Course Description of the Bachelor of Science in Cybersecurity Program

Program Compulsory Courses

Course Code: SYS100	**Course title:** Computer programming	**Credits:** 3
Introduction to computing, data types and variables, expressions, selection and repetition control structures, library and user-defined functions, files and streams, arrays, library and user-defined classes, and Artificial Intelligence applications.		

Course Code: SYS240	**Course title:** Introduction to Cyber Security Engineering	**Credits:** 3
This course provides a comprehensive introduction to the principles, applications, and practices of cybersecurity engineering, with a strong emphasis on ethical considerations in the design and implementation of secure systems. Students will learn fundamental cybersecurity concepts, terminology, and methodologies, focusing on the ethical implications of cybersecurity decisions. The course covers how cybersecurity is integrated post-design and implementation, introducing systems engineering and design processes. Students will also explore how to ethically apply cybersecurity tools and techniques to safeguard systems and data while considering the broader impact on society and individuals.		

Course Code: SYS310	**Course title:** Object-Oriented Programming	**Credits:** 3
This course introduces Object Oriented Programming concepts, Classes, objects and data abstraction, Constructors and destructors; Object-oriented design, encapsulation and information hiding, abstraction and modularization, coupling and cohesion, sample design patterns; inheritance, class and type hierarchies, polymorphism, Abstract classes, Interfaces, Packages, Collection classes, Generics, streams and files, exception handling; unit testing and debugging, Application Programming Interfaces.		

Course Code: SYS320	**Course title:** Object-Oriented Programming Lab	**Credits:** 1
Lab session every week to enhance hands-on experience on topics that are theoretically covered in Object-Oriented Programming course, which are: Object Oriented Programming concepts, classes, objects and data abstraction, Constructors and destructors; Object-oriented design; encapsulation and information hiding, abstraction and modularization, coupling and cohesion, sample design patterns, inheritance class and type hierarchies, polymorphism, Abstract classes, Interfaces,		

Packages, Collection classes, Generics, streams and files, exception handling, unit testing and debugging, Application Programming Interfaces.

Co**urse Code:** SYS330	**Course title:** Operating Systems	**Credits:** 3
This course has two components: a theory component to teach the students the concepts and principles that underlie modern operating systems (OSs), and a practice component to relate theoretical principles with operating system implementation. This course addresses basic issues such as virtual memory, kernel and user mode, system calls, threads, context switches, interrupts, inter-process communication, coordination of concurrent activities. It may also address concurrency, processes and multi-threading, context switching, synchronization, scheduling, and deadlock. Memory management, dynamic memory allocation, address translation. Management of file systems, storage devices, directories, protection, scheduling, and crash recovery.		

Co**urse Code:** SYS340	**Course title:** Data Structures	**Credits:** 3
This course provides a comprehensive introduction to fundamental data structures and their applications in efficient algorithm design. Key topics include arrays, linked lists, queues, stacks, hash tables, graphs, and trees, with a focus on binary search trees and heap trees. The course also explores advanced concepts such as recursion, graph algorithms, and techniques for data storage, searching, sorting, and analysis to optimize computational efficiency.		

Co**urse Code:** ECE210	**Course title:** Digital Systems	**Credits:** 3
This is a foundation course in digital design. Topics such as number systems, basic logic gates, TTL device parameters, logic circuit simplification techniques, timing analysis, the application combinational logic devices, gates. Sequential circuit design, such as multiplexers, demultiplexers, decoders, adders, multipliers, flip-flops, hierarchical design are covered		

Co**urse Code:** ECE325	**Course title:** Digital Systems Lab	**Credits:** 1
The Digital Systems Lab is an introductory lab; it will cover experimental sessions that will complement ECE210 course theory. It provides students with hands-on experience in the fundamental concepts of digital systems, number representations, logic design, and practical applications using Arduino-based projects. Students will begin by exploring number system conversions and arithmetic operations using programs. They will have hands-on experimentation with primitive logic gates, then design and simulate combinational logic circuits in Logisim, including adders, subtractors, multiplexers, and decoders. The course focuses also on digital systems implementation through Arduino experiments, covering digital I/O, logic gate implementation, and interfacing with sensors and actuators such as ultrasonic sensors, LEDs, seven-segment displays, LCD displays, servo motors, and PIR motion sensors. This lab equips students with computational problem-solving skills, hardware simulation experience, and embedded systems prototyping.		

