



Sana'a University



Cybersecurity Program Specifications

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ظهرت الحاجة إلى أمن البيانات منذ وقت مبكر في الحياة البشرية لغرض تبادل البيانات والرسائل السرية. فقد بدأ الإنسان باستخدام طرق مختلفة، مثل استخدام الحمام الزاجل، التشفير والإخفاء (Cryptography & Steganography) لغرض تبادل الرسائل بطريقة سرية وأمنة. ونظرا للتطور المتسارع في الحوسبة والاتصالات والاعتماد عليها في تخزين البيانات، ومعالجتها ونقلها، رافق ذلك حاجة العالم المتزايدة لأدوات، وتقنيات وتكنولوجيات متطورة لتصون البيانات والحفاظ على أمنها وسريتها في حالات التخزين، والمعالجة والنقل. وخلال العقدين الماضيين من القرن الواحد والعشرين برزت حاجة العالم إلى متخصصين في أمن المعلومات (أمن الحاسوب، أمن الشبكات، أو الأمن السيبراني) في القطاعين العام والخاص.

وللعلم فإن كلية الحاسوب وتكنولوجيا المعلومات – جامعة صنعاء قد قدمت برنامج "تكنولوجيا الشبكات وأمن الحاسوب" في العام الأول من تأسيسها 2007-2008م. استقبلت الكلية أول دفعة من الطلاب المتقدمين للبرنامج في العام الجامعي 2007-2008م، حيث أن كلية الحاسوب وتكنولوجيا المعلومات في جامعة صنعاء تعتبر أول كلية في المنطقة العربية تقدم برنامجا متخصصا في الشبكات وأمن الحاسوب. كما أن الكلية خرجت أول دفعة من طلابها تخصص "تكنولوجيا الشبكات وأمن الحاسوب" في العام الجامعي 2010-2011م تلاها تخريج ست دفع من الطلبة، ألا أنه تم إيقاف إستقبال الطلبة المتقدمين للبرنامج في العام الجامعي 2013-2014م.

ونظرا لأهمية دور المؤسسات الأكاديمية في رفد المجتمع بالمتخصصين في مختلف المجالات منها مجال الحوسبة والأمن السيبراني، فقد تم تقديم النسخة الأولى لبرنامج الأمن السيبراني في عام 2017م من قبل (ACM & IEEE) وآخرون، كما تم إدراجها في قائمة برامج منظمة ABET للاعتماد الأكاديمي. ونتيجة لذلك بادرت المؤسسات الأكاديمية في العالم باستحداث برنامج الأمن السيبراني لتلبي الاحتياج المتزايد من المتخصصين لمواجهة التهديدات، الهجمات، جرائم الحاسوب والشبكات والمخاطر المتقدمة والمتزايدة التي تؤثر على الحكومات والأعمال في فضاء الأمن السيبراني. لذا فإن برنامج الأمن السيبراني يشكل أهمية عالية لدى المؤسسات الأكاديمية لغرض تزويد المجتمع بالمتخصصين والتقنيين لحماية وصيانة بيانات، برمجيات، التطبيقات والمكونات المادية للمجتمع، المؤسسات والأشخاص لمنع تلك الهجمات والمخاطر والتقليل من أثارها والحفاظ على استمرارية الأعمال في فضاء الأمن السيبراني.

يعد برنامج الأمن السيبراني من برامج الحوسبة حيث يجمع بين الدراسة الأكاديمية واكتساب المعرفة وتنمية المهارات العملية والتطبيقية التي تمكن الخريجين من أن يصبحوا أكثر فعالية وإنتاجية في مكان العمل. يكتسب خريجو برنامج الأمن السيبراني المعرفة والمهارات اللازمة والضرورية لتلبية احتياجات المجتمع والأعمال وصناعة تكنولوجيا المعلومات والاتصالات. حيث يتولى البرنامج إعداد كوادر مؤهلة بالمعرفة النظرية والتطبيقات العملية قادرة على المساهمة بفاعلية في نشر الوعي الأمني، فهم متطلبات الأمن السيبراني، التهديدات، والهجمات، والمخاطر، والتحقيق في الجرائم العدلية الرقمية، والأدوات والتقنيات الضرورية للسيطرة على مخاطر الأمن السيبراني والتقليل من أثارها على المجتمع والأعمال وصناعة تكنولوجيا المعلومات والاتصالات. كما يتولى البرنامج تطوير قدرات ومهارات الطلبة التنافسية في حل مشاكل الأمن الرقمي، وتطوير أنظمة الحاسوب والشبكات والتطبيقات اللازمة لتطوير وتحسين أداء المؤسسة، والعمل بكفاءة في مواقع العمل المختلفة، ومواكبة التقنيات الناشئة وتطبيقها بشكل فعال، وكذا إدارة أنشطة مخاطر الأمن على أساس المسؤوليات الأخلاقية والمهنية والقانونية في ممارسات الأمن السيبراني.

خريج هذا البرنامج يمكن أن يعمل في مجالات متعددة لوظائف الحوسبة المتضمنة:

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يتخرج الطالب من هذا البرنامج بعد أن يكمل بنجاح 138 ساعة معتمدة على الأقل، إضافة إلى ذلك إكمال التدريب الميداني. الدرجة العلمية التي يمنحها البرنامج للطلاب المتخرج هي شهادة البكالوريوس في الأمن السيبراني.

The graduate of this program can be work in many areas of computing industries include:

1. Network Systems Security Management,
2. Information Security Crime Investigator/Forensics Expert,
3. Information System Security Management,
4. Network Security Engineer,
5. Software Security Engineer,
6. Technical development (Software Design and Development),
7. Penetration Tester and Security Auditor.

The graduate student from this program should be completed at least 138 credits hours, an additional to complete the training field. The degree award at program completion is the Bachelor of Cybersecurity.

1. Program Identification and General Information:		
1	Scientific name of the program:	Cybersecurity
2	Total credit hours required to award the degree	138 Credit Hours
3	Number of years needed for completion of the program:	4 Years [8 Academic semesters and Summer Training]
4	The body responsible for granting the degree:	Sana'a University
5	The body responsible for the program:	Department of Cybersecurity and Digital Forensics, Faculty of Computer Science & IT
6	Award granted on completion of the program:	Bachelor of Cybersecurity
7	Study system:	Regular attendance
8	Study Language of the Program:	English/Arabic
9	Entry requirements:	Scientific Secondary School Certificate
10	Departments participating in the program:	None
11	Starting year of the program:	2022/2023
12	Study methods in the program:	Full time
13	Location of Delivery:	Sana'a University, Faculty of Computer Science & IT
14	The program resources:	Sana'a University
15	Minimum grade requirements:	As per Regulations of the Ministry of Higher Education and Scientific Research
16	Other admission requirements:	According to the University Rules and Regulations
17	Date of current development of the program:	
18	The graduate of this program can be work in many areas of computing industries include:	1. Network Systems Security Management, 2. Information Security Crime Investigator/Forensics Expert, 3. Information System Security Management, 4. Network Security Engineer, 5. Software Security Engineer, 6. Technical development (Software Design and Development), 7. Penetration Tester and Security Auditor. 8. Assistants Teachers

2. University Vision, Mission, Values, Objectives, and Goals:

University vision 2025:

تطمح جامعة صنعاء الى الريادة الوطنية في التعليم والتعلم والبحث العلمي وخدمة المجتمع وأن تكون من أفضل الجامعات الإقليمية وبيت الخبرة في اليمن.

University mission:

الإسهام في جهود التنمية المستدامة من خلال توفير بيئة تعليم عال يحقق معايير الجودة وخدمات بحثية متميزة في ظل شراكة وطنية مثمرة ترتكز على الشفافية والمهنية والإبداع.

University Core values:

- A pioneering and Continuous Education
- Teamwork
- Transparency and Accountability
- Creativity and Innovation
- Professional integrity and objectivity

Special University Objectives (Educational):

1. إتاحة الفرص الدراسية المتخصصة والمتعمقة للطلبة في ميادين المعرفة المختلفة لتلبية لاحتياجات البلاد من التخصصات والفنيين والخبراء.
2. العناية باللغة العربية وتدريسها وتطويرها وتعميم استعمالها كلغة علمية وتعليمية في مختلف مجالات المعرفة والعلوم وذلك باعتبارها الوعاء الحضاري للمعاني والقيم والأخلاق للحضارة العربية والإسلامية.
3. تطوير المعرفة بإجراء البحوث العلمية في مختلف مجالات المعرفة سواء على المستوى الفردي أو الجماعي، وتوجيهها لخدمة احتياجات المجتمع وخطط التنمية.
4. الاهتمام بتنمية التقنية "التكنولوجيا" وتطويرها والاستفادة منها في تطوير المجتمع.
5. تشجيع حركة التأليف والترجمة والنشر في مختلف مجالات المعرفة مع التركيز بوجه خاص على التراث اليمني.
6. الإسهام في رقي الآداب والفنون وتقديم العلوم.
7. توفير المناخ الأكاديمي المساعد على حرية الفكر والتعبير والنشر بما لا يتعارض مع الإسلام وقيمه السامية ومثلها العليا.
8. تقوية الروابط مع الجامعات والمؤسسات العامة والخاصة في البلاد بما يكفل التفاعل المتبادل والبناء للمعارف والخبرات والموارد والمشاركة التي تكفل الإسهام الفعال في إحداث التنمية الشاملة في البلاد.
9. توثيق الروابط العلمية والثقافية مع الجامعات والهيئات العلمية ومراكز البحوث والتطوير العربية والأجنبية بما يساعد على تطوير الجامعة وتعزيز مكانتها.
10. تقديم الدراسات والاستشارات الفنية والمتخصصة لمختلف أجهزة الدولة ومؤسساتها العامة والمختلطة.
11. المساهمة في تطوير السياسات وأساليب العمل في مؤسسات وأجهزة الدولة والقطاعين العام والخاص وتقديم النماذج والتجارب المبتكرة لحل المشاكل المختلفة.
12. رفع كفاءة العاملين في مؤسسات وأجهزة الدولة والقطاعين العام والخاص، وذلك من خلال المساهمة في برامج الإعداد والتأهيل أثناء الخدمة.

3. Faculty Vision, Mission, Values, and Objectives:

Vision:

الريادة أكاديمياً وبحثياً في مجالات الحوسبة والتكنولوجيا على المستوى الوطني والإقليمي.

Mission:

تقديم برامج أكاديمية متميزة وتوفير بيئة تعليمية وبحثية محفزة في مجالات الحوسبة التكنولوجية وفقاً لمعايير الجودة والاعتماد الأكاديمي وتعزيز الشراكة والمسئولية المجتمعية ومواكبة متطلبات سوق العمل.

Values:

- A pioneering and Continuous Education
- Teamwork
- Transparency and Accountability
- Creativity and Innovation
- Professional integrity and objectivity

Faculty Objectives (Educational):

1. تقديم وتطوير برامج أكاديمية وبحثية متميزة في مجالات الحاسوب وتكنولوجيا المعلومات وفقاً لمتطلبات الجودة والاعتماد الأكاديمي.
2. إعداد كوادر علمية وبحثية متخصصة في مجالات الحاسوب وتكنولوجيا المعلومات قادرة على المنافسة والإبداع في سوق العمل محلياً وإقليمياً.
3. المساهمة في تطوير المعرفة في مجالات الحاسوب وتكنولوجيا المعلومات من خلال تشجيع البحث العلمي وتوجيهه لخدمة المجتمع وتنميته.
4. تقديم الاستشارات العلمية والتقنية ذات العلاقة بمجالات الحاسوب وتكنولوجيا المعلومات والمساهمة في تدريب الكوادر الفنية للقطاعات المختلفة.
5. إقامة علاقات شراكة مع المؤسسات العلمية المناظرة لتبادل الخبرات في المجالات العلمية والبحثية.

4. Cybersecurity and Digital Forensics Department Vision, Mission, and Objectives :

Vision of the Department:

To qualify cybersecurity and digital forensics professionals

تأهيل متخصصين في الأمن السيبراني والقضايا الجنائية الرقمية.

Mission of the Department:

Providing distinguish academic and research programs in cybersecurity and digital forensics issues through providing an appropriate motivated education environment for creative thinking and scientific research excellence according to accreditation standards to meet the needs of the local and regional labor market.

تقديم برامج أكاديمية وبحثية متميزة في مجال الامن السيبراني والقضايا الجنائية الرقمية من خلال توفير بيئة تعليمية ملائمة تحفز على التفكير الإبداعي والبحث العلمي وفقا لمعايير الاعتماد لتلبية متطلبات سوق العمل المحلي والإقليمي.

Objectives of the Cybersecurity and Digital Forensics Department:

1. Providing academic programs with high quality that meet the needs of the local and regional labor market in cybersecurity and digital forensics disciplines.
2. Providing an appropriate and stimulated (motivated) learning environment for creativity, innovation and research excellence.
3. Preparing graduates with knowledge, intellectual and general skills for future careers in cybersecurity and digital forensics issues to be active and responsible members of society.
4. Developing the students and academic staff capabilities for self-learning, effective communication, and teamwork, taking into account the ethics of the profession.
5. Encouraging faculty members and involve students in projects/scientific research in cybersecurity.
6. Providing scientific and technical consulting, and participating in training technical cadres to secure the various sectors.

1. تقديم برامج أكاديمية في مجال الامن السيبراني والقضايا الجنائية الرقمية بجودة عالية تلبي احتياجات سوق العمل المحلي والإقليمي.
2. توفير بيئة تعليمية مناسبة ومحفزة للإبداع والابتكار والتميز البحثي.
3. إعداد الخريجين بالمعارف والمهارات الفكرية والعامة للوظائف المستقبلية في مجال الامن السيبراني والقضايا الجنائية الرقمية ليكونوا أعضاء فاعلين ومسؤولين في المجتمع.
4. تنمية قدرات الطلبة وأعضاء هيئة التدريس على التعلم الذاتي والتواصل الفعال والعمل الجماعي مع مراعاة أخلاقيات المهنة.
5. تشجيع أعضاء هيئة التدريس وإشراك الطلبة في المشاريع / البحث العلمي في تخصص الأمن السيبراني.
6. تقديم لاستشارات العلمية والفنية ، والمشاركة في تدريب الكوادر الفنية لتأمين القطاعات المختلفة

5. cybersecurity Program Mission and Objectives:

Program Mission:

Preparing students with knowledge, skills, values and competitive capabilities to contribute in developing and protecting of the cybersecurity community to meet the needs of the local and regional labour market through providing an appropriate educational environment.

إعداد الطلبة بالمعارف والمهارات والقيم والقدرات التنافسية للمساهمة في تطوير وحماية مجتمع الأمن السيبراني تلبي احتياجات سوق العمل المحلي والإقليمي، من خلال توفير بيئة تعليمية مناسبة.

Program Objectives:

1. Providing the students with theoretical concepts, intellectual skills, values and practical applications in the field of cybersecurity .

تزويد الطلبة بالمفاهيم النظرية والمهارات الفكرية والقيم والتطبيقات العملية في مجال الأمن السيبراني.

2. Acquiring students' skills, tools and techniques for analyzing, designing, implementing and evaluating computing-based systems secure .

اكتساب الطلبة المهارات والأدوات والتقنيات اللازمة لتحليل وتصميم وتنفيذ وتقييم أنظمة حاسوبية آمنة

3. Preparing specialized cadres capable of competing for future careers in the field of cybersecurity that meet the needs of the local and regional labor market.

إعداد كوادر متخصصة قادرة على المنافسة للوظائف المستقبلية في مجال الأمن السيبراني تلبي احتياجات سوق العمل المحلية والإقليمية.

4. Developing graduates' skills in communication and working within a team or an individually, and encourage them to creative thinking and lifelong learning to be active and responsible in cybersecurity.

تنمية مهارات الخريجين في الاتصال والعمل ضمن فريق أو بشكل فردي، وتشجيعهم على التفكير الإبداعي والتعلم مدى الحياة ليكونوا أعضاء فاعلين ومسؤولين في الأمن السيبراني.

Annex- 1, Survey on the Strategic Orientations of the Department and Similar Departments, and their Alignment to the Strategic Orientations of the University and Faculty.

