined for several industry sectors. Topics also include network breach notification requirements, the NIST Risk Management Framework and NIST Cybersecurity Framework.

**CYBR 893P – Social Dynamics of Cybercrime 3 credit hours**

This course takes a multidisciplinary perspective for understanding how social dynamics of individuals, groups or organizations. We will introduce students with social dynamics modeling approaches drawn from social networks analysis combined with text mining or natural language processing to develop statistical model representative of cybercrime behavior. Using social networks, dynamic modeling of networks and organizational risk analyzer toolkit, this course will offer students a broader theoretical and methodological understanding of how these network-based modelling toolkits can be used for predicting cybercrime. We will first introduce a set of theories and methodological approaches drawn from social networks theories and analysis and use social networks modelling toolkit to demonstrate its usability in understanding and predicting cybercrime behavior. This course will conclude with connecting social dynamics and modelling approaches to understanding technology-driven crime and corporate challenges related to cyber threats, ransomware attacks and preventative measures for safeguarding corporate information.

**CYBR 894 – Graduate Thesis 3-6 credit hours**

Independent original research in Cyber Systems under the direction of a Cyber Systems faculty member. A written contract specifying topic and requirements is required before registering for the course.

Department Consent Required

Total Credits Allowed: 6.00

**CYBR 895 – Cyber Systems Graduate Capstone 3 credit hours**

This course provides experience and background that will prepare the student for an actual working environment. Reinforcement and validation of knowledge gained in previous course work, enhancement of communication skills, and learning to work with people will be emphasized. Primary tasks will include a team-based project using technologies appropriate to the student's program of study, the study of ethics for cyber systems professionals, and project design and development and project oversight using appropriate project management tools. This course also provides opportunity for writing in the cyber systems disciplines. Prior to enrollment in this class, students are expected to have had one of the following: a college-level Data Structures and Algorithms course, an undergraduate course in Systems Analysis and Design or CYBR 890 Info Networking Law and Public Policy.

Total Credits Allowed: 6.00

**CYBR 895P – Cyber Systems Graduate Capstone 3 credit hours**

This course provides experience and background that will prepare the student for an actual working environment. Reinforcement and validation of knowledge gained in previous course work, enhancement of communication skills, and learning to work with people will be emphasized. Primary tasks will include a team-based project using technologies appropriate to the student's program of study, the study of ethics for cyber systems professionals, and project design and development and project oversight using appropriate project management tools. This course also provides opportunity for writing in the cyber systems disciplines. Prior to enrollment in this class, students are expected to have had one of the following: a college-level Data Structures and Algorithms course, an undergraduate course in Systems Analysis and Design or CYBR 890 Info Networking Law and Public Policy.  
Total Credits Allowed: 6.00

**CYBR 898 – Special Topics in Cyber Systems 3 credit hours**

Course is designed to enable students to become knowledgeable of recent trends and issues in cyber systems. The course format varies depending on subject matter, instructor and student needs.  
Total Credits Allowed: 6.00

**CYBR 898P – Special Topics in Cyber Systems 3 credit hours**

A course designed to enable students to become knowledgeable of recent trends and issues in cyber systems. The course format varies depending on subject matter, instructor and student needs.  
Total Credits Allowed: 6.00

**CYBR 899 – Special Problems in Cyber Systems 3 credit hours**

Independent investigations of organizational problems. Topics to be investigated may be tailored to meet the needs of the student. The course consists of class discussion and/or special projects in the student's program of study. The study topic will be selected in consultation with the supervising Cyber System's faculty member. Permission of the Master-level program director is required for the independent study to count toward the Master-level program course requirements. A written contract specifying the topic and requirements must be submitted and approved by the department before registering for the course.  
Department Consent Required  
Total Credits Allowed: 6.00