Course Code: SYS345	Course title: Fundamentals of Data & Network Communication for Cybersecurity	Credits: 3
This course offers a robust foundation in data and network communication within the realm of cybersecurity. The course initiates with an exploration of digital communication concepts, focusing on various signal types, transmission methods, and encoding techniques. Subsequently, it provides a detailed examination of the OSI model, analyzing the function of each layer and its critical role in ensuring secure data flow across networks. Additionally, the course discusses network devices and technologies such as routers and switches, emphasizing their importance in creating efficient and secure network topologies. Students will also learn about IP addressing, subnetting, and basic network configurations, essential for grasping network operations and troubleshooting. As the course progresses, it introduces fundamental network security concepts, associating these with potential vulnerabilities in network architectures. The course incorporates practical examples and scenarios to solidify the theoretical content, equipping students to tackle more advanced topics in network security.		

Course Code: SYS350	Course title: Introduction to Network Security	Credits: 3
This course provides a comprehensive introduction to network security principles, emphasizing the protection of data and communications across modern networked systems. It covers foundational concepts such as symmetric and asymmetric cryptography, cryptographic hash functions, and message authentication. Students will explore network security protocols, including SSL/TLS, IPsec, and VPNs, as well as mechanisms for intrusion detection, firewalls, and defense against denial-of-service attacks. Emphasis is placed on the analysis and evaluation of security technologies and their application to real-world network environments. The course incorporates practical, hands-on demonstrations, case-based exercises, and simulation tools to strengthen conceptual understanding and application skills in network security design and defense strategies.		

Course Code: SYS370	Course title: Database Management Systems	Credits: 3
This course provides an introduction to the concepts, design, and implementation of database systems. Topics include data modeling, entity-relationship (ER) diagrams, relational models, normalization, and relational algebra. Students will learn how to define, query, and manipulate data using Structured Query Language (SQL) and gain an understanding of how database systems support organizational information management. Although the course does not include a formal lab component, it incorporates in-class SQL demonstrations, guided exercises, and small group projects to reinforce practical skills in database design and querying.		

Course Code: SYS410	Course title: Cryptography Fundamentals	Credits: 3
This course provides an introduction to the fundamental concepts and mathematical foundations of cryptography. It examines security threats and vulnerabilities related to cryptographic algorithms and explores key cryptographic techniques, including symmetric and asymmetric encryption. Emphasis is placed on public-key cryptography as the basis for digital signatures, certificate generation, and verification. The course also introduces cryptographic hash functions and their applications in ensuring data integrity and authentication. Students will gain both theoretical understanding and practical insights into how cryptographic systems secure information in modern computing environments.		

Course Code: SYS425	Course title: Secure Software Engineering	Credits: 3
This course offers a thorough foundation in secure software development, focusing on embedding security principles across all stages of the software development lifecycle. Topics include securing requirements analysis, designing robust systems, performing risk assessments, conducting threat modeling, implementing cryptographic algorithms, employing defensive programming techniques, executing penetration testing, fuzzing, conducting static code analysis, and performing comprehensive security evaluations. By the end of the course, students will have developed the practical expertise necessary to create, test, and maintain secure software solutions.		

Course Code: SYS428	Course title: Information Security Policy and Governance	Credits: 3
This course provides an in-depth understanding of information security policies, governance frameworks, and standards, with particular emphasis on ISO/IEC 27001:2022 and related international best practices. Students will examine the policy development lifecycle, from planning and formulation to implementation, enforcement, and continuous improvement, while aligning security policies with organizational strategy and business objectives. The course also explores the legal, ethical, and sociological dimensions of security governance, addressing key regulations such as GDPR, HIPAA, and the Sarbanes–Oxley Act. Through case studies and a policy development project, students will gain practical experience in designing, evaluating, and maintaining effective security policies that ensure compliance, accountability, and resilience across different organizational contexts.		