6. Program Standards & Benchmarks:

Academic Standards:

1. ABET Criteria for Accrediting Computing Programs.
2. National Academic Reference Standards (NARS): Computing Program.
3. Cybersecurity Curricula 2017, Curriculum Guidelines for Post-Secondary Degree Programs in Cybersecurity. A Report in the Computing Curricula Series Joint Task Force on Cybersecurity Education, Version 1.0 Report, 31 December 2017:



- Association for Computing Machinery (ACM),
 - IEEE Computer Society (IEEE-CS),
 - Association for Information Systems Special Interest Group on Information Security and Privacy (AIS SIGSEC), and
 - International Federation for Information Processing Technical Committee on Information Security Education (IFIP WG 11.8).
4. ABET, Computing Accreditation Commission, Criteria for Accrediting Computing Programs, Effective for Reviews during the 2020-2021 Accreditation Cycle.

[Annex- 2, Academic Standards Curriculum Criteria of Accreditation Board](#)

[Annex- 3, Unified Regulations for Student Affairs, Ministry of Higher Education and Scientific Research](#)

Program Benchmarks:

Survey on the Strategic Orientations of the Department and Similar Departments, and their Alignment to the Strategic Orientations of the University and Faculty:

1. **National University of Singapore - Singapore.** [https:// www.comp.nus.edu.sg](https://www.comp.nus.edu.sg)
Cybersecurity Program Information: <https://www.comp.nus.edu.sg/programmes/ug/isc/curr/>
2. **Imam Abdulrahman Bin Faisal University Dammam - Saudi Arabia:** <https://www.iau.edu.sa/>
Cybersecurity Program Information: <https://www.iau.edu.sa/en/news/cyber-security-and-digital-forensics-of-the-ccsit-iau-is-accredited-by-abet>
3. **Capitol Technology University - United States- Maryland:** [https:// www.captechu.edu](https://www.captechu.edu)
Cybersecurity Program Information: <https://www.captechu.edu/degrees-and-programs/bachelors-degrees/cybersecurity-bs>
4. **Southeast Missouri State University - United States- Missouri:** <https://www.semo.edu>
Cybersecurity Program Information: <https://semo.edu/study/cybersecurity.html>
5. **University of Bahrain - Bahrain.** <https://www.uob.edu.bh/>
Cybersecurity Program Information: <https://bub.bh/courses/bsc-computer-science-with-cyber-security/>

7. Graduate Attributes:

The cybersecurity program graduates are:	
1.	Problem solver and critical thinker مفكر ناقد وحال للمشكلات
2.	Analyst and detector of cybersecurity requirements, vulnerabilities, weaknesses, threats and risks محلل ومكتشف لاحتياجات وثغرات ونقاط ضعف وتهديدات ومخاطر الامن السيبراني
3.	Operator and master of cybersecurity systems, technologies, and tools at various institutional levels متعامل ومشغل لأنظمة وتقنيات وأدوات الامن السيبراني في مختلف المستويات المؤسسية
4.	Designer of secure computer systems and networks مصمم لأنظمة وشبكات حاسوبية آمنة
5.	Resist security attacks and maintain a safe working environment متصدي للهجمات الأمنية ومحافظ على استمرار بيئة عمل آمنة
6.	Communicator and Team-worker متواصل وعضو فريق فعال
7.	Social, legal, and ethical responsible متحمل للمسؤولية المجتمعية والأخلاقية والقانونية
8.	Self-learner متعلم ذاتي

8. Program Learning Outcomes (PILOs):

ILOs Type		Proposed ILOs to FCIT – Sana'a Univ.
A	Knowledge and Understanding	A 1: Demonstrate an understanding of theoretical knowledge and practical concepts, mathematics, computing and social science fundamentals related to cybersecurity. A 2: Explain, discuss and express security issues and requirements, software components and application, vulnerabilities, threats, attack and risk activities in cybersecurity environment. A 3: Conscious about security policy and planning, professional ethics, crimes legal and organizational responsibilities to maintain business continuity.
B	Cognitive/Intellectual Skills	B 1: Recognize, identify and classify cybersecurity requirements, crimes, threats, vulnerabilities, risks, networks tools and technologies in cybersecurity practices. B 2: Analysis and evaluate the impact of computing-based system on society, business and individual, computing system security and digital forensics issues based on professional ethics and legal responsibilities, cybersecurity rules and standards. B 3: Propose suitable cybersecurity solutions, plan, policy, technologies, tools and techniques to meet the society and business continuity needs. B 4: Design, integrate and test a secure computer and network systems, software components and applications that meet organization and individual needs.
C	Practical and Professional Skills	C 1: Apply and practice theoretical and practical principles of cybersecurity, computing science and mathematics to detect, defend and maintain a business continuity and secure computing-based system assets. C 2: Use cybersecurity standards, and digital forensics concept, tools and techniques to solve and investigate a security problem in cybersecurity practices. C 3: Employ cybersecurity frameworks, tools, techniques and technologies to implement, operate, manage and monitor a secure computer and network systems in the presence of threats and risks in different platforms. C 4: Test, troubleshoot, and develop a secure computer and networks systems, software components and applications that meet organization and individual needs.

Head of Department

Quality Unit

Dean of the Faculty

Center of Development & Quality Assurance

Rector

D	General and Transferable Skills	D 1: Communicate effectively to convince ideas and proposed solutions in different environments. D 2: Function individually, leader or as a team member to accomplish a common goal based on professional, legal and ethical responsibilities in cybersecurity practices. D 3: Use creative thinking, research skills in solving cybersecurity problem to contribute in improve the enterprise's security and performance. D 4: Keep up with modern cybersecurity skills, standards, tools and techniques for personal professional development and life-long self-learning.
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9. Teaching and Learning Strategies:

- Lectures/Active lectures
- Tutorials
- Seminar/ project/presentation
- Interactive class discussions
- Exercises and home works
- Laboratory based session
- Directed self- study/ Independent learning
- Problem solving
- Team work (group learning)

Teaching Strategy	Description
Lectures /Interactive lectures	These are interactive lectures weekly conducted in the class and supported with variety of teaching formats including, lectures and multimedia presentations, use of whiteboard to solve examples and illustrating different tasks and problems introduced by the presentation, and class discussions, in which concepts, approaches, and case studies are presented, explored, and shown students what they need to know.
Discussion	This is allow the students ask questions during the lecture or other students for purpose of clarifying the subject of the lecture and increasing the concentration and absorption of the student and attention.
Illustrations	Illustrations performing an activity so that learners can observe how it is done in order to help prepare learner to transfer theory to practical application. Moreover, this strategy involves the teacher showing learners how to do something

Teaching Strategy	Description
Brainstorming	It is a process for generating multiple ideas/options in which judgment is suspended until a maximum number of ideas has been generated. It is a common teaching approach that is often used by organizing a meeting of a group of students in a round circle, so that students combined focus their thinking on solving a problem in creative ways, and this strategy is usually followed in educational meetings and work sessions to stimulate students, their thinking and discussion.
Seminar/ project/presentation	In each course, different projects which cover a variety tasks in the course will be prepared by the teacher and assigned to different student's groups. Moreover, the teacher needs to set advance work for a selected number of students, and then have the selected students present their work to the whole group, for discussion, criticism and suggestions for improvement. Seminar sessions and presentations provide an opportunity to address questions, queries and problems.
Tutorials	Tutorial classes are provided to create a stimulating environment for students to work through examples, exercises and case studies. Tutorials include worksheets of carefully-designed questions that make students to think about challenging subjects. They are designed to be used after a brief lecture in which students work in pairs or groups.
Case Studies	To be taken in each subject to be aware regarding the courses.
Computer lab-based sessions	Practical Applications using a variety of software or simulations software before the real design and implementation. The student use programing and applications in the laboratory based sessions that are required for some courses to balance between theoretical and practical issues. A variety of web-based searches students will be assigned to learn how they can search for solutions using the Web.
Directed self-study/ Self-learning	Students are encouraged to undertake independent study to both supplement and consolidate what are being learned. Students are encouraged to undertake independent study in some topics to consolidate what is being learned. Self-learning is required for students to "talk science" and encourage them to teach each other.

Teaching Strategy	Description
Training	The training is used to relate the theoretical aspects with the practical ones. The course of training is a sequence of events that trainer needs it for a particular job or activity.
Problem solving	This allows students to become more active in their learning as they work out which information, they need to find out how to solve a particular problem.

10. Assessment Methods

- Written examinations (Mid and final Terms)
- Quizzes
- Oral exams
- Technical/Practical Report
- Project/Practical Lab Sessions
- Coursework Activities
- Home works and assignments
- Case studies
- Presentations.
- Problem solving
- Individual/Group Project.

Assessment Strategy	Description
Written examinations (Mid and final Terms)	Mid. term & Final exams for each course is required for all courses except Graduation Projects. These exams will evaluate the extent in which the student understanding of theoretical and applied subjects
Quizzes	Some points are assigned to multiple choice questions and Quizzes in order to assess' student ability to follow the lecturer during the study course. quizzes are related to past as well as topics discussed in the period. This helps students develop self-confidence, readiness, and accuracy in major exams.
Oral exams	Oral exams is useful to evaluate the extent of understanding the different subjects of the course.
Technical/practical Report/Project/Practical Lab Sessions	Assessing students to their ability to write theoretical and lab reports as well as the understanding of organizing the reports. The practical lab sessions are required for some courses.



Assessment Strategy	Description
Assignments	Students are given special tasks, exercises, puzzles, and activities during the class or at homes.
Coursework Activities	Course work Activities is one of the assessment methods by which it can evaluate students.
Home works and assignments	Home works and assignments will evaluate students according to their ability to explain and illustrate the assignments they are given.
Case studies	Assigning case studies to students is very helpful to assess the extent of understanding the topics.

11. Alignment of Program Intended Learning Outcomes (PILOs) to Teaching Strategies and Assessment Methods:

PILOs	Teaching Strategy	Assessment Methods
Knowledge and Understanding A1, A2, A3	- Lectures/Interactive lectures - Discussion - Illustrations - Case Studies - Directed self-study/ Self-learning - Exercises	- Written tests (mid and final terms) - Quizzes - Oral exams - Assignments
Intellectual Skills B1, B2, B3, B4	- Lectures/Interactive lectures - Discussion - Illustrations - Preparation Seminar/ project/presentation - Tutorials - Brainstorming - Case Studies - Problem solving - Team work (group learning)	- Written examinations (Mid and final Terms) - Quizzes - Oral exams - Technical Report - Assignments - Coursework Activities - Case studies - Presentations. - Problem solving
Professional & practical skills C1, C2, C3, C4	- Interactive lectures - Discussion - Illustrations - Preparation Seminar/ project/presentation - Tutorials - Case Studies - Computer lab-based sessions - Directed self-study/ Self-learning - Training - Problem solving - Team work (group learning) - Group project	- Written examinations (Mid and final Terms) - Quizzes - Oral exams - Technical/Practical Report/ Practical Lab Sessions - Assignments - Coursework Activities - Case studies - Presentations. - Problem solving - Individual/Group Project
General & Transferable Skills D1, D2, D3, D4	- Preparation and presentation - Tutorials - Case Studies - Directed self-study/ Self-learning - Team work (group learning) - Exercises and home work	- Technical Report - Coursework Activities - Case studies - Presentations. - Problem solving

12. Project Assessment:

Each project will be assessed as follows:

Item	Marks Distribution
Research project supervisor.	60
Internal examiner: a member of the department teaching staff.	20
External examiner: a qualified external examiner (either from other departments of the faculty or from another university).	20
Total	100

13. Training Course Assessment:

The training course will be assessed through:

- Head of department,
- Coordinator,
- Supervisor from the Department Staff,
- Manager the place of training.

14. Intended Learning Outcomes Mapping:

See below Annexes.

[Annex- 13, Alignment of Program PILOs with Council of Accreditation \(NARS\) and ABET Standards](#)

[Annex- 14, Survey of Credit Hours of Similar Programs](#)

15. The Program Structure

CH: Credit Hours; Distrib.: Distribution; L: Lecture; T: Tutorial; Lab: Laboratory

15.1. University Requirement

No	Course Code	Course Title		CH	CH Distrib.			Prerequisite	Dep.
		English	Arabic		L	T	Lab		
1		Islamic Culture	الإسلامية الثقافة	2	2	-	-	--	UNI
2		Arabic Language (1)	لغة عربية (1)	2	2	-	-	--	UNI
3		English Language (1)	لغة انجليزية (1)	2	2	-	-	--	UNI
4		Arabic Language (2)	لغة عربية (2)	2	2	-	-	Arabic Language (1)	UNI
5		English Language (2)	لغة انجليزية (2)	2	2	-	-	English Language (1)	UNI
6		National Culture	ثقافة وطنية	2	2	-	-	-	UNI
7		Arabic-Israel Conflicts	الصراع العربي الإسرائيلي	2	2	-	-	-	UNI
8		Computer Skills	مهارات الحاسوب	3	2	-	2		
Total Hours				17	16	-	2		

15.2. Faculty Requirement

No	Course Code	Course Title		CH	CH Distrib.			Prerequisite	Dep.
		English	Arabic		L	T	Lab		
1	FR	Programming Fundamentals		3	2	-	2	Introduction to Computer	
2	FR	Communication Skills		2	2	--	--	English Language (2)	FCIT
3	FR	Computer Ethics		2	2	--	--	Introduction to Computer	FCIT
4	FR	Research Methodology		2	2	--	--	--	FCIT
5	FR	Graduation Project (1)		3	--	--	--		
6	FR	Graduation Project (2)		3	--	--	--	Graduation Project (1)	
Total Hours				15	8		2		

15.3. Program Requirement

No	Course Code	Course Title		CH	CH Distrib.			Prerequisite	Dep.
		English	Arabic		L	T	Lab		
1	CYS	Cybersecurity fundamentals		3	3	-	-		CYS
2		Discrete Mathematics		3	2	2			CYS
3		Mathematics (1).		3	2	2	-	--	
4		Mathematics (2).		3	2	2	-	Mathematics (1).	
5		Probability and Statistics		3	2	2	-	Mathematics (1).	
6		Web Development		3	2	-	2	Computer programming	
7	CYS	Information Security		3	2	-	2		CYS
8		Computer programming		3	2	-	2		CYS
9		Operating Systems		3	2	-	2		CYS
10		Database Management Systems		3	2	-	2		CYS
11		Computer Networks (1)		3	2	-	2		CYS
12	CYS	Computer Networks (2)		3	2	-	2		CYS
13		Data Structures and Algorithms		3	2	-	2		CYS
14		Linear Algebra		3	2	2			CYS
15		Object Oriented Programming		3	2	-	2		CYS
16	CYS	Cybersecurity Governance and policy		2	2	-	-		
17	CYS	Introduction to Linux		3	2	-	2		CYS
18	CYS	Network Security		3	2	-	2		CYS
19	CYS	Cryptography		3	3	-	-		CYS
20	CYS	Database Security		3	2	-	2		CYS
21	CYS	Programming language for Cybersecurity		3	2	-	2		CYS
22		Mobile Application programming		3	2	-	2		CYS
23		Software engineering		3	2	-	2		CYS

15.3. Program Requirement

No	Course Code	Course Title		CH	CH Distrib.			Prerequisite	Dep.
		English	Arabic		L	T	Lab		
24	CYS	Security Risk management		3	3	-	-		CYS
25	CYS	Digital Forensics		3	2	-	2		CYS
26	CYS	Ethical Hacking and Penetration Testing		3	2	-	2		CYS
27	CYS	Web development security		3	2	-	2		CYS
28	CYS	Mobile & Wireless Security		3	2	-	2		CYS
29	CYS	Software Security		3	2	-	2		CYS
30		Project Management		3	2	2	-		CYS
31	CTS	AI and Cybersecurity		3	2	-	2		
32		Cloud Computing and Security		3	2	-	2		CYS
33	CYS	Information Security management system		3	3	-	-		CYS
34	CYS	Elective (1)		3	3	-	-		CYS
35	CYS	Elective (2)		3	3	-	-		CYS
Total Hours				104	76	12	44		

Training Field

Summer Training Field is Compulsory Coursework, where:

- This course is implements in the summer of the third level,
- Program students must complete at least 90 hours in training field place,
- There is no credit hour for this course,
- Program students should pass in this course.