Course Code: SYS430	Course title: System Security and Resilience	Credits: 3
This course focuses on modeling and evaluation of the engineering systems that are expected to operate in a contested cyber environment. It covers architectures and modeling, usage of a variety of techniques, establishing measures of performance that are relevant to the domain of operation, evaluating the security or vulnerability of the system to cyber exploits, and then assessing its resilience.		

Co**urse Code:** SYS440	**Course title:** Ethical Hacking laboratory	**Credits:** 1
This course provides hands-on experience in addressing network security issues, focusing on critical topics such as ethical hacking, incident handling, and response strategies. Students will explore the processes of penetration testing, vulnerability assessment, and security breach mitigation, applying techniques to identify and exploit system weaknesses. Key areas of study include footprinting, reconnaissance, system and wireless hacking, and network exploitation. The course emphasizes real-world applications, where students will engage in ethical hacking practices, investigate security vulnerabilities, and develop effective strategies for response to incidents. Additionally, students will learn how to secure networks, analyze traffic, and handle security incidents using industry-standard methodologies and tools. Through practical exercises, they will gain essential skills in securing and defending network systems, preparing them for real-life cybersecurity challenges. Courses supported by this curriculum include Cybersecurity, Network Security, and related subjects, providing students with a comprehensive foundation in the field of network security.		

Co**urse Code:** SYS450	**Course title:** Penetration Testing laboratory	**Credits:**1
This laboratory course provides hands-on experience in penetration testing, vulnerability assessment, and incident response. Students will learn to apply ethical hacking methodologies to identify, exploit, and mitigate security vulnerabilities across networks, systems, and web applications. The lab emphasizes practical skills in reconnaissance, scanning, exploitation, privilege escalation, and post-exploitation techniques, using industry-standard tools and frameworks such as Metasploit, Nmap, Wireshark, and Burp Suite.		

Co**urse Code:** SYS460	**Course title**: Computer Forensics laboratory	**Credits:** 1
This laboratory course provides hands-on experience in tackling security challenges related to computer forensics and incident handling and response. Students will engage in practical exercises focused on identifying, analyzing, and mitigating cyber threats, recovering digital evidence, and responding to security breaches. The course covers key forensic methodologies such as data acquisition, chain of custody, and evidence analysis, enabling students to address real-world security incidents. The course is directly linked to key topics from theoretical courses in the program. For example, students will apply concepts from network protocols and traffic analysis (covered in Network Security) to investigate network-based security incidents. The course also integrates principles from cryptography and encryption (discussed in Cybersecurity courses) to ensure data integrity and confidentiality during forensic investigations. Furthermore, students will explore concepts from incident response and vulnerability assessment, building on their knowledge of threat detection and response strategies learned in previous theoretical courses.		

Co**urse Code:** SYS470	**Course title**: Industrial Control Systems Security	**Credits:** 3
This course provides an introduction to industrial control systems (ICS). It covers fundamental concepts of control loops and their main components. Human-Machine Interface (HMI) and displays. Remote measurements through networks or through telemetry. Diagnostic and maintenance utilities. Input-Output servers. Data historian utility. ICS Security. Connectivity of the control system network to other networks. Possible security threats. Vulnerability assessments. Multilayer defense strategies.		

Co**urse Code:** SYS472	**Course title:** Information Privacy and Security	**Credits:** 3
This course covers fundamental issues surrounding information security and privacy. Course topics include confidentiality, integrity, availability; authentication models, protection models, security kernels, secure programming, audit, intrusion detection and response, operational security issues, physical security issues, personnel security, policy formation and enforcement, access controls, information flow; legal and social issues, identification and authentication in local and distributed systems, classification and trust modeling, risk assessment, data aggregation, behavioral advertising, privacy-preserving data mining, privacy-preserving data publishing, website privacy policies and practices, anonymous communication, Artificial Intelligence in intrusion detection.		

Course Code: SYS474	**Course title:** Reverse Software Engineering	Credits: 3
This course explores reverse engineering principles, tools, and methodologies used to analyze and understand software systems. Students will study how to identify vulnerabilities and detect hidden or malicious functionality using tools such as virtual machines, sandboxes, process monitors, packet sniffers, and de-obfuscation methods. The course also covers the concept of hardware Trojans and other forms of malicious hardware. Students will learn about prevention techniques at the design, fabrication, and post-fabrication levels, and explore various countermeasures against both software and hardware-based threats.		

Co**urse Code:** SYS476	**Course title:** Cyber Physical Systems	**Credits:** 3
This elective course introduces cyber-physical systems as an integration of physical, computational, and networking processes. It discusses how embedded computers and networks monitor and control the physical processes with feedback loops and how physical processes affect computations and vice versa. It also discusses modeling and simulation of cyber-physical systems, system design, and implementation. This course analyzes such systems based on abstractions for modeling physical systems and abstractions for modeling data transformations. It also covers security issues in cyber-physical systems and applications selected from communication, consumer, energy, infrastructure, health care, manufacturing, military, physical security, robotics, smart buildings, and transportation domains.		

Co**urse Code:** SYS478	**Course title:** Special topics in Cybersecurity	**Credits:** 3
This elective course represents an in-depth approach to specific areas in information security which are of interest to undergraduate students in the program. This course covers topics in computer, network, and systems security and privacy which are not covered as part of required courses. Examples of these areas include cryptographic tools, user authentication, database and cloud Security, malicious software, denial of service attacks, intrusion detection, firewalls and intrusion prevention systems, IT security management and risk assessment, human resources security, legal and ethical aspects, enterprise roles, security metrics, risk management, standards and regulations, physical security, and cybercrime issues and investigation.		

Co**urse Code:** SYS480	**Course title:** Methods of User Authentication	**Credits:** 3
This elective course discusses limitations of passwords & PINs and introduces alternatives. It covers user authentication based on security tokens and smart cards. It introduces basics of biometric systems, based on information such as fingerprints, facial features, iris, and voice. It discusses the use and security of electronic ID cards and passports. And it covers methods of distinguishing human from internet bots over the network, such as CAPTCHA's.		

Co**urse Code:** SYS482	**Course title:** Intrusion Detection	**Credits:** 3
This elective course provides a thorough examination of intrusion detection, anomaly detection, signature-based detection, and real-time monitoring, focusing on the methodologies, techniques, and tools used to monitor and analyze events within computer systems and networks. It covers approaches for identifying, preventing, and responding to unauthorized activities and malicious behavior, with an emphasis on ensuring the security and integrity of digital environments. Students will learn how to detect unwanted processes, safeguard systems from cyber threats, and recover from security breaches.		

Co**urse Code: SYS485**	**Course title:** Internship I	**Credits:** 2
Students spend 8 weeks on a full-time basis in a cybersecurity or consulting office in the UAE or abroad to earn practical skills. This course aims at offering career exploration opportunities for students as well as opportunities to correlate their academic preparation to the reality of conducting professional practice, to interact effectively with others in practice, to develop professional skills and communicate effectively in the workplace, and to gain true practical experience that is necessary for their future practice as Cybersecurity Specialists in their respective discipline after graduation.		

Co**urse Code :**SYS 486	**Course title:** Internship II	**Credits:** 2
Students spend 8 weeks on a full-time basis in a cybersecurity or consulting office in the UAE or abroad to earn practical skills. This course aims at offering career exploration opportunities for students as well as opportunities to correlate their academic preparation to the reality of conducting professional practice, to interact effectively with others in practice, to develop professional skills and communicate		

effectively in the workplace, and to gain true practical experience that is necessary for their future practice as Cybersecurity Specialists in their respective discipline after graduation.

Co**urse Code:** SYS490	**Course title:** Senior Graduation Project	**Credits:** 3
This course guides senior undergraduate students, working in small teams, through the complete lifecycle of a substantial cybersecurity-related project. Students will identify a research or practical problem, conduct a literature review, perform feasibility and risk analyses, and develop a detailed project plan. The course emphasizes hands-on implementation, experimentation, testing, and evaluation of results. Deliverables include technical reports, oral presentations, and project demonstrations. The course emphasizes hands-on experience, teamwork, critical thinking, and applying theoretical knowledge to practical problems. This course prepares students for professional challenges through independent research and problem-solving.		