16. Study Plan

UR: University Requirements CHs: Credit Hours					FR: Faculty Requirements PR: Program Requirements								
Level 1										Courses = 14		CHs = 35	
Semester 1										Courses = 7		CHs = 17	
No.	Lev-Sem.	Course Code	Course Name	اسم المقرر	CHs.	L	T	P	Prerequisites, Co-requisites				
1	1-1	UR	Arabic Language (1)	اللغة العربية (101)	2	2	-	-	----				
2	1-1	UR	English Language (1)	اللغة الانجليزية (101)	2	2	-	-	----				
3	1-1	PR	Mathematics (1)	الرياضيات (1)	3	2	2	-	----				
4	1-1	FR	Programming Fundamentals	أساسيات البرمجة	3	2	-	2	----				
5	1-1	UR	Islamic Culture	الثقافة الإسلامية	2	2	-	-	----				
6	1-1	UR	Computer Skills	مهارات الحاسوب	3	2	-	2	----				
7	1-1	UR	Arabic Israeli Conflict	الصراع العربي الإسرائيلي	2	2	-	-	----				
Total					17	14	2	4					
Semester 2										Courses = 7		CHs = 18	
No.	Lev-Sem.	Course Code	Course Name	اسم المقرر	CHs.	L	T	P	Prerequisites, Co-requisites				
1	1-2	UR	Arabic Language (2)	اللغة العربية (102)	2	2			Arabic Language (1)				
2	1-2	UR	English Language (2)	اللغة الانجليزية (102)	2	2			English Language (1)				
3	1-2	UR	National Culture	الثقافة الوطنية	2	2			----				
4	1-2	PR	Computer Programming	برمجة الحاسوب	3	2		2	Programming Fundamentals				
5	1-2	PR	Mathematics (2)	الرياضيات (2)	3	2	2		Mathematics (1)				
6	1-2	PR	Discrete Mathematics	الرياضيات المتقطعة	3	2	2		Mathematics (1)				
7	1-2	PR	Cybersecurity Fundamentals	أساسيات الأمن السيبراني	3	3	-	2	Computer Skills				
Total					18	15	4	4					
Level 2										Courses = 13		CHs = 38	
Semester 1										Courses = 6		CHs = 18	
No.	Lev-Sem.	Course Code	Course Name	اسم المقرر	CHs.	L	T	P	Prerequisites, Co-requisites				

1	2-1	PR	Database Systems	نظم قواعد البيانات	3	2	-	2	Cybersecurity fundamentals
2	2-1	PR	Computer Networks (1)	شبكات الحاسوب (1)	3	2	-	2	Introduction to Computer
3	2-1	PR	Data and Information security	أمن البيانات والمعلومات	3	2	-	2	Cybersecurity fundamentals
4	2-1	PR	Object Oriented Programming	البرمجة الكائنية الموجهة	3	2	-	2	Computer Programming
5	2-1	PR	Probability and statistics	الإحصاء والاحتمالات	3	2	2	-	-----
6	2-1	PR	Web Development	تطوير الويب	3	2	-	2	
Total					18	12	2	10	

Semester 2 Courses = 7 CHs = 20									
No.	Lev-Sem.	Course Code	Course Name	اسم المقرر	CHs.	L	T	P	Prerequisites, Co-requisites
1	2-2	PR	Computer Networks (2)	شبكات الحاسوب (2)	3	2	-	2	Computer Networks (1)
2	2-2	PR	Data Structures and Algorithms	هياكل البيانات والخوارزميات	3	2	-	2	Object Oriented Programming
3	2-2	PR	Algebra for Cybersecurity	الجبر للأمن السيبراني	3	2	2	-	
4	2-2	PR	Operating Systems	نظم التشغيل	2	2	-	2	Introduction to Linux
5	2-2	PR	Communication Skills	مهارات الاتصال	2	2	-	-	English Language (2)
6	2-2	PR	Computer Organization and Architectures	تنظيم ومعمارية الحاسوب	3	2	-	2	
7	2-2	PR	Web Application Security	أمن تطبيقات الويب	3	2	-	2	Computer Programming
Total					20	14	2	10	

Level 3 Courses = 14 CHs = 38									
Semester 1 Courses = 7 CHs = 18									
No.	Lev-Sem.	Course Code	Course Name	اسم المقرر	CHs.	L	T	P	Prerequisites, Co-requisites
1	3-1	FR	Research Methodology	منهجية البحث	2	2	-	-	----
2	3-1	PR	Introduction to Cryptography	مقدمة في التشفير	3	2	-	2	Linear Algebra
3	3-1	PR	Database Management System and Security	نظم إدارة قواعد البيانات والأمن	3	2	-	2	Database Systems
4	3-1	PR	Network Security	أمن الشبكات	3	2	-	2	Computer Network (2)
5	3-1	PR	Software Engineering	هندسة البرمجيات	3	2	-	2	
6	3-1	FR	Programming Language for Cybersecurity	لغة برمجة للأمن السيبراني	3	2	-	2	----

7	3-1	PR	Assembly Code Security	أمن لغة التجميع	1	2	-	2	Web Development
Total					18	12	-	12	

Semester 2 Courses = 7 CHs = 20

No.	Lev-Sem.	Course Code	Course Name	اسم المقرر	CHs.	L	T	P	Prerequisites, Co-requisites
1	3-2	PR	Professional Ethics	أخلاقيات المهنة	2	2	-	-	
2	3-2	PR	Artificial Intelligence for Cybersecurity	الذكاء الاصطناعي للأمن السيبراني	3	2	-	2	
3	3-2	PR	Information Security Management	إدارة أمن المعلومات	3	2	-	2	
4	3-2	PR	Project Management	إدارة المشاريع	3	2	-	2	
5	3-2	PR	Mobile and Wireless Security	أمن الموبايل والشبكات اللاسلكية	3	2	-	2	
6	3-2	PR	Secure Software Design	تصميم البرمجيات الآمنة	3	2	-	2	
7	3-2	PR	Digital Forensics Fundamentals	أساسيات التحري الرقمي	3	2	-	2	
Total					20	14	-	12	

Training Field

Summer Training Compulsory (There is no credit hour for this course, the student should pass in this course). Summer Training Field is Compulsory Coursework, where:

- This course is implements in the summer of the third level,
- Program students must complete at least 90 hours in training field place,
- There is no credit hour for this course,
- Program students should pass in this course.

Level 4 Courses = 9 CHs = 27

Semester 1 Courses = 5 CHs = 15

No.	Lev-Sem.	Course Code	Course Name	اسم المقرر	CHs.	L	T	P	Prerequisites, Co-requisites
1	4-1	PR	Ethical Hacking and Penetration Testing	الهكر الاخلاقي وفحص الاختراق	3	2	-	2	
2	4-1	PR	Network Forensics and Anti-Forensics	التحري والتحري المضاد للشبكات	3	2	-	2	Project Management
3	4-1	PR	Entrepreneurship	ريادة الأعمال	2	2	-	-	
4	4-1	PR	Elective (1)	اختياري (1)	3	-	-	-	
5	4-1	FR	Graduation Project (1)	مشروع التخرج (1)	3	1	4		
Total					15	7	4	4	
Semester 2 Courses = 4 CHs = 12									
No.	Lev-Sem.	Course Code	Course Name	اسم المقرر	CHs.	L	T	P	Prerequisites, Co-requisites
1	4-2	PR	Cloud Computing and Security	الحوسبة السحابية والأمن	3	2	-	2	Security Risk Management
2	4-2	PR	System Administration and Security	إدارة وأمن النظم	3	2	-	2	
3	4-2	PR	Elective (2)	اختياري (2)	3	-	-	-	
4	4-2	FR	Graduation Project (2)	مشروع التخرج (2)	3	1	4	-	Graduation Project (1)
Total					12	5	4	4	
Program Credit Hours Total = 137 Hrs									

Elective Courses

1		PR	Selected Topics in Cybersecurity & Digital Forensics		3	-	-	-	
2		PR	Advanced Cryptography		2	2	-	2	
3		PR	Cybersecurity Governance and Policy		3	-	-	-	
4		PR	Security Threats Analysis		2	-	2	-	
5		PR	Security Risk Management		2	2	-	2	
6		PR	Identity and Authentication Management		2	2	-	2	
7		PR	Business Continuity and Disaster Recovery		2	2	-	2	
8		PR	SW Testing and Troubleshooting		2	2	-	2	
Total					18	10	2	10	
Digital Forensics Courses									
1		PR	Digital Evidence Analysis		3	2	-	2	
2		PR	Digital Forensics and Criminal Justice		3	2	-	2	
3		PR	Operating Systems for Digital Forensics		3	2	-	2	
4		PR	Data Recovery		3	2	-	2	
5		PR	Mobile and IoT forensic		3	2	-	2	
6		PR	Mobile Digital Investigation		3	2	-	2	
7		PR	Criminal Scene Investigation		3	2	-	2	
Total					21	14	-	14	

Department/ Program Requirements:

- Academic Staff Requirements

- 2 Assistants Teachers
- 2 Assistant Professor
- Associate Professor (if any)

- Technical Requirements

- Data center,
- Wireless Network Equipment's,
- **Program Labs:** the labs must be internetworking with others and data center;

✓ Network Lab 1: must include:

- | | |
|---|---------------------------|
| 1. Cable UTP/STP, Optic Fiber | 2. Network Tool Kit Set |
| 3. 10 unit Compaq Workstation (Multiple OS) | 4. Video Conferencing Kit |
| 5. Hub, Switch — Layer 2, 3 and 4, Router | 6. Open Rack |
| 7. Wireless Network Equipments | 8. 3550 Switch |
| 9. 3 CISCO 2651 Router dan 3 Catalyst CISCO | 10. Fluke Network Tester |
| 11. Optimum Network Performance (OPNET) | 12. MatLab |
| 13. Simscript | 14. NeoTracer |
| 15. Standard Operating System (IOS) | 16. Internetworking |

✓ Network Lab 2: must include:

- | | |
|---|----------------------|
| 1. 4 unit Sequent Technical Server (Parallel Machine) | 2. Ipv6 Testbed |
| 3. Network of Workstations (Cluster of Workstations) | 4. Dynixptx |
| 5. Dedicated Switch and router for Ipv6 | 6. Linux Red Hat |
| 7. 2 Server Dell Power Edge 1600 SC | 8. Machine (PVM) |
| 9. Message Passing Interface (MPI) | 10. Parallel Virtual |
| 11. C, C++ | 12. Sun Solaris |

✓ Virtual Lab:

- Firewall System,
- Intrusion Detection System,
- Intrusion Prevention System,
- Other SW Systems: research on it and add it to requirements.
- Other Infrastructures Requirements
 - HoD and stuff Rooms
 - Teaching Rooms

17. Benchmarked Programs:

Survey on the Strategic Orientations of the Department and Similar Departments, and their Alignment to the Strategic Orientations of the University and Faculty:

1. **National University of Singapore - Singapore.** [https:// www.comp.nus.edu.sg](https://www.comp.nus.edu.sg)
Cybersecurity Program Information:
<https://www.comp.nus.edu.sg/programmes/ug/isc/curr/>
2. **Imam Abdulrahman Bin Faisal University Dammam - Saudi Arabia .**<https://www.iau.edu.sa/>
Cybersecurity Program Information: <https://www.iau.edu.sa/en/news/cyber-security-and-digital-forensics-of-the-ccsit-iau-is-accredited-by-abet>
3. **Capitol Technology University - United States- Maryland:** <https://www.captechu.edu>
Cybersecurity Program Information: <https://www.captechu.edu/degrees-and-programs/bachelors-degrees/cybersecurity-bs>
4. **Southeast Missouri State University - United States- Missouri:** <https://www.semo.edu>
Cybersecurity Program Information: <https://semo.edu/study/cybersecurity.html>
5. **University of Bahrain - Bahrain.** <https://www.uob.edu.bh/>
Cybersecurity Program Information: <https://bub.bh/courses/bsc-computer-science-with-cyber-security/>

18. Distribution of Total Credit Hours:

Level	Term	University Requirements		Basic Requirements		Faculty Requirements		Program Requirements		Program Electives		Training		Project		Total CH		Total CH/Level
		No. of Courses	CH	No. of Courses	CH	No. of Courses	CH	No. of Courses	CH	No. of Courses	CH	No. of Courses	CH	No. of Courses	CH	No. of Courses	CH	
First	First	4	8	-	-	1	3	2	6	-	-	-	-	-	-	7	17	25%
	Second	3	6	-	-	2	6	2	6	-	-	-	-	-	-	7	18	
Second	First	-	-	-	-	1	3	5	15	-	-	-	-	-	-	6	18	28%
	Second	-	-	-	-	1	2	6	18	-	-	-	-	-	-	7	20	
Third	First	-	-	-	-	1	3	6	15	-	-	-	-	-	-	7	18	28%
	Second	-	-	-	-	1	3	6	17	-	-	-	-	-	-	7	20	
* Summer of 3 rd Year		-	-	-	-	-	-	-	-	-	-	1*	3*	-	-	1*	3*	-
Fourth	First	-	-	-	-	-	-	3	8	1	3	-	-	1**	3**	5	14	19%
	Second	-	-	-	-	-	-	2	6	1	3	-	-	1**	3**	4	12	
Total:		7	14	--	--	7	20	32	91	2	6	1	3	2	6	50	137	100%
Percentage:		10%		---%		15%		67%		4%		---%		4%		100%		

* The Credit Hours of the Training Field Course is not computed in the Credit Hours Total of the Program.

** Two Graduation Project Courses are Faculty Requirements.

Annex- 15, Survey of Number of Courses and Credit Hours of Similar Programs

Annex- 16, Themes of Courses of Study and their Weightage

Annex- 17, Coding System

Annex- 18, Survey of Course Names per Academic Semesters of Similar Program

Annex- 20, Matrix of Mapping Program PILO's with Courses

19. Survey the Program Courses with Similar Programs Courses

	Sana'a University	National University of Singapore	Imam Abdulrahman Bin Faisal	Capitol Technology University	Southeast Missouri State University	Bahrain University
	Faculty of Computer and IT	Computing	Computer Science and Information Technology s	Cyber and Information Security	HARRISON COLLEGE OF BUSINESS AND COMPUTING	College of Information Technology
	Department of Cybersecurity and Digital Forensics	Computer Science	Bachelor of Science	Bachelor of Science	Information Technology and Cybersecurity	Department of Information Systems
	Cybersecurity	Information Security	Cyber Security and Digital Forensics	Cyber and Information Technology	Cybersecurity	Cybersecurity
	Republic of Yemen	Singapore	Saudi Arabia	United States-Maryland	United States	Bahrain
	46	55		45	30	45
Total of CH	138	160	124	120	120	132
	4	4	4	4	4	4
	Cour se	Cour se	Cour se	Cour se	Cour se	Cour se
	CH	CH	CH	CH	CH	CH
	L	L	L	L	L	L
	T	T	T	T	T	T
	P	P	P	P	P	P
Level 1 - Semester 1						
1	Introduc tion to compute r	Intro ducti on to Comp uter Syste ms	Introduc tion to Computi ng /Fundam entals of Info. Systems	Introduc tion to Data Science	Comput er Science I	Fundame ntals of Informati on Systems
2	Arabic Language (1)					Arabic Language Skills
3	Mathem atics (1)	Introducto ry Mathem atics	Calculus	Intermed iate Algebra	Mathem atics	Calculus I
4	English Language (1)			English Commun ications I	Written Commu nication	Language Develop ment I
5	Islamic Culture		Social System in Islam			
6	National Culture				Constitu tion Require ment	Islamic Culture
7			Physics/ Biology/ Electronics		C & the Posix Environ ment	Business Elective I
Level 1 - Semester 2						
1	Program ming Fundam entals	Introduc tion to Computi ng and Program ming I	Fundam entals of Program ming	Intro to Program ming Using Python	Intro to Comput er Program ming	Compute r Program ming I
2	English Language (2)			English Commun ications II	Oral Commu nication	Language Develop ment II

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—	Sana'a University					National University of Singapore					Imam Abdulrahman Bin Faisal					Capitol Technology University					Southeast Missouri State University					Bahrain University					
	Faculty of Computer and IT					Computing					Computer Science and Information Technology s					Cyber and Information Security					HARRISON COLLEGE OF BUSINESS AND COMPUTING					College of Information Technology					
	Department of Cybersecurity and Digital Forensics					Computer Science					Bachelor of Science					Bachelor of Science					Information Technology and Cybersecurity					Department of Information Systems					
	Cybersecurity					Information Security					Cyber Security and Digital Forensics					Cyber and Information Technology					Cybersecurity					Cybersecurity					
	Republic of Yemen					Singapore					Saudi Arabia					United States- Maryland					United States					Bahrain					
	46					55										45					30					45					
T o t a l o f C H .	138					160					124					120					120					132					
	4					4					4					4					4					4					
	Cour se		Course Hours			Cour se		Course Hours			Cour se		Course Hours			Cour se		Course Hours			Cour se		Course Hours			Cour se		Course Hours			
C			H	L	T			P	C	H			L	T	P			C	H	L			T	P	C			H	L	T	P
	Network s						Network s and Applicati ons					Network Fund					Networki ng					Network s					Compute r & Network Technolo gy				
3	Comput er program ming											Object Oriented Program ming 1	3				Intro to Object Oriented Program ming C++	3					3						3	0	3
4	Operatin g Systems						4					Operatin g Systems	3				Operatin g Systems	3				Comput er Operatin g Systems / Comput er Systems & Assembl y Languag e	3					Network Operatin g Systems			
5	Discrete Mathem atics						Discrete Structur es	4				Discrete Mathem atics	2				Discrete Mathema tics	3				Natural Sciences	3								
6	Intro to Program ming Using Python							4					2				Intro to Network Program ming Using C	3					3						3	0	3
7								4				Digital Hardwar e	3				Introduct ion to Unix	3				Social and Behavior al Sciences	4					Business Elective II	3	2	3
8								4				The Economi c System in Islam	3					3					4					Human Rights			
Level 2 - Semester 2																															