Degree requirements (Cybersecurity)

Co**urse Code:** MAT 150	**Course title:** Numerical Analysis	**Credits:** 3
An introduction to computational problem-solving, this course covers key numerical algorithms for interpolation, integration, and solving equations (linear and non-linear). Emphasis is placed on algorithmic design, computational efficiency, and error analysis, with potential extensions into differential equations and eigenvalue calculations.		

Co**urse Code: MAT110**	**Course title:** Calculus I	**Credits:** 3
Elementary functions, limits, continuity, limits involving infinity, tangent lines, derivative of elementary functions, differentiation rules, chain rule, implicit differentiation, linear approximation, l'Hospital rule. Graph sketching (extrema, intervals of monotonicity, concavity), optimization. Anti-derivatives, definite integrals, Fundamental Theorem of Calculus, integration by substitution, area between curves, improper integrals.		

Co**urse Code: MAT120**	**Course title:** Calculus II	**Credits:** 3
Volume of solids (by slicing, by shells); integration techniques (by parts, by use of trigonometry, by partial fractions); parametric curves, velocity vector, enclosed area, and arc length; curves in polar coordinates, enclosed area, and conic sections; sequences, series, convergence tests, alternating series, absolute convergence, power series, Taylor and Mclaurin series.		

Co**urse Code: MAT130**	**Course title:** Linear Algebra	**Credits:** 3
Solving systems of linear equations, matrices and determinants; Vector spaces, inner product spaces; Eigenvalues, eigenvectors, diagonalization; Least Squares fitting; Some engineering applications.		

Course Code: **MAT 140**	**Course title:** Probability and Statistics	**Credits:** 3
The course begins with a foundation in descriptive statistics, covering data types, graphical summaries, and numerical measures of central tendency and variability. We will then delve into probability theory, learning the rules that govern uncertainty, including key probability distributions, both discrete and continuous. The course culminates in statistical inference, where students will learn to construct confidence intervals and conduct hypothesis tests to make data-driven decisions and predictions about real-world phenomena.		

GED course's description
GED compulsory courses

ENG 103	**ENGLISH I**	Credits: 3
This course develops the student's writing skills through understanding the different genre structures of the written texts. Students' are taught the different types of sentences, how to connect them to build up a well-organized paragraph, moving to writing an essay. Students will be expected to compose, revise, and edit their written assignments, produce essays in accordance with their purpose and tone.		
ENG 104	English II	Credits: 3
This course reinforces the knowledge and skills learned in ENG103. It introduces students to the techniques, principles, and concepts of argument, persuasive and textual analysis through composition of increasingly complex analytical essays and reports. The students learn different types of articles. Students study thoroughly the different types of essays and trained to master writing each one of them. This course also provides students with the requirements and skills needed to write official letters after a detailed study of their elements. The focus is on developing the students' skills and competency in critical analysis and interpretation of texts.		
CIT 100	Computer Concepts and Applications	3
This course provides a foundational introduction to the essential aspects of computing and its applications. It emphasizes the examination of computer hardware components and the utilization of software for word processing, spreadsheet management, presentation creation, and database design. Commencing with defining computers, their significance, and key components for input, processing, output, and storage, the course explores various network types and their applications. The curriculum addresses challenges related to computing, including data confidentiality, security, and privacy.		
GED 101	Islamic Culture	Credits: 3

This course studies the concept of Islamic culture, its importance, characteristics, sources, and components. It covers the most important values that Islamic teachings focus on, such as knowledge, mercy, peace, citizenship, and tolerance. The course also discusses the most important challenges facing society, such as the ones related to the family, the phenomenon of extremism, and violence that causes destabilization of intellectual security, and its impact on human life.

GED 112	Contemporary Emirati Studies	Credits: 3

The course covers a wide range of topics related to the United Arab Emirates in the contemporary era, focusing on introducing the student to the theoretical and empirical aspects that define political life in the country. It also sheds light on the country's position in the international arena and its performance in global competitiveness. The course also delves into Emirati society's values, essential heritage, and efforts to develop the Emirati people and foster their contributions to the betterment of the society, emphasizing their crucial role in shaping the country's future. The course also highlights significant achievements in vital national fields, showcasing the UAE's efforts in furthering human competencies and striving towards the future, the goals of empowering women and achieving development, and the unique features of the UAE's cultural and literary richness. The course also addresses issues of priority for the prudent leadership, including meeting food security requirements and ensuring community safety and prosperity through efforts to enhance community health, improve wellbeing practices, the country's pioneering pursuits in environmental sustainability, and efforts to achieve technical development and employ its achievements in various fields.

MTH 100	College Algebra	Credits: 3

This course outlines the concepts and principles of algebra, dealing with equations, graphs, models, functions, and other aspects to develop a strong understanding of algebraic concepts and principles in the student. Appropriate applications will be included.
Upon entering College Algebra, the student is expected to possess an understanding of Elementary and Intermediate Algebra.
1)Linear Equations in one variable with applications.
2)Linear inequalities in one variable.
3)Absolute values equations and inequalities.
4)Quadratic equations.
5)Rectangular coordinates and graphs of linear and quadratic functions.
6)Polynomial functions of a single variable (including graphs, remainder, and factor theorem).
7)Exponential and logarithmic functions.
8)Matrices and their applications.
9)Binomial theorem.

IES 111	Innovation Entrepreneurship and Sustainability	Credits: 3
Creativity, innovation, and entrepreneurship are essential tools for the global society including the Gulf region, which require the acquisition of new skills and abilities to take advantage of opportunities in different fields; such as social, economic and cultural. Shaping sustainable solutions for the current challenges. Therefore, this course is designed to provide students with an understanding and recognition of creativity, innovation, and entrepreneurship. Students will be able to gain acknowledge of the theoretical framework and utilized its application in the real world in a sustainable manner.		

GED Free Elective courses (Group 1)

GED 130	Introduction to GIS	Credits: 3
This course offers introduction to Geographic Information Systems (GIS), immersing participants in the exploration of fundamental theories and practical applications applying specific software tools. The course encompasses essential components, including data input, storage, editing, spatial structures, analytical functions, and GIS management. Engaging lab exercises provide participants with hands-on experience, allowing them to cultivate practical proficiency in applying GIS concepts to diverse real-world scenarios. Through this multifaceted approach, participants not only gain theoretical knowledge but also develop a nuanced understanding of how to effectively navigate and leverage GIS tools for spatial analysis and decision-making.		
GED 140	Conceptual Physics	Credits: 3
This course examines the concepts and theories of physics in understanding the physical world as we understand it; focusing on aspects of Newton's laws, how gravity works, the functions of heat, sound, and light, the process of electricity, concepts of relativity and quantum theory, and other topics.		

GED Free Elective courses (Group 2)

GED 150	Critical Thinking	Credits: 3
This course offers a comprehensive exploration of the cognitive skills and methodologies necessary in understanding, analyzing and evaluating arguments, assertions, and problems frequently encountered in everyday situations through the application of formal logical reasoning.		
GED 180	Human Behavior and Socialization	Credits: 3
This course studies the relationship between the culture, and environment and the science of psychology and its processes. It discusses cultural and environmental elements of human behaviors, thoughts, and emotions and how social and developmental psychology and the study of socialization deal with the role of culture in these processes.		

It also focuses on the different approaches and results of mainstream psychology while discussing topics such as development and growth behavior, social influence, family models, parenting, moral development, and socialization.
This course is an introduction and broad overview of the concepts and principles of sociology, with an emphasis on the social natures of human behavior, including an understanding of the make-up and definitions of culture, the development of social structures and socialization, the formations of a family structure, issues of gender and religion, and other topics specific to human behavior and socialization.

IES112	Introduction to Environmental Sustainability	Credits: 3

Environmental sustainability is essential for ensuring the well-being of current and future generations. This course provides students with an understanding of key concepts in environmental sustainability, including the principles, challenges, and practices involved. Topics cover sustainable resource management, climate change, renewable energy, and sustainable urban development.

GED 160	Psychology in Everyday Life	Credits: 3

This course enables the student to understand ideas, theories and methods related to psychology, including the history, concept, principles, and the role played by psychology in the advancement of science. It also shows the student how to analyze and evaluate psychological concepts, and develop skills in assessing and using different kinds of evidence.
This course is an exploration of the principles and concepts and a basic overview of the field of psychology and how these concepts are applied in everyday living. Students study specific topics and then apply their understanding through exercises and activities.