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—	Sana'a University					National University of Singapore					Imam Abdulrahman Bin Faisal					Capitol Technology University					Southeast Missouri State University					Bahrain University										
	Faculty of Computer and IT					Computing					Computer Science and Information Technology s					Cyber and Information Security					HARRISON COLLEGE OF BUSINESS AND COMPUTING					College of Information Technology										
	Department of Cybersecurity and Digital Forensics					Computer Science					Bachelor of Science					Bachelor of Science					Information Technology and Cybersecurity					Department of Information Systems										
	Cybersecurity					Information Security					Cyber Security and Digital Forensics					Cyber and Information Technology					Cybersecurity					Cybersecurity										
	Republic of Yemen					Singapore					Saudi Arabia					United States- Maryland					United States					Bahrain										
	46					55										45					30					45										
T o t a l o f C H .	138					160					124					120					120					132										
	4					4					4					4					4					4										
	Cour se		Course Hours			Cour se		Course Hours			Cour se		Course Hours			Cour se		Course Hours			Cour se		Course Hours			Cour se		Course Hours			Cour se		Course Hours			
			C	H	L			T	P	C			H	L	T			P	C	H			L	T	P			C	H	L			T	P	C	H
Level 3 - Semester 1																																				
1	Network Security						Comput er Systems Security						Network Security/ Network Forensic s, Intrusion Detectio n, and Respons e	3					Compreh ensive Compute r and Network Security*	3					Information Security & Assuran ce	3					Network Security I/ Informati on Security					
2	Comput er Ethics						Professi onal, Ethical and Social Issues in Computi ng						Faith Morals	3					Ethics	3						3					Cyberethi cs	3	2	3		
3	Databas e Manage ment Systems and Security						Databas e and Web Applicati ons						Database Manage ment Systems	3						3						3										
4	Security Project Manage ment						Data Structur es and Algorith ms	4					Project Proposal	3					Project Manage ment	3						3					IT Project Manage ment I					
5	Probabil ity and Statistics						Probabil ity and Statistics						Informat ion System Audit	3					Introduc tion to Statistics	3						Element ary Probabil ity & Statistics	3-4					Probabili ty and Statistics	3	2	3	
6	Researc h Methodo logy							4						2						3						3						3	2	3		
7	Web Design													3					3						3					Internet Software Develop ment	0	3	1			

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—	Sana'a University					National University of Singapore					Imam Abdulrahman Bin Faisal					Capitol Technology University					Southeast Missouri State University					Bahrain University																		
	Faculty of Computer and IT					Computing					Computer Science and Information Technology s					Cyber and Information Security					HARRISON COLLEGE OF BUSINESS AND COMPUTING					College of Information Technology																		
	Department of Cybersecurity and Digital Forensics					Computer Science					Bachelor of Science					Bachelor of Science					Information Technology and Cybersecurity					Department of Information Systems																		
	Cybersecurity					Information Security					Cyber Security and Digital Forensics					Cyber and Information Technology					Cybersecurity					Cybersecurity																		
	Republic of Yemen					Singapore					Saudi Arabia					United States- Maryland					United States					Bahrain																		
	46					55										45					30					45																		
T o t a l o f C H .	138					160					124					120					120					132																		
	4					4					4					4					4					4																		
	Cour se		Course Hours				Cour se		Course Hours				Cour se		Course Hours				Cour se		Course Hours				Cour se		Course Hours				Cour se		Course Hours											
C			H	L	T	P			C	H	L	T			P	C	H	L			T	P	C	H			L	T	P	C			H	L	T	P	C	H	L	T	P			
8												Cyber Laws & Security Policy	3							Humanit ies Electives (2)**/ Social Science Electives (2)**	3							Humanit ies & Fine Arts	3							Humanit ies and Social Sciences Elective	3	2	3					
Level 3 - Semester 2																																												
1	Mobile Applicati on program ming												3								3								Mobile Computi ng	3								3	2	3				
2	System Analysis and design												3								3								Software Engineeri ng I	3									Secure Software Engineeri ng					
3	Information Security and Risk manage ment												Information Security Manage ment & Standard s	3							3								Information Security in System Adminis tration										IT Auditing and Business Continuit y /Govern ance and Manage ment of Enterpris e IT					
4	Digital Forensic s												Digital Evidence Analysis /Digital Forensic Techniqu es and Tools	3							Digital Forensics and the Investiga tive Process*							Comput er Forensic s										Digital Forensics	0	6	3			
5	Ethical Hacking												Architect ure of Secure Operatin g System	3															Security in Data Protocol s										Ethical Hacking	3	2	3		

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	Department of Cybersecurity and Digital Forensics					Computer Science					Bachelor of Science					Bachelor of Science					Information Technology and Cybersecurity					Department of Information Systems						
	Cybersecurity					Information Security					Cyber Security and Digital Forensics					Cyber and Information Technology					Cybersecurity					Cybersecurity						
	Republic of Yemen					Singapore					Saudi Arabia					United States- Maryland					United States					Bahrain						
	46					55										45					30					45						
T o t a l o f C H .	138					160					124					120					120					132						
	4					4					4					4					4					4						
	Cour se	Course Hours					Cour se	Course Hours					Cour se	Course Hours					Cour se	Course Hours					Cour se	Course Hours						
		C H	L	T	P	C H		L	T	P	C H	L		T	P	C H	L	T		P	C H	L	T	P		C H	L	T	P			
6	Web develop ment security							4						2							Web Applicati on Security / Web Develop ment & Security						Entrepre neurship and Digital Innovatio n					
	Training					Industrial Practice					Cooperative Summer Training Program (COOP) (Completed 90 credit hours)																					
Level 4 - Semester 1																																
1	Mobile & Wireless Security										Mobile & Wireless Security	3					Applied Wireless Network Security*															
2	Software Security										Secure Software Design and Engineering	3					Introduction to Incident Handling and Malicious Code*/Malware Analysis/Reverse Engineering*															
3	Cloud Computi ng						4					3									Cloud Computi ng						Cloud Computi ng I					
4	Elective (1)						8				Elective Course	3					HU-331or HU-332 Arts and Ideas									ITCY Elective 1						

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	Department of Cybersecurity and Digital Forensics					Computer Science					Bachelor of Science					Bachelor of Science					Information Technology and Cybersecurity					Department of Information Systems										
	Cybersecurity					Information Security					Cyber Security and Digital Forensics					Cyber and Information Technology					Cybersecurity					Cybersecurity										
	Republic of Yemen					Singapore					Saudi Arabia					United States- Maryland					United States					Bahrain										
	46					55										45					30					45										
T o t a l o f C H .	138					160					124					120					120					132										
	4					4					4					4					4					4										
	Cour se		Course Hours				Cour se		Course Hours				Cour se		Course Hours				Cour se		Course Hours				Cour se		Course Hours				Cour se		Course Hours			
C			H	L	T	P			C	H	L	T			P	C	H	L			T	P	C	H			L	T	P	C			H	L	T	P
5	Graduation Project (1)						Software Development Project						3					Senior Design Project I*									Senior Project	3	2	3						
Level 4 - Semester 2																																				
1	Penetration Security										Security Threats & Vulnerabilities	3						Penetration Testing*										3	2	3						
2	Secure Coding						Information Systems and Organisations					Applied Cryptography	3					Secure Coding									Security Risk Assessment and Counter measures	3	2	3						
3	Elective (2)										Elective Course	3															ITCY Elective 2	3	2	3						
4	Graduation Project (2)						Cybersecurity Computing Project					Project Implementation	3					Senior Design Project II*									ITCY Elective 3	3	2	3						
5											Elective Course	3															ITCY Elective 4									

20. Admission Requirements:

1. Admissions to the program shall be made as per the admission rules set by the Ministry of Higher Education and Scientific Research as well as Sana'a University admission guidelines.
2. General Secondary school certificate (Science Section) or any equivalent certificate with grade as specified in the admission rules made by Ministry of Higher Education and Scientific Research.
3. Pass the aptitude test and personal interview if any.
4. Any necessary requirement for specialization, decided by the Department and Faculty.

21. Attendance and Graduation Requirements:

1. Student attendance should not be less than 75%.
2. Student will graduate after successfully passing all program requirements.
3. Total credit hours for the program is 138 credit hours.
4. Minimum score for any student to pass any **credit hours course** is 50% marks.

22. Grading System:

From 90% to 100% of total marks	Excellent
From 80% to less than 90%	Very Good
From 65% to less than 80%	Good
From 50% to less than 65%	Pass
Less than 50%	Poor/Fail

23. Facilities Required for Running the Program:

1. Sufficient Classrooms furnished with all necessary pieces and equipment.
2. Labs. as per the course's specifications.
3. Computer and Computer Networks Labs: Three Labs are connected each to other and to the Internet.
4. Academic and administrative staff offices.

24. Program Assessment:

Type of the Sample who Assess the program		Instruments used	Sample
1	Students	Questionnaires	
2	Academic Staff	Providing Specialized Academic Staff, Courses Evaluation Templates	

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3	Administrative Staff	Courses Evaluation Templates In The End Semester, Questionnaires	
4	Quality Assurance Unit in University	Providing specialized academic staff, follow-up, program development and improvement strategy, continuous evaluation	
5	Accreditation & Quality Assurance Council, Yemen	Standard Criteria Of Accreditation & Quality Assurance Council,	

25. Program Quality Standards:

- 1st Level standard of Academic Program Specification (2017), Council for Accreditation & Quality Assurance, Yemen.
- ABET, Computing Accreditation Commission, Criteria for Accrediting Computing Programs, Effective for Reviews during the 2020-2021 Accreditation Cycle.

26. Internal and external training to satisfy program standards::

1. Implement the training field in the summer of the third level,
2. The students in this track would typically work towards getting the specialization certificates in cybersecurity. Where the director of the program/department/college announces to the students of the program to register for the available certificates/training courses and the cost of each certificate. After that, students of the program register for the certificates they want, and the students pays the additional undergraduate tuition for each certificate they choose. Or the director of the program/department/college distributes the students of the program in groups on the following certificates:
 - Systems Security Certified Practitioner (SSCP),
 - Cisco Certified Network Administrator/Administration (CCNA),
 - GIAC Penetration Tester certification (GPEN),
 - Certified Ethical Hacker (CEH)*
 - SANS/GIAC Security Essentials*: SysAdmin, Audit, Network, and Security/Global Information Assurance Certification,
 - Certified Information Security Manager (CISM)
 - Comp TIA Security +
 - Certified Information Systems Security Professional (CISSP)

* These courses are considered foundational and might provide a good starting point for people just getting started in the cybersecurity field.

27. Program Policies:

Based on University Regulations

1. (Class Attendance):

A student should attend not less than 75 % of total hours of the subject; otherwise he/she will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring a proof statement from university Clinic. If the

	absent is more than 25% of a course total contact hours, student will be required to retake the entire course again.
2.	(Tardy): For late in attending the class, the student will be initially notified. If he repeated lateness in attending class he/she will be considered as absent.
3.	(Exam Attendance/Punctuality): A student should attend the exam on time. He/she is permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam.
4.	(Assignments & Projects): Assignments and projects are given as per course specification; the student has to submit all the assignments for checking on time, mostly one week after given the assignment.
5.	(Cheating): For cheating in exam, a student will be considered as fail. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.
6.	(Plagiarism): Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proofed a plagiarism of a student, he/she will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university or according to the university roles.
7.	(Other policies): Mobile phones are not allowed to use during a class lecture. It must be closed; otherwise the student will be asked to leave the lecture room. - Mobile phones are not allowed in class during the examination. - Lecture notes and assignments might be given directly to students using soft or hard copy.



Annex- 1, Survey on the Strategic Orientations of the Department and Similar Departments, and their Alignment to the Strategic Orientations of the University and Faculty:

Benchmarked Programs:

- 1- **National University of Singapore - Singapore.** [https:// www.comp.nus.edu.sg](https://www.comp.nus.edu.sg)
Cybersecurity Program Information: <https://www.comp.nus.edu.sg/programmes/ug/isc/curr/>
- 2- **Imam Abdulrahman Bin Faisal University Dammam - Saudi Arabia .** [https:// https://www.iau.edu.sa/](https://www.iau.edu.sa/)
Cybersecurity Program Information: <https://www.iau.edu.sa/en/news/cyber-security-and-digital-forensics-of-the-ccsit-iau-is-accredited-by-abet>
- 3- **Capitol Technology University - United States- Maryland:** [https:// www.captechu.edu](https://www.captechu.edu)
Cybersecurity Program Information: <https://www.captechu.edu/degrees-and-programs/bachelors-degrees/cybersecurity-bs>
- 4- **Southeast Missouri State University - United States- Missouri:** [https:// www.semo.edu](https://www.semo.edu)
Cybersecurity Program Information: <https://semo.edu/study/cybersecurity.html>
- 5- **University of Bahrain - Bahrain.** <https://www.uob.edu.bh/>
Cybersecurity Program Information: <https://bub.bh/courses/bsc-computer-science-with-cyber-security/>



1. Vision of the Corresponding Departments and Suggested Vision:

#	The Department	Vision
1.		
2.		
3.		
4.		
5.		
6.		
7.		

2. Mapping of Department Vision to the University and Faculty Visions:

University Vision	Faculty of Computer and IT Vision	Department of Cybersecurity and Digital Forensics Vision
تطمح جامعة صنعاء الى الريادة الوطنية في التعليم والتعلم والبحث العلمي وخدمة المجتمع وأن تكون من أفضل الجامعات الإقليمية وبيت الخبرة في اليمن.	الريادة أكاديمياً وبخثياً في مجالات الحوسبة والتكنولوجيا على المستوى الوطني والاقليمي.	To qualify cybersecurity and digital forensics professionals تأهيل متخصصين في الأمن السيبراني والقضايا الجنائية الرقمية.



3. Mission of the Corresponding Departments and Suggested Mission:

#	The Department	Mission
1.		
2.		
3.		
4.		
5.		
6.		
7.		

4. Mapping of Department Mission to the University and Faculty Missions:

University Mission	Faculty of Computer and IT Mission	Cybersecurity and Digital Forensics Department of Cybersecurity Mission
الإسهام في جهود التنمية المستدامة من خلال توفير بيئة تعليم عال يحقق معايير الجودة وخدمات بحثية متميزة في ظل شراكة وطنية مثمرة تركز على الشفافية والمهنية والإبداع.	تقديم برامج أكاديمية متميزة وتوفير بيئة تعليمية وبحثية محفزة في مجالات الحوسبة التكنولوجية وفقاً لمعايير الجودة والاعتماد الأكاديمي وتعزيز الشراكة والمسئولية المجتمعية ومواكبة متطلبات سوق العمل.	Providing distinguish academic and research programs in cybersecurity and digital forensics issues through providing an appropriate motivated education environment for creative thinking and scientific research excellence according to accreditation standards to meet the needs of the local and regional labor market. تقديم برامج أكاديمية وبحثية متميزة في مجال الأمن السيبراني والقضايا الجنائية الرقمية من خلال توفير بيئة تعليمية ملائمة تحفز على التفكير الإبداعي والبحث العلمي وفقاً لمعايير الاعتماد لتلبية متطلبات سوق العمل المحلي والإقليمي.



5. Objectives (Educational) of the Corresponding Departments and Suggested Objectives:

6- Mapping of Department Objectives to the University and Faculty Objectives:

University Objectives	Faculty of Computer and IT Objectives	Department of Cybersecurity and Digital Forensics Objectives
1. إتاحة الفرص الدراسية المتخصصة والمتعمقة للطلبة في ميادين المعرفة المختلفة تلبي احتياجات البلاد من التخصصات والفنيين والخبراء. 2. العناية باللغة العربية وتعليمها وتطويرها وتعميم استعمالها كلفة علمية وتعليمية في مختلف مجالات المعرفة والعلوم وذلك باعتبارها الوعي الحضاري للمعاني والقيم والأخلاق للحضارة العربية والإسلامية. 3. تطوير المعرفة بإجراء البحوث العلمية في مختلف مجالات المعرفة سواء على المستوى الفردي أو الجماعي، وتوجيهها لخدمة احتياجات المجتمع وخطط التنمية. 4. الاهتمام بتنمية التقنية "التكنولوجيا" وتطويرها والاستفادة منها في تطوير المجتمع. 5. تشجيع حركة التأليف والترجمة والنشر في مختلف مجالات المعرفة مع التركيز بوجه خاص على التراث اليمني. 6. الإسهام في رقي الآداب والفنون وتقديم العلوم. 7. توفير المناخ الأكاديمي المساعد على حرية الفكر والتعبير والنشر بما لا يتعارض مع الإسلام وقيمه السامية ومثلها العليا. 8. تقوية الروابط مع الجامعات والمؤسسات العامة والخاصة في البلاد بما يكفل التفاعل المتبادل والبناء للمعارف والخبرات والموارد والمشاركة التي تكفل الإسهام الفعال في إحداث التنمية الشاملة في البلاد. 9. توثيق الروابط العلمية والثقافية مع الجامعات والهيئات العلمية ومراكز البحوث والتطوير العربية والأجنبية بما يساعد على تطوير الجامعة وتعزيز مكانتها.	1. تقديم وتطوير برامج أكاديمية وبحثية متميزة في مجالات الحاسوب وتكنولوجيا المعلومات وفقا لمتطلبات الجودة والاعتماد الأكاديمي. 2. إعداد كوادر علمية وبحثية متخصصة في مجالات الحاسوب وتكنولوجيا المعلومات قادرة على المنافسة والإبداع في سوق العمل محليا وإقليميا. 3. المساهمة في تطوير المعرفة في مجالات الحاسوب وتكنولوجيا المعلومات من خلال تشجيع البحث العلمي وتوجيهه لخدمة المجتمع وتنميته. 4. تقديم الاستشارات العلمية والتقنية ذات العلاقة بمجالات الحاسوب وتكنولوجيا المعلومات والمساهمة في تدريب الكوادر الفنية للقطاعات المختلفة. 5. إقامة علاقات شراكة مع المؤسسات العلمية المناظرة لتبادل الخبرات في المجالات العلمية والبحثية.	1. Providing academic programs with high quality that meet the needs of the local and regional labor market in cybersecurity and digital forensics disciplines. 2. Providing an appropriate and stimulated (motivated) learning environment for creativity, innovation and research excellence. 3. Preparing graduates with knowledge, intellectual and general skills for future careers in cybersecurity and digital forensics issues to be active and responsible members of society. 4. Developing the students and academic staff capabilities for self-learning, effective communication,



University Objectives	Faculty of Computer and IT Objectives	Department of Cybersecurity and Digital Forensics Objectives
10. تقديم الدراسات والاستشارات الفنية والمتخصصة لمختلف أجهزة الدولة ومؤسساتها العامة والمختلطة. 11. المساهمة في تطوير السياسات وأساليب العمل في مؤسسات وأجهزة الدولة والقطاعين العام والخاص وتقديم النماذج والتجارب المبتكرة لحل المشاكل المختلفة. 12. رفع كفاءة العاملين في مؤسسات وأجهزة الدولة والقطاعين العام والخاص، وذلك من خلال المساهمة في برامج الإعداد والتأهيل أثناء الخدمة.		and teamwork, taking into account the ethics of the profession. 5. Encouraging faculty members and involve students in projects/scientific research in cybersecurity. 6. Providing scientific and technical consulting, and participating in training technical cadres to secure the various sectors. 1. تقديم برامج أكاديمية في مجال الامن السيبراني والقضايا الجنائية الرقمية بجودة عالية تلبي احتياجات سوق العمل المحلي والإقليمي. 2. توفير بيئة تعليمية مناسبة ومحفزة للإبداع والابتكار والتميز البحثي. 3. إعداد الخريجين بالمعارف والمهارات الفكرية والعامة للوظائف المستقبلية في مجال الامن السيبراني والقضايا الجنائية الرقمية ليكونوا أعضاء فاعلين ومسؤولين في المجتمع. 4. تنمية قدرات الطلبة وأعضاء هيئة التدريس على التعلم الذاتي والتواصل الفعال والعمل الجماعي مع مراعاة أخلاقيات المهنة.



University Objectives	Faculty of Computer and IT Objectives	Department of Cybersecurity and Digital Forensics Objectives
		5. تشجيع أعضاء هيئة التدريس وإشراك الطلبة في المشاريع / البحث العلمي في تخصص الأمن السيبراني. 6. تقديم لاستشارات العلمية والفنية، والمشاركة في تدريب الكوادر الفنية لتأمين القطاعات المختلفة.

Annex- 2, Academic Standards Curriculum Criteria of Accreditation Board

1.



Council for Accreditation & Quality Assurance

National Academic Reference Standards (NARS)
For -----
First Edition

Council for Accreditation & Quality Assurance, Yemen
May 2018

2



Annex- 3, Unified Regulations for Student Affairs, Ministry of Higher Education and Scientific Research

Attached Separately



Annex- 4, Survey of Similar Accredited Programs at National and International Universities (Benchmarks)

Program No.	The Academic Program	The University	Website	The Faculty/College	The Department	The Country	Degree Award at Program Completion	Program Accrediting Body	Year of Accreditation	Study Duration
Current Program	Cybersecurity	Sana'a University	website	Faculty of Computer Science and Information Technology	Cybersecurity	Yemen	Bachelor of Cybersecurity	Accrediting	Accreditation	4
The 1 st Program	Information Security	National University of Singapore	www.comp.nus.edu.sg	Computing	Computing in Information Security	Singapore	Bachelor of Information Security)	CAC of ABET	2015/2016	4
The 2 nd Program	Cyber Security and Digital Forensics	Imam Abdulrahman Bin Faisal University Dammam	www.iau.edu.sa	Computer Science and Information Technology	Cyber Security and Digital Forensics	Saudi Arabia	BSc (CYS)	ABET	Oct 1, 2018 – Present	5
The 3 rd Program	Cybersecurity	Capitol Technology University	www.captechu.edu	Capitol College	Cyber and Information Security	USA	BSc (CYS)	ABET	Oct 1, 2018 – Present	4
The 4 th Program	Cybersecurity	Southeast Missouri State University	www.semo.edu	Business and Computing	Computer Science	USA	BSc (CYS)	ABET	Oct 1, 2016 – Present	4
The 5 th Program	Cybersecurity	University of Bahrain	https://www.uob.edu.bh/	College of engineering and technology	Computer Science with Cyber Security	Bahrain	BSc (CYS)	ACM/IEEE/ ABET	2013/2010	4



Annex- 5, Survey on Mission and Objectives of the Program and Similar Accredited Programs and its Alignment to the University, Faculty, and Department Missions and objectives

1- Survey on Mission and Objectives of the Program and Similar Accredited Programs

University	National University of Singapore	Imam Abdulrahman Bin Faisal	Capitol Technology University	Southeast Missouri State	University of Bahrain	Sana'a University
Faculty/College	Computing	Computer Science and Information Technology	Capitol College	Business and Computing	College of engineering and technology	Faculty of Computer and Information Technology
Department	Computer Science	Cyber Security and Digital Forensics	Cyber and Information Security	Computer Science	Computer Science with Cyber Security	Cybersecurity and Digital Forensics
Program	Information Security	Cyber Security and Digital Forensics	Cybersecurity	Cybersecurity	Cybersecurity	Cybersecurity
Country	Singapore	Saudi Arabia	USA	USA	Bahrain	Yemen
Program Mission	to educate, inspire and transform	Providing students with quality cybersecurity and digital forensics education to inspire discovery, lifelong learning and professional services with community engagements.	The B.S. in cybersecurity program prepares students for exciting entry level positions protecting customer data and defending the nation's critical infrastructure from	Prepares students to be leaders in the protection of information systems.	The College of Science is dedicated to providing students with knowledge, intellectual and general skills; preparing them for future careers, graduate and professional studies; and	Preparing students with knowledge, skills, values and competitive capabilities to contribute in developing and protecting of the cybersecurity community to meet the needs of the local and regional labour market through providing an appropriate educational environment.



University	National University of Singapore	Imam Abdulrahman Bin Faisal	Capitol Technology University	Southeast Missouri State	University of Bahrain	Sana'a University
			cybercriminals and nation states alike.		guiding them to become active and responsible members of society. The College also aims to generate and disseminate knowledge in areas of national and international concerns that address society's problems and enhance economic development. The College is keen to: build partnerships with the public and private sectors; create a learning environment that provides excellent teaching,	



University	National University of Singapore	Imam Abdulrahman Bin Faisal	Capitol Technology University	Southeast Missouri State	University of Bahrain	Sana'a University
					mentoring, and interactive student-based learning; innovative research; and reach out to local, regional, and global communities.	
Program Objectives	- To provide a broad-based, inter-disciplinary information security undergraduate programming within NUS. - To contribute to the national focus on growing the pool of cyber security professionals in Singapore. - To produce graduates who are able to understand	Graduates of the program will: - Have a successful career in practicing the knowledge and skills of cybersecurity and digital forensics for solving problems and designing appropriate solution following the best practices. - Contribute effectively in	- Within three to five years of graduation, Cybersecurity alumni will be highly sought and will be recognized as having expertise in their field. - Within three to five years of graduation, Cybersecurity alumni will demonstrate a lifelong commitment to expanding	- Recognized by their peers and superiors for their applied skills, problem solving capabilities and professional skills in the field of Cybersecurity. - Professionals as effective communicators in oral and written communication. - Practitioners who incorporate ethical, legal and social	- Review all the College programs and ensure that they are compatible with the needs of the market - Ensure that all the College programs are benchmarked and are of high quality - Create a learning environment that	- Providing the students with theoretical concepts, intellectual skills, values and practical applications in the field of cybersecurity. - Acquiring students' skills, tools and techniques for analyzing, designing, implementing and evaluating computing-based systems secure . - Preparing specialized cadres capable of competing for future careers in the field of cybersecurity that meet



University	National University of Singapore	Imam Abdulrahman Bin Faisal	Capitol Technology University	Southeast Missouri State	University of Bahrain	Sana'a University
	information security issues and practices from both technical and organizational points of view.	the profession of cybersecurity and digital forensics as an individual, team member and leader. 3. Engage actively in lifelong learning, career growth, and community services. 2. Demonstrate ethical and social values in their professional practices.	their professional expertise. 5. Within three to five years of graduation, Cybersecurity alumni will continue to demonstrate character and values by making ethical decisions throughout their professional careers. 6. Within three to five years of graduation, Cybersecurity alumni will strive for the betterment of society by pursuing their vocation.	implications to outcomes of their profession. 4. Professionals actively engaged in activities which allow for the continuous development of their computing and cybersecurity skills.	provides excellent teaching 4- Provide students with knowledge, intellectual and general skills, and prepare them for future careers. 5- Develop students' competence and prepare them to be active and responsible members of society 6- Prepare competitive graduates in the programs offered by the College 7- Focus on scientific research and encourage	the needs of the local and regional labor market. 4. Developing graduates' skills in communication and working within a team or an individually, and encourage them to creative thinking and lifelong learning to be active and responsible in cybersecurity.



University	National University of Singapore	Imam Abdulrahman Bin Faisal	Capitol Technology University	Southeast Missouri State	University of Bahrain	Sana'a University
					faculty members to involve students in scientific research 8-Build partnerships with the public and private stakeholders يهدف برنامج البكالوريوس في الأمن السيبراني إلى إعداد خريجين قادرين على: • الانخراط بنجاح في الحياة المهنية في الوظائف التي تخدم مجالات الأمن السيبراني، لتلبية احتياجات سوق العمل في القطاعين: العام، والخاص، أو الشروع في مسار قيادة الأعمال. • المساهمة القيمة في المجتمع، من خلال الالتزام بالسلوكيات	



University	National University of Singapore	Imam Abdulrahman Bin Faisal	Capitol Technology University	Southeast Missouri State	University of Bahrain	Sana'a University
					الأخلاقية والمهنية في مهنة الأمن السيبراني. الانخراط في ممارسة التعلم مدى الحياة، والتطور المهني، والبحث عن مزيد من فرص التعلم، والتأقلم مع التغيرات في بيئة العمل، وتحقيق الكفاءات القيادية.	
Program ILOs	1. Strong knowledge of computer science foundations and fundamentals, including: a. familiarity with common computer science themes and principles, b. high-level understanding of systems as a whole, and	1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions. 2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements	1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions. 2. Design, implement, and evaluate a computing-based solution to meet a given set of computing	1. An ability to analyze a problem, and to identify and define the computing requirements appropriate to its solution. 2. An ability to design, implement and evaluate a computer-based solution to meet a given set of computing requirements in the context of the discipline.	1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions. 2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements	A 1: Demonstrate an understanding of theoretical knowledge and practical concepts, mathematics, computing and social science fundamentals related to cybersecurity. A 2: Explain, discuss and express security issues and requirements, software components and application, vulnerabilities, threats, attack and risk activities in cybersecurity environment.



University	National University of Singapore	Imam Abdulrahman Bin Faisal	Capitol Technology University	Southeast Missouri State	University of Bahrain	Sana'a University
	c. understanding of the theoretical underpinnings of computer science and their influences in practice. 2. An ability to function effectively in teams to accomplish a common goal. 3. An understanding of professional, ethical, legal, security, and social issues and responsibilities. 4. An ability to analyse the local and global impact of computing on individuals, organizations, and society. 5. Clear recognition of the need for	in the context of the program's discipline. 3. Communicate effectively in a variety of professional contexts. 4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles. 5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline. 6. Apply security principles and practices to	requirements in the context of the program's discipline. 3. Communicate effectively in a variety of professional contexts. 4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles. 5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline. 6. Apply security principles and	3. An ability to communicate effectively with a range of audiences about technical information. 4. An ability to make informed judgments in computing practice based on legal and ethical principles. 5. An ability to function effectively on teams to establish goals, plan tasks, meet deadlines, manage risk and produce deliverables. 6. An ability to apply security principles and practices to the environment, hardware, software, and	in the context of the program's discipline. 3. Communicate effectively in a variety of professional contexts. 4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles. 5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline. 6. Apply security	A 3: Conscious about security policy and planning, professional ethics, crimes legal and organizational responsibilities to maintain business continuity. B 1: Recognize, identify and classify cybersecurity requirements, crimes, threats, vulnerabilities, attacks, risks, networks tools and technologies/techniques in cybersecurity environment. B 2: Analysis and evaluate the impact of computing-based system on society, business and individual, computing system security issues and digital forensics problems based on professional ethics and legal responsibilities, and cybersecurity rules and standards.



University	National University of Singapore	Imam Abdulrahman Bin Faisal	Capitol Technology University	Southeast Missouri State	University of Bahrain	Sana'a University
	and an ability to engage in continuing professional development. 6. An ability to design, implement, and evaluate a computer-based system, process, components, or programming to meet the security needs. 7. An understanding of the processes and challenges that support the delivery and management of information security in an organization. 8. An ability to use the current techniques, skills, and tools necessary for information	maintain operations in the presence of risks and threats.	practices to maintain operations in the presence of risks and threats.	human aspects of a system. 7. An ability to analyze and evaluate systems with respect to maintaining operations in the presence of risks and threats.	principles and practices to maintain operations in the presence of risks and threats.	B 3: Propose suitable cybersecurity solutions, plan, policy, technologies, tools and techniques to meet the society and business continuity needs. B 4: Design, integrate and test a secure computer and network systems, software components and applications that meet organization and individual needs in cyberspace. C 1: Apply and practice theoretical and practical principles of cybersecurity, computing science and mathematics to detect, defend and maintain a business continuity and secure computing-based system assets. C 2: Use cybersecurity standards, and digital forensics concept, tools and techniques to solve and investigate a



University	National University of Singapore	Imam Abdulrahman Bin Faisal	Capitol Technology University	Southeast Missouri State	University of Bahrain	Sana'a University
	security practice.					security problem in cybersecurity practices. C 3: Employ cybersecurity frameworks, tools, techniques and technologies to implement, operate, manage and monitor a secure computer and network systems in the presence of threats and risks in different platforms. C 4: Test, troubleshoot, and develop a secure computer and networks systems, software components and applications that meet organization and individual needs in cyberspace. D 1: Communicate effectively to convince ideas and proposed solutions in different environments. D 2: Function individually, leader or as a team member to accomplish a



University	National University of Singapore	Imam Abdulrahman Bin Faisal	Capitol Technology University	Southeast Missouri State	University of Bahrain	Sana'a University
						common goal based on professional, legal and ethical responsibilities in cybersecurity practices. D 3: Use creative thinking, research skills in solving cybersecurity problem to contribute in improve the enterprise's security and performance. D 4: Keep up with modern cybersecurity skills, standards, tools and techniques for personal professional development and life-long self-learning.



2- Survey/Mapping of Program Mission with the University, Faculty and Department Missions:

University Mission	Faculty of Computer and IT Mission	Cybersecurity and Digital Forensics Department Mission	Cybersecurity Program Mission
الإسهام في جهود التنمية المستدامة من خلال توفير بيئة تعليم عال يحقق معايير الجودة وخدمات بحثية متميزة في ظل شراكة وطنية مثمرة تركز على الشفافية والمهنية والإبداع.	تقديم برامج أكاديمية متميزة وتوفير بيئة تعليمية وبحثية محفزة في مجالات الحوسبة التكنولوجية وفقاً لمعايير الجودة والاعتماد الأكاديمي وتعزيز الشراكة والمسئولية المجتمعية ومواكبة متطلبات سوق العمل.	Providing distinguish academic and research programs in cybersecurity and digital forensics issues through providing an appropriate motivated education environment for creative thinking and scientific research excellence according to accreditation standards to meet the needs of the local and regional labour market. تقديم برامج أكاديمية وبحثية متميزة في مجال الأمن السيبراني والقضايا الجنائية الرقمية من خلال توفير بيئة تعليمية ملائمة تحفز على التفكير الإبداعي والبحث العلمي وفقاً لمعايير الاعتماد لتلبية متطلبات سوق العمل المحلي والإقليمي.	Preparing students with knowledge, skills, values and competitive capabilities to contribute in developing and protecting of the cybersecurity community to meet the needs of the local and regional labour market through providing an appropriate educational environment. إعداد الطلبة بالمعارف والمهارات والقيم والقدرات التنافسية للمساهمة في تطوير وحماية مجتمع الأمن السيبراني تلبي احتياجات سوق العمل المحلي والإقليمي، من خلال توفير بيئة تعليمية مناسبة.



3- Survey/Mapping of Program Objectives with the University, Faculty and Department Objectives:

University Objectives	Faculty of Computer and IT Objectives	Cybersecurity and Digital Forensics Department Objectives	Cybersecurity Program Objectives
1. إتاحة الفرص الدراسية المتخصصة والمتعمقة للطلبة في ميادين المعرفة المختلفة لتلبية لاحتياجات البلاد من التخصصات والفنيين والخبراء. 2. العناية باللغة العربية وتدريبها وتعميم استعمالها كلفة علمية وتعليمية في مختلف مجالات المعرفة والعلوم وذلك باعتبارها الوعاء الحضاري للمعاني والقيم والأخلاق للحضارة العربية والإسلامية. 3. تطوير المعرفة بإجراء البحوث العلمية في مختلف مجالات المعرفة سواء على المستوى الفردي أو الجماعي، وتوجيهها لخدمة احتياجات المجتمع وخطط التنمية. 4. الاهتمام بتنمية التقنية "التكنولوجيا" وتطويرها والاستفادة منها في تطوير المجتمع. 5. تشجيع حركة التأليف والترجمة والنشر في مختلف مجالات المعرفة مع التركيز بوجه خاص على التراث اليمني. 6. الإسهام في رقي الآداب والفنون وتقديم العلوم. 7. توفير المناخ الأكاديمي المساعد على حرية الفكر والتعبير والنشر بما لا	1. تقديم وتطوير برامج أكاديمية وبحثية متميزة في مجالات الحاسوب وتكنولوجيا المعلومات وفقا لمتطلبات الجودة والاعتماد الأكاديمي. 2. إعداد كوادر علمية وبحثية متخصصة في مجالات الحاسوب وتكنولوجيا المعلومات قادرة على المنافسة والإبداع في سوق العمل محليا وإقليميا. 3. المساهمة في تطوير المعرفة في مجالات الحاسوب وتكنولوجيا المعلومات من خلال تشجيع البحث العلمي وتوجيهه لخدمة المجتمع وتنميته. 4. تقديم الاستشارات العلمية والتقنية ذات العلاقة بمجالات الحاسوب وتكنولوجيا المعلومات والمساهمة في تدريب الكوادر الفنية للقطاعات المختلفة. 5. إقامة علاقات شراكة مع المؤسسات العلمية المناظرة لتبادل الخبرات في المجالات العلمية والبحثية.	1. Providing academic programs with high quality that meet the needs of the local and regional labor market in cybersecurity and digital forensics disciplines. 2. Providing an appropriate and stimulated (motivated) learning environment for creativity, innovation and research excellence. 3. Preparing graduates with knowledge, intellectual and general skills for future careers in cybersecurity and digital forensics issues to be active and responsible members of society. 4. Developing the students and academic staff capabilities for self-learning, effective	1. Providing the students with theoretical concepts, intellectual skills, values and practical applications in the field of cybersecurity . تزويد الطلبة بالمفاهيم النظرية والمهارات الفكرية والقيم والتطبيقات العملية في مجال الأمن السيبراني. 2. Acquiring students' skills, tools and techniques for analyzing, designing, implementing and evaluating computing-based systems secure . اكتساب الطلبة المهارات والأدوات والتقنيات اللازمة لتحليل وتصميم وتنفيذ وتقييم أنظمة حاسوبية آمنة 3. Preparing specialized cadres capable of competing for future careers in the field of cybersecurity that meet the



University Objectives	Faculty of Computer and IT Objectives	Cybersecurity and Digital Forensics Department Objectives	Cybersecurity Program Objectives
يتعارض مع الإسلام وقيمه السامية ومثلها العليا. 8. تقوية الروابط مع الجامعات والمؤسسات العامة والخاصة في البلاد بما يكفل التفاعل المتبادل والبناء للمعارف والخبرات والموارد والمشاركة التي تكفل الإسهام الفعال في إحداث التنمية الشاملة في البلاد. 9. توثيق الروابط العلمية والثقافية مع الجامعات والهيئات العلمية ومراكز البحوث والتطوير العربية والأجنبية بما يساعد على تطوير الجامعة وتعزيز مكانتها. 10. تقديم الدراسات والاستشارات الفنية والمتخصصة لمختلف أجهزة الدولة ومؤسساتها العامة والمختلطة. 11. المساهمة في تطوير السياسات وأساليب العمل في مؤسسات وأجهزة الدولة والقطاعين العام والخاص وتقديم النماذج والتجارب المبتكرة لحل المشاكل المختلفة. 12. رفع كفاءة العاملين في مؤسسات وأجهزة الدولة والقطاعين العام والخاص، وذلك من خلال المساهمة في برامج الإعداد والتأهيل أثناء الخدمة.		communication, and teamwork, taking into account the ethics of the profession. 5. Encouraging faculty members and involve students in projects/scientific research in cybersecurity. 6. Providing scientific and technical consulting, and participating in training technical cadres to secure the various sectors. 1. تقديم برامج أكاديمية في مجال الأمن السيبراني والقضايا الجنائية الرقمية بجودة عالية تلبي احتياجات سوق العمل المحلي والإقليمي. 2. توفير بيئة تعليمية مناسبة ومحفزة للإبداع والابتكار والتميز البحثي. 3. إعداد الخريجين بالمعارف والمهارات الفكرية والعامة للوظائف المستقبلية في مجال الأمن السيبراني والقضايا الجنائية	needs of the local and regional labor market. إعداد كوادر متخصصة قادرة على المنافسة للوظائف المستقبلية في مجال الأمن السيبراني تلبي احتياجات سوق العمل المحلية والإقليمية. 4. Developing graduates' skills in communication and working within a team or an individually, and encourage them to creative thinking and lifelong learning to be active and responsible in cybersecurity. تنمية مهارات الخريجين في الاتصال والعمل ضمن فريق أو بشكل فردي، وتشجيعهم على التفكير الإبداعي والتعلم مدى الحياة ليكونوا أعضاء فاعلين ومسؤولين في الأمن السيبراني.



University Objectives	Faculty of Computer and IT Objectives	Cybersecurity and Digital Forensics Department Objectives	Cybersecurity Program Objectives
		الرقمية ليكونوا أعضاء فاعلين ومسؤولين في المجتمع. 4. تنمية قدرات الطلبة وأعضاء هيئة التدريس على التعلم الذاتي والتواصل الفعال والعمل الجماعي مع مراعاة أخلاقيات المهنة. 5. تشجيع أعضاء هيئة التدريس وإشراك الطلبة في المشاريع / البحث العلمي في تخصص الأمن السيبراني. 6. تقديم لاستشارات العلمية والفنية، والمشاركة في تدريب الكوادر الفنية لتأمين القطاعات المختلفة.	



Annex- 6, Alignment of Department Objectives to the Faculty Objective

Department Objectives	Faculty Objectives				
	FObj1	FObj2	FObj3	FObj4	FObj5
DObj1	√				
DObj2		√			
DObj3		√			
DObj4		√	√		
DObj5			√		
DObj6				√	√



Annex- 7, Alignment of Program Intended Learning Outcomes (PILOs) to the Department Objective

Program PILOs	Department Objectives					
	DObj1	DObj2	DObj3	DObj4	DObj5	DObj6
A1	√	√	√		√	
A2		√	√			
A3	√		√	√		√
B1		√	√			√
B2		√	√	√	√	
B3	√		√			√
B4	√		√			
C1		√				√
C2	√		√			
C3		√			√	
C4	√				√	
D1			√	√		
D2			√	√		√
D3		√	√		√	
D4			√	√		√



Annex- 8, Alignment of Program Intended Learning Outcomes (PILOS) to Program Objectives (POs)

Program PILOs	Program Objectives			
	PObj1	PObj2	PObj3	PObj4
A1	√	√		
A2		√	√	
A3	√		√	√
B1	√		√	
B2	√	√		
B3	√		√	
B4	√	√	√	
C1	√			√
C2		√	√	
C3	√	√	√	
C4		√	√	
D1			√	√
D2	√		√	√
D3			√	√
D4			√	√



Annex- 9, Mapping of Program Objectives to the Faculty Mission

Program Objectives	Faculty Mission: تقديم برامج أكاديمية متميزة وتوفير بيئة تعليمية وبحثية محفزة في مجالات الحوسبة التكنولوجية وفقاً لمعايير الجودة والاعتماد الأكاديمي وتعزيز الشراكة والمسؤولية المجتمعية ومواكبة متطلبات سوق العمل.				
	تقديم برامج أكاديمية متميزة	وتوفير بيئة تعليمية وبحثية محفزة في مجالات الحوسبة التكنولوجية	وفقاً لمعايير الجودة والاعتماد الأكاديمي	وتعزيز الشراكة والمسؤولية المجتمعية	ومواكبة متطلبات سوق العمل.
PObj1	✓	✓			
PObj2		✓	✓		
PObj3					✓
PObj4				✓	✓



Annex- 10, Mapping Program Objectives to the Department Mission

Program Objectives	Department Mission			
	Providing distinguish academic and research programs in cybersecurity and digital forensics issues through providing an appropriate motivated education environment for creative thinking and scientific research excellence according to accreditation standards to meet the needs of the local and regional labor market.			
	Providing distinguish academic and research programs in cybersecurity and digital forensics issues	through providing an appropriate motivated education environment for creative thinking and scientific research excellence	according to accreditation standards	to meet the needs of the local and regional labor market.
PObj1			√	
PObj2		√	√	
PObj3	√			√
PObj4		√		



Annex- 11, Mapping of Program Objectives (POs) to the Department Objectives

Program Objectives	Department Objectives					
	DObj1	DObj2	DObj3	DObj4	DObj5	DObj6
PObj1	✓		✓	✓		
PObj2			✓			
PObj3	✓		✓			✓
PObj4		✓		✓	✓	



Annex- 12, Survey of PILOs for Similar Accredited Programs at National and International Universities

Current Program ILOs	Similar Accredited Programs				
	National University of Singapore	University of Imam Abdulrahman Bin Faisal	Capitol Technology University	University of Southeast Missouri State	University of Bahrain
A1	L01	L01, L06	L01, L06	L01, L06	L01, L06
A2	L03	L01,	L01,	L01,	L01,
A3	L03, L07	L04, L06	L04, L06	L04, L06	L04, L06
B1	L07	L02, L06	L02, L06	L02, L06	L02, L06
B2	L04, L06	L01, L02, L04, L06	L01, L02, L04, L06	L01, L02, L04, L06	L01, L02, L04, L06
B3	L07	L02, L06	L02, L06	L02, L06	L02, L06
B4	L06	L02, L06	L02, L06	L02, L06	L02, L06
C1	L08	L01, L06	L01, L06	L01, L06	L01, L06
C2	L08	L02, L06	L02, L06	L02, L06	L02, L06
C3	L07,	L01, L06	L01, L06	L01, L07	L01, L07
C4	L06	L02, L06	L02, L06	L02, L06	L02, L06
D1	--	L03,	L03,	L03,	L03,
D2	L02	L05, L04,	L05, L04,	L05, L04,	L05, L04,
D3	L08	L05	L05	L05	L05
D4	L05	L05, L06	L05, L06	L05, L06	L05, L06

اسم هيئة الاعتماد: مجلس الاعتماد الأكاديمي وضمان جودة التعليم العالي، إصدار المعايير: مايو 2018م إن وجد

Annex- 13, Alignment of Program PILOs with Council of Accreditation (NARS) and ABET Standards

Accreditation Body: National Academic Reference Standards (NARS), Yemen, May 2018 If Any

Program PILOs	NARS (Yemen), ILOs for CYS Programs	ABET PILOs
A1	Note: The cybersecurity Program not included in NARS - Yemen	LO1, LO6
A2		LO1,
A3		LO4, LO6
B1		LO2, LO6
B2		LO1, LO2, LO4, LO6
B3		LO2, LO6
B4		LO2, LO6
C1		LO1, LO6
C2		LO2, LO6
C3		LO1, LO6
C4		LO2, LO6
D1		LO3,
D2		LO5, LO4,
D3		LO5
D4		LO5, LO6



I. GRADUATE ATTRIBUTES

Upon successful completion of an undergraduate cybersecurity program, the graduates will be able to:

- 1- Problem solver and critical thinker

مفكر ناقد وحال للمشكلات

- 2- Analyst and detector of cybersecurity requirements, vulnerabilities, weaknesses, threats and risks

محلل ومكتشف لاحتياجات وثغرات ونقاط ضعف وتهديدات ومخاطر الامن السيبراني

- 3- Operator and master of cybersecurity systems, technologies, and tools at various institutional levels

متعامل ومشغل لأنظمة وتقنيات وأدوات الامن السيبراني في مختلف المستويات المؤسسية

- 4- Designer of secure computer systems and networks

مصمم لأنظمة وشبكات حاسوبية آمنة

- 5- Resist security attacks and maintain a safe working environment

متصدي للهجمات الأمنية ومحافظ على استمرار بيئة عمل آمنة

- 6- Communicator and Team-worker

متواصل وعضو فريق فعال

- 7- Social, legal, and ethical responsible

متحمل للمسؤولية المجتمعية والأخلاقية والقانونية

- 8- Self-learner

متعلم ذاتي



II. LEARNING OUTCOMES

A. Knowledge & Understanding Skills

Upon successful completion of an undergraduate Cybersecurity education programs, the graduates will be able to:

- A 1:** Demonstrate an understanding of theoretical knowledge and practical concepts, mathematics, computing and social science fundamentals related to cybersecurity.
- A 2:** Explain, discuss and express security issues and requirements, software components and application, vulnerabilities, threats, attack and risk activities in cybersecurity environment.
- A 3:** Conscious about security policy and planning, professional ethics, crimes legal and organizational responsibilities to maintain business continuity.

B. Cognitive/Intellectual Skills

Upon successful completion of an undergraduate Cybersecurity education program, the graduates will be able to:

- B 1:** Recognize, identify and classify cybersecurity requirements, crimes, threats, vulnerabilities, risks, networks tools and technologies in cybersecurity practices.
- B 2:** Analysis and evaluate the impact of computing-based system on society, business and individual, computing system security and digital forensics issues based on professional ethics and legal responsibilities, cybersecurity rules and standards.
- B 3:** Propose suitable cybersecurity solutions, plan, policy, technologies, tools and techniques to meet the society and business continuity needs.
- B 4:** Design, integrate and test a secure computer and network systems, software components and applications that meet organization and individual needs.

C. Practical and Professional Skills:

Upon successful completion of an undergraduate Cybersecurity education program, the graduates will be able to:



- C 1:** Apply and practice theoretical and practical principles of cybersecurity, computing science and mathematics to detect, defend and maintain a business continuity and secure computing-based system assets.
- C 2:** Use cybersecurity standards, and digital forensics concept, tools and techniques to solve and investigate a security problem in cybersecurity practices.
- C 3:** Employ cybersecurity frameworks, tools, techniques and technologies to implement, operate, manage and monitor a secure computer and network systems in the presence of threats and risks in different platforms.
- C 4:** Test, troubleshoot, and develop a secure computer and networks systems, software components and applications that meet organization and individual needs.

D. General and Transferable Skills

Upon successful completion of an undergraduate Cybersecurity education program, the graduates will be able to:

- D 1:** Communicate effectively to convince ideas and proposed solutions in different environments.
- D 2:** Function individually, leader or as a team member to accomplish a common goal based on professional, legal and ethical responsibilities in cybersecurity practices.
- D 3:** Use creative thinking, research skills in solving cybersecurity problem to contribute in improve the enterprise's security and performance.
- D 4:** Keep up with modern cybersecurity skills, standards, tools and techniques for personal professional development and life-long self-learning.



III. Example of ABET: Criteria for Accrediting Computing Programs

GENERAL CRITERIA

Criterion 1. Students

Student performance must be evaluated. Student progress must be monitored to foster success in attaining student outcomes, thereby enabling graduates to attain program educational objectives. Students must be advised regarding curriculum and career matters.

The program must have and enforce policies for accepting both new and transfer students, awarding appropriate academic credit for courses taken at other institutions, and awarding appropriate academic credit for work in lieu of courses taken at the institution. The program must have and enforce procedures to ensure and document that students who graduate meet all graduation requirements.

Criterion 2. Program Educational Objectives

The program must have published program educational objectives that are consistent with the mission of the institution, the needs of the program's various constituencies, and these criteria. There must be a documented, systematically utilized, and effective process, involving program constituencies, for the periodic review of these program educational objectives that ensures they remain consistent with the institutional mission, the program's constituents' needs, and these criteria.

Criterion 3. Student Outcomes

The program must have documented and publicly stated student outcomes that include (1) through (5) below and any outcomes required by applicable Program Criteria. The program may define additional outcomes.

Graduates of the program will have an ability to:

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
3. Communicate effectively in a variety of professional contexts.
4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.



Criterion 4. Continuous Improvement

The program must regularly use appropriate, documented processes for assessing and evaluating the extent to which the student outcomes are being attained. The results of these evaluations must be systematically utilized as input for the program's continuous improvement actions. Other available information may also be used to assist in the continuous improvement of the program.

Criterion 5. Curriculum

The program's requirements must be consistent with its program educational objectives and designed in such a way that each of the student outcomes can be attained. The curriculum must combine technical, professional, and general education components to prepare students for a career, further study, and lifelong professional development in the computing discipline associated with the program.

The curriculum requirements specify topics, but do not prescribe specific courses. The program must include mathematics appropriate to the discipline and at least 30 semester credit hours (or equivalent) of up-to-date coverage of fundamental and advanced computing topics that provide both breadth and depth. The computing topics must include:

1. Techniques, skills, and tools necessary for computing practice.
2. Principles and practices for secure computing.
3. Local and global impacts of computing solutions on individuals, organizations, and society.

Criterion 6. Faculty

Each faculty member teaching in the program must have expertise and educational background consistent with the contributions to the program expected from the faculty member. The competence of faculty members must be demonstrated by such factors as education, professional credentials and certifications, professional experience, ongoing professional development, contributions to the discipline, teaching effectiveness, and communication skills. Collectively, the faculty must have the breadth and depth to cover all curricular areas of the program.

The faculty serving in the program must be of sufficient number to maintain continuity, stability, oversight, student interaction, and advising. The faculty must have sufficient responsibility and authority to improve the program through definition and revision of program educational objectives and student outcomes as well as through the implementation of a program of study that fosters the attainment of student outcomes.

Criterion 7. Facilities



Classrooms, offices, laboratories, and associated equipment must be adequate to support attainment of the student outcomes and to provide an atmosphere conducive to learning. Modern tools, equipment, computing resources, and laboratories appropriate to the program must be available, accessible, and systematically maintained and upgraded to enable students to attain the student outcomes and to support program needs. Students must be provided appropriate guidance regarding the use of the tools, equipment, computing resources, and laboratories available to the program. The library services and the computing and information infrastructure must be adequate to support the scholarly and professional activities of the students and faculty.

Criterion 8. Institutional Support

Institutional support and leadership must be adequate to ensure the quality and continuity of the program. Resources including institutional services, financial support, and staff (both administrative and technical) provided to the program must be adequate to meet program needs. The resources available to the program must be sufficient to attract, retain, and provide for the continued professional development of a qualified faculty. The resources available to the program must be sufficient to acquire, maintain, and operate infrastructures, facilities and equipment appropriate for the program, and to provide an environment in which student outcomes can be attained.

PROGRAM CRITERIA FOR CYBERSECURITY AND SIMILARLY NAMED COMPUTING PROGRAMS

Lead Society: CSAB

These program criteria apply to computing programs using cybersecurity, cyber operations, computer security, information assurance, information security, computer forensics, or similar terms in their titles.

3. Student Outcomes

In addition to outcomes 1 through 5, graduates of the program will also have an ability to:

6. Apply security principles and practices to maintain operations in the presence of risks and threats.

5. Curriculum

The curriculum requirements specify topics, but do not prescribe specific courses. These requirements are:

- A. At least 45 semester credit hours (or equivalent) of computing and cybersecurity course work. The course work must include:

1. Application of the crosscutting concepts of confidentiality, integrity, availability, risk, adversarial thinking, and systems thinking.



2. Fundamental topics from each of the following:
 - a. Data Security: protection of data at rest, during processing, and in transit.
 - b. Software Security: development and use of software that reliably preserves the security properties of the protected information and systems.
 - c. Component Security: the security aspects of the design, procurement, testing, analysis, and maintenance of components integrated into larger systems.
 - d. Connection Security: security of the connections between components, both physical and logical.
 - e. System Security: security aspects of systems that use software and are composed of components and connections.
 - f. Human Security: the study of human behavior in the context of data protection, privacy, and threat mitigation.
 - g. Organizational Security: protecting organizations from cybersecurity threats and managing risk to support successful accomplishment of the organizations' missions.
 - h. Societal Security: aspects of cybersecurity that broadly impact society as a whole.
 3. Advanced cybersecurity topics that build on crosscutting concepts and fundamental topics to provide depth.
- B.** At least 6 semester credit hours (or equivalent) of mathematics that must include discrete mathematics and statistics.



Annex- 14, Survey of Credit Hours of Similar Programs

Benchmarking		Sana'a University	National University of Singapore	Imam Abdulrahman Bin Faisal	Capitol Technology University	Southeast Missouri State	Bahrain University		Average Cr. Hrs.
University Requirements	Credit Hours	14	40	8	--	42	11	--	25.25
	Percentage	10%	25%	5%	--%	35%	8%	--%	18.25%
University Electives	Credit Hours	0	--	-	--	--	9	--	9
	Percentage	0%	--%	%	--%	--%	7%	--%	7%
Faculty Requirements	Credit Hours	20 + 6 GP*	--	30 + 60	--	--	25	--	27.5
	Percentage	15%	--%	(19+39) %	--%	--%	19%	--%	19%
Faculty Electives	Credit Hours	0	--	-	--	--	-	--	
	Percentage	0%	--%	--%	--%	--%	-	--%	
Department Requirements	Credit Hours	0	--	--	--	--	-	--	
	Percentage	0%	--%	--%	--%	--%	-	--%	
Major Requirements	Credit Hours	91	84	47	--	75	75	--	70.25
	Percentage	67%	52.5%	31%	--%	62.5%	57%	--%	50.75%
Major Electives	Credit Hours	6	36	9	--	3	12	--	15
	Percentage	4%	22.5%	6%	--%	2.5%	9%	--%	10%
Practical Courses	Credit Hours	---	--	--	--	--	--	--	--
	Percentage	---%	--%	--%	--%	--%	--%	--%	--%
Training Courses	Credit Hours	3**	--	--	--	--	--	--	--
	Percentage	2%**	--%	--%	--%	--%	--%	--%	--%
Project Courses	Credit Hours	6	--	--	--	--	--	--	--
	Percentage	4%	--%	--%	--%	--%	--%	--%	--%
Total Credit Hours	Credit Hours	137	160	154	120	120	132	---	137

* The credit hour of the graduation project courses are computed in the row of project courses (not computed in the faculty requirements courses).

** The credit hours of the training field is not computed in the credit hours total of the program.



Annex- 15, Survey of Number of Courses and Credit Hours of Similar Programs

University		Sana'a University		National University of Singapore		Imam Abdulrahman Bin Faisal		Capitol Technology		Southeast Missouri State		Bahrain University		Total		Average	
Total Courses and CH		CH	Courses	CH	Courses	CH	Courses	CH	Courses	CH	Courses	CH	Courses	CH	Courses	CH	Courses
University Requirements	Compulsory	14	7	40	14	8	3	--	--	42	14	11	4	--	--	24.6	9
	Electives	--	--	--	--	--	--	--	--	--	--	9	3	--	--	9	3
Faculty Requirements	Compulsory	20	7	--	--	--	--	--	--	--	--	--	--	--	--	9	3
	Electives	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Department Requirements	Compulsory	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Electives	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Major Requirements	Compulsory	91	32	84	28	47	18	--	--	75	25	75	25	--	--	74.8	26
	Electives	6	2	36	12	9	3	--	--	3	1	12	4	--	--	13.2	5
	Graduation Project	6	2	--	--	--	--	--	--	--	--	--	--	--	--	6	2
	Summer Training	3*	1*	--	--	--	--	--	--	--	--	--	--	--	--	3	1
	Industrial Training	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Practical Skills	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Other Courses		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total		137	50+1*	160	55	154	54	120	45	120	30	132	45	--	--		

Note: The Field Training Course is not included in the total of credit hours of the program.



Annex- 16, Themes of Courses of Study and their Weightage

#	Themes	No. of Courses	Credit Hours	Percentage of CH
1	University Requirements	7	14	10%
2	Faculty Requirements	7	20	15%
3	Program Compulsory Courses	32	91	67%
4	Program Elective Courses	2	6	4%
5	Graduation Project Courses	2*	6*	4%
6	Field Training*	1**	3**	--
Program Total		50+TF*=50	137	100%

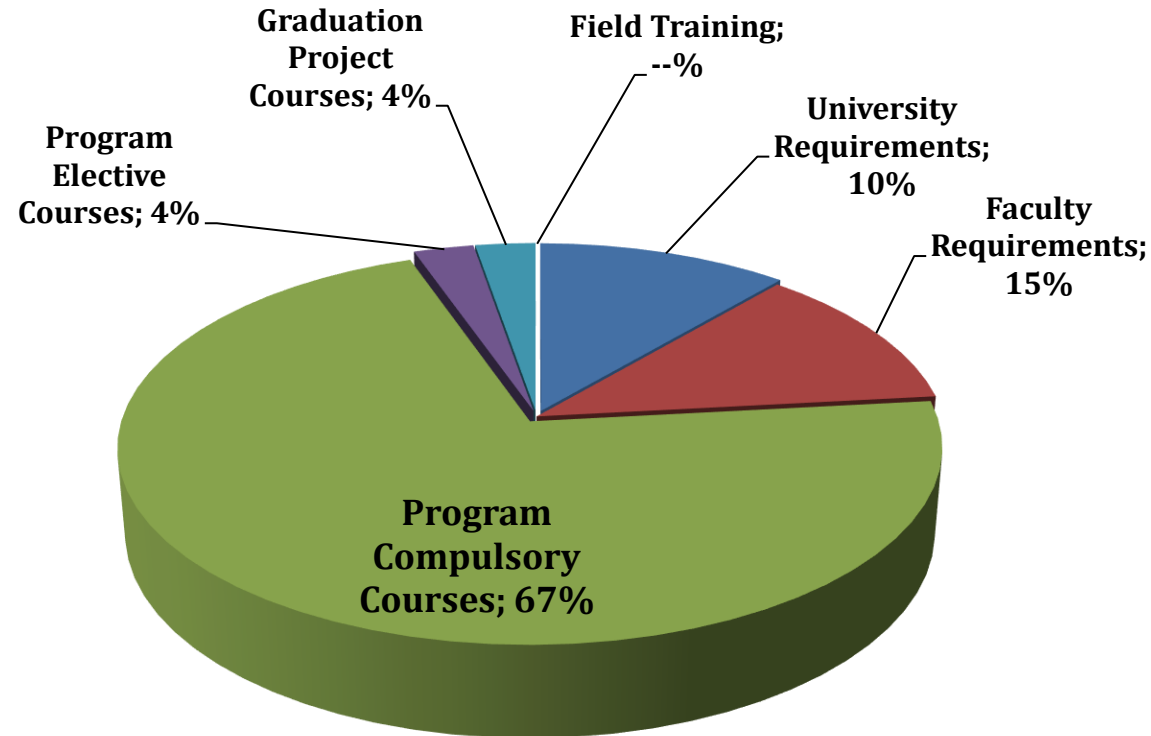
Note:

* Two Graduation Project Courses are Faculty Requirements.

** The Credit Hours of the Training Field Course is not computed in the Credit Hours Total of the Program.



Themes of Courses of Study and their Weightage





Annex- 17, Coding System



Annex- 18, Survey of Course Names per Academic Semesters of Similar Programs

University		Sana'a University	National University of Singapore	Imam Abdulrahman Bin Faisal	Capitol Technology University	Southeast Missouri State University	Bahrain University
No of Courses		50	55	54	45	30	45
Total Cr. Hrs.		137	160	124/153	120	120	132
Total Years		4	4	5	4	4	4
Level 1							
Semester	No	Course Name	Course Name	Course Name	Course Name	Course Name	Course Name
1	1	Introduction to computer	Introduction to Computer Systems	Introduction to Computing /Fundamentals of Info. Systems	Introduction to Data Science	Computer Science I	Fundamentals of Information Systems
	2	Arabic Language (1)					Arabic Language Skills
	3	Mathematics (1)	Introductory Mathematics	Calculus	Intermediate Algebra	Mathematics	Calculus I
	4	English Language (1)			English Communications I	Written Communication	Language Development I
	5	Islamic Culture		Social System in Islam			
	6	National Culture				Constitution Requirement	Islamic Culture
	7			Physics/Biology/ Electronics		C & the Posix Environment	Business Elective I
--		--	--	--	--	--	--
2	1	Programming Fundamentals	Introduction to Computing and Programming I	Fundamentals of Programming	Intro to Programming Using Python	Intro to Computer Programming	Computer Programming I
	2	English Language (2)			English Communications II	Oral Communication	Language Development II
	3	Probability and Statistics	Introduction to Computing and Programming II	Intro to Statist & Probability Theory		Computer Science II	Computer Programming II
	4	Mathematics (2)	Calculus for Computing	Mathematical Foundations of Information Security			
	5	Arabic-Israel Conflicts		Political System in Islam			Modern History of Bahrain and Citizenship



University		Sana'a University	National University of Singapore	Imam Abdulrahman Bin Faisal	Capitol Technology University	Southeast Missouri State University	Bahrain University
f	6	Cybersecurity fundamentals	Introduction to Information Security		Introduction to Information Assurance Concepts	introduction to Cybersecurity/ Introduction to Cyber Operations	Fundamentals of Cybersecurity
	7	Arabic Language (2)					
--		--	--	--	--	--	--
Level 2							
Semester	No	Course Name	Course Name	Course Name	Course Name	Course Name	Course Name
1	1	Linear Algebra	Linear Algebra				
	2	Computer Networks	Computer Networks and Applications	Communication & Network Fund	Introduction to Networking	Introduction to Networks	Introduction to Computer & Network Technology
	3	Computer programming		Object Oriented Programming 1	Intro to Object Oriented Programming C++		
	4	Operating Systems		Operating Systems	Operating Systems	Computer Operating Systems/ Computer Systems & Assembly Language	Network Operating Systems
	5	Discrete Mathematics	Discrete Structures	Discrete Mathematics	Discrete Mathematics	Natural Sciences	
	6	Intro to Programming Using Python			Intro to Network Programming Using C		
	7			Digital Hardware	Introduction to Unix	Social and Behavioral Sciences	Business Elective II
	8			The Economic System in Islam			Human Rights
--		--	--	--	--	--	--
2	1	Database Systems		Database Concepts and Design	Database Management	Database	Database Management Systems
	2	Routing and Switches		Network Protocols and E-Commerce	Internetworking with Routers and Switches	Routing & Switching Essentials	Computer Networks I
	3	Data Structures and Algorithms		Data Structure	Data Structures	Discrete Structures I (	Data Structures /Discrete Structures I/ Design of Algorithms
	4	Cryptography			Secure Data Communications and Cryptography*	Mathematical Cryptography	Cryptography
	5	Object Oriented Programming by pathon		Object Oriented Programming 2			Computer Networks II



University		Sana'a University	National University of Singapore	Imam Abdulrahman Bin Faisal	Capitol Technology University	Southeast Missouri State University	Bahrain University
	6	Communication Skills	Communication for Computing Professionals	Technical Reports / Professional Responsibility		Business Communication	Technical Report Writing
	7	Introduction to Linux		Business (1)	Secure System Administration and Operation (UNIX)*		Network Programming
--		--	--	--	--	--	--
		Level 3					
Semester	No	Course Name	Course Name	Course Name	Course Name	Course Name	Course Name
1	1	Network Security	Computer Systems Security	Network Security/ Network Forensics, Intrusion Detection, and Response	Comprehensive Computer and Network Security*	Information Security & Assurance	Network Security I/ Information Security
	2	Computer Ethics	Professional, Ethical and Social Issues in Computing	Faith Morals	Ethics		Cyberethics
	3	Database Management Systems and Security	Database and Web Applications	Database Management Systems			
	4	Security Project Management	Data Structures and Algorithms	Project Proposal	Project Management		IT Project Management I
	5	Probability and Statistics	Probability and Statistics	Information System Audit	Introduction to Statistics	Elementary Probability & Statistics	Probability and Statistics
	6	Research Methodology					
	7	Web Design					Internet Software Development
	8			Cyber Laws & Security Policy	Humanities Electives (2)**/ Social Science Electives (2)**	Humanities & Fine Arts	Humanities and Social Sciences Elective
--		--	--	--	--	--	--
2	1	Mobile Application programming				Mobile Computing	
	2	System Analysis and design	Introduction to Software Engineering			Software Engineering I	Secure Software Engineering
	3	Information Security and Risk management	Information Security Management	Information Security Management & Standards		Information Security in System Administration	IT Auditing and Business Continuity /Governance and Management of Enterprise IT
	4	Digital Forensics		Digital Evidence Analysis /Digital Forensic	Digital Forensics and the	Computer Forensics	Digital Forensics



University		Sana'a University	National University of Singapore	Imam Abdulrahman Bin Faisal	Capitol Technology University	Southeast Missouri State University	Bahrain University
				Techniques and Tools	Investigative Process*		
	5	Ethical Hacking		Architecture of Secure Operating System		Security in Data Protocols	Ethical Hacking
	6	Web development security				Web Application Security/ Web Development & Security	Entrepreneurship and Digital Innovation
	7						
	8						
		Training	Industrial Practice	Cooperative Summer Training Program (COOP) (Completed 90 credit hours)		Capstone Experience	Internship in Cybersecurity
-- -- -- -- -- -- --							
		Level 4					
Semester	No	Course Name	Course Name	Course Name	Course Name	Course Name	Course Name
1	1	Mobile & Wireless Security		Mobile & Wireless Security	Applied Wireless Network Security*		
	2	Software Security		Secure Software Design and Engineering	Introduction to Incident Handling and Malicious Code*/Malware Analysis/Reverse Engineering*		
	3	Cloud Computing				Cloud Computing	Cloud Computing I
	4	Elective (1)		Elective Course	HU-331or HU-332 Arts and Ideas		ITCY Elective 1
	5	Graduation Project (1)	Software Development Project		Senior Design Project I*		Senior Project
-- -- -- -- -- -- --							
2	1	Penetration Security		Security Threats & Vulnerabilities	Penetration Testing*		



University		Sana'a University	National University of Singapore	Imam Abdulrahman Bin Faisal	Capitol Technology University	Southeast Missouri State University	Bahrain University
	2	Secure Coding	Information Systems and Organisations	Applied Cryptography	Secure Coding		Security Risk Assessment and Countermeasures
	3	Elective (2)		Elective Course			ITCY Elective 2
	4	Graduation Project (2)	Cybersecurity Computing Project	Project Implementation	Senior Design Project II*		ITCY Elective 3
	5			Elective Course			ITCY Elective 4



Annex- 19, Comparison of Program Courses and Similar Programs Courses

	Sana'a University	National University of Singapore					Imam Abdulrahman Bin Faisal					Capitol Technology University					Southeast Missouri State University					Bahrain University						
	Faculty of Computer and IT	Computing					Computer Science and Information Technology s					Cyber and Information Security					HARRISON COLLEGE OF BUSINESS AND COMPUTING					College of Information Technology						
	Department of Cybersecurity and Digital Forensics	Computer Science					Bachelor of Science					Bachelor of Science					Information Technology and Cybersecurity					Department of Information Systems						
	Cybersecurity	Information Security					Cyber Security and Digital Forensics					Cyber and Information Technology					Cybersecurity					Cybersecurity						
	Republic of Yemen	Singapore					Saudi Arabia					United States- Maryland					United States					Bahrain						
	47	55										45					30					45						
Total CHs.	138	160					124					120					120					132						
Years	4	4					4					4					4					4						
	Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours						
		CH	L	T	P		CH	L	T	P		CH	L	T	P		CH	L	T	P		CH	L	T	P			
Level 1 - Semester 1																												
1	Introduction to computer					Introduction to Computer Systems					Introduction to Computing /Fundamentals of Info. Systems	3				Introduction to Data Science	3				Computer Science I	3			Fundamentals of Information Systems	3	2	3
2	Arabic Language (1)											3					3					3			Arabic Language Skills	3	0	3
3	Mathematics (1)					Introductory Mathematics					Calculus	3				Intermediate Algebra	3				Mathematics	3			Calculus I	3	0	3
4	English Language (1)											4				English Communications I	3				Written Communication	3			Language Development I	3	2	3
5	Islamic Culture										Social System in Islam	2					3					3				3	0	3
6	National Culture											3					3				Constitution Requirement	2			Islamic Culture	3	23	
7							4				Physics/Biology/ Electronics	4					3				C & the Posix Environment	4			Business Elective I			



	Sana'a University	National University of Singapore					Imam Abdulrahman Bin Faisal					Capitol Technology University					Southeast Missouri State University					Bahrain University								
	Faculty of Computer and IT					Computing					Computer Science and Information Technology s					Cyber and Information Security					HARRISON COLLEGE OF BUSINESS AND COMPUTING					College of Information Technology				
	Department of Cybersecurity and Digital Forensics					Computer Science					Bachelor of Science					Bachelor of Science					Information Technology and Cybersecurity					Department of Information Systems				
	Cybersecurity					Information Security					Cyber Security and Digital Forensics					Cyber and Information Technology					Cybersecurity					Cybersecurity				
	Republic of Yemen					Singapore					Saudi Arabia					United States- Maryland					United States					Bahrain				
	47					55										45					30					45				
Total CHs.	138					160					124					120					120					132				
Years	4					4					4					4					4					4				
	Course		Course Hours			Course		Course Hours			Course		Course Hours			Course		Course Hours			Course		Course Hours			Course		Course Hours		
			CH	L	T			P	C	H			L	T	P			C	H	L			T	P	C			H	L	T
Level 1 - Semester 2																														
1	Programming Fundamentals					Introduction to Computing and Programming I	4				Fundamentals of Programming	3				Intro Programming to Using Python	3				Intro to Computer Programming	3				Computer Programming I				
2	English Language (2)						4					4				English Communications II	3				Oral Communication	3				Language Development II				
3	Probability and Statistics					Introduction to Computing and Programming II					Intro to Statist & Probability Theory	2					3				Computer Science II	3				Computer Programming II	3	0	3	
4	Mathematics (2)					Calculus for Computing					Mathematical Foundations of Information Security	2					3					4								
5	Arabic-Israel Conflicts						4				Political System in Islam	3					3					4				Modern History of Bahrain and Citizenship	3	2	3	
6	Cybersecurity fundamentals					Introduction to Information Security	4					3				Introduction to Information	3				introduction to Cybersecurity/	4				Fundamentals of Cybersecurity	3	2	3	



	Sana'a University	National University of Singapore					Imam Abdulrahman Bin Faisal					Capitol Technology University					Southeast Missouri State University					Bahrain University								
	Faculty of Computer and IT	Computing					Computer Science and Information Technology s					Cyber and Information Security					HARRISON COLLEGE OF BUSINESS AND COMPUTING					College of Information Technology								
	Department of Cybersecurity and Digital Forensics	Computer Science					Bachelor of Science					Bachelor of Science					Information Technology and Cybersecurity					Department of Information Systems								
	Cybersecurity	Information Security					Cyber Security and Digital Forensics					Cyber and Information Technology					Cybersecurity					Cybersecurity								
	Republic of Yemen	Singapore					Saudi Arabia					United States- Maryland					United States					Bahrain								
	47	55										45					30					45								
Total CHs.	138	160					124					120					120					132								
Years	4	4					4					4					4					4								
	Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours			
		CH	L	T	P		C	H	L	T		P	C	H	L		T	P	C	H		L	T	P	C		H	L	T	P
															Assurance Concepts					Introduction to Cyber Operations										
7	Arabic Language (2)						4					3					3					3					3	2	3	
Level 2 - Semester 1																														
1	Linear Algebra					Linear Algebra	4					3					3					3					3	0	3	
2	Computer Networks					Computer Networks and Applications	4				Communication & Network Fund	2				Introduction to Networking	3				Introduction to Networks	4				Introduction to Computer Network Technology	3	2	3	
3	Computer programming										Object Oriented Programming 1	3				Intro to Object Oriented Programming C++	3					3					3	0	3	
4	Operating Systems						4				Operating Systems	3				Operating Systems	3				Computer Operating Svstems/	3				Network Operating Systems				



	Sana'a University	National University of Singapore					Imam Abdulrahman Bin Faisal					Capitol Technology University					Southeast Missouri State University					Bahrain University								
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	Department of Cybersecurity and Digital Forensics					Computer Science					Bachelor of Science					Bachelor of Science					Information Technology and Cybersecurity					Department of Information Systems				
	Cybersecurity					Information Security					Cyber Security and Digital Forensics					Cyber and Information Technology					Cybersecurity					Cybersecurity				
	Republic of Yemen					Singapore					Saudi Arabia					United States- Maryland					United States					Bahrain				
	47					55										45					30					45				
Total CHs.	138					160					124					120					120					132				
Years	4					4					4					4					4					4				
	Course		Course Hours			Course	Course Hours			Course	Course Hours			Course	Course Hours			Course	Course Hours			Course	Course Hours							
CH			L	T	P		CH	L	T		P	CH	L		T	P	CH		L	T	P		CH	L	T	P				
																		Computer Systems & Assembly Language												
5	Discrete Mathematics					Discrete Structures		4			Discrete Mathematics		2			Discrete Mathematics		3			Natural Sciences		3							
6	Intro to Programming Using Python							4					2			Intro to Network Programming Using C		3					3							
7								4			Digital Hardware		3			Introduction to Unix		3			Social and Behavioral Sciences		4							
8								4			The Economic System in Islam		3					3					4							
Level 2 - Semester 2																														
1	Database Systems										Database Concepts and Design		3			Database Management		3			Database		3							
2	Routing and Switches										Network Protocols and E-Commerce		3			Internetworking with Routers and Switches		3			Routing & Switching Essentials		3							
																					Database Management Systems		3	2	3					
																					Computer Networks I		3	2	3					



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	Cybersecurity					Information Security					Cyber Security and Digital Forensics					Cyber and Information Technology					Cybersecurity					Cybersecurity																					
	Republic of Yemen					Singapore					Saudi Arabia					United States- Maryland					United States					Bahrain																					
	47					55										45					30					45																					
Total CHs.	138					160					124					120					120					132																					
Years	4					4					4					4					4					4																					
	Course		Course Hours				Course		Course Hours				Course		Course Hours				Course		Course Hours				Course		Course Hours																				
CH			L	T	P	C H			L	T	P	C H			L	T	P	C H			L	T	P	C H			L	T	P																		
3	Data Structures and Algorithms										Data Structure								Data Structures				3					Discrete Structures I (				3					Data Structures /Discrete Structures I/ Design of Algorithms				3	2	3				
4	Cryptography												3					Secure Data Communications and Cryptography*				3					Mathematical Cryptography				3					Cryptography											
5	Object Oriented Programming by pathon										Object Oriented Programming 2				3						3										3					Computer Networks II											
6	Communication Skills									Communication for Computing Professionals	4					Technical Reports /Professional Responsibility				3						3			Business Communication				3-4					Technical Report Writing									
7	Introduction to Linux		2								4					Business (1)				3						3									3					Network Programming							
Level 3 - Semester 1																																															



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	Cybersecurity	Information Security					Cyber Security and Digital Forensics					Cyber and Information Technology					Cybersecurity					Cybersecurity											
	Republic of Yemen	Singapore					Saudi Arabia					United States- Maryland					United States					Bahrain											
	47	55										45					30					45											
Total CHs.	138	160					124					120					120					132											
Years	4	4					4					4					4					4											
	Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours											
		CH	L	T	P		CH	L	T	P		CH	L	T	P		CH	L	T	P		CH	L	T	P								
1	Network Security					Computer Systems Security					Network Security/ Network Forensics, Intrusion Detection, and Response	3					Comprehensive Computer and Network Security*	3					Information Security & Assurance	3					Network Security I/ Information Security				
2	Computer Ethics					Professional, Ethical and Social Issues in Computing					Faith Morals	3					Ethics	3						3					Cyberethics	3	2	3	
3	Database Management Systems and Security					Database and Web Applications					Database Management Systems	3						3						3									
4	Security Project Management					Data Structures and Algorithms	4				Project Proposal	3					Project Management	3						3					IT Project Management I				
5	Probability and Statistics					Probability and Statistics					Information System Audit	3					Introduction to Statistics	3						Elementary Probability & Statistics	3-4				Probability and Statistics	3	2	3	
6	Research Methodology						4					2						3						3						3	2	3	



	Sana'a University	National University of Singapore					Imam Abdulrahman Bin Faisal					Capitol Technology University					Southeast Missouri State University					Bahrain University										
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	Cybersecurity	Information Security					Cyber Security and Digital Forensics					Cyber and Information Technology					Cybersecurity					Cybersecurity										
	Republic of Yemen	Singapore					Saudi Arabia					United States- Maryland					United States					Bahrain										
	47	55										45					30					45										
Total CHs.	138	160					124					120					120					132										
Years	4	4					4					4					4					4										
	Course	Course Hours					Course	Course Hours					Course	Course Hours					Course	Course Hours					Course	Course Hours						
		CH	L	T	P	CH		L	T	P	CH	L		T	P	CH	L	T		P	CH	L	T	P								
7	Web Design										3					3						3					Internet Software Development	3	0	3	1	
8											Cyber Laws & Security Policy	3				Humanities Electives (2)**/ Social Science Electives (2)**	3					Humanities & Fine Arts	3				Humanities and Social Sciences Elective	3	2	3		
Level 3 - Semester 2																																
1	Mobile Application programming						4					3					3					Mobile Computing	3						3	2	3	
2	System Analysis and design					Introduction to Software Engineering						3					3					Software Engineering I	3				Secure Software Engineering					
3	Information Security and Risk management					Information Security Management					Information Security Management & Standards	3					3					Information Security in System Administration					IT Auditing and Business Continuity /Governance and Management of Enterprise IT					
4	Digital Forensics						4				Digital Evidence Analysis /Digital Forensic	3				Digital Forensics and the						Computer Forensics					Digital Forensics	3	0	6	3	



	Sana'a University	National University of Singapore					Imam Abdulrahman Bin Faisal					Capitol Technology University					Southeast Missouri State University					Bahrain University													
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	Department of Cybersecurity and Digital Forensics					Computer Science					Bachelor of Science					Bachelor of Science					Information Technology and Cybersecurity					Department of Information Systems									
	Cybersecurity					Information Security					Cyber Security and Digital Forensics					Cyber and Information Technology					Cybersecurity					Cybersecurity									
	Republic of Yemen					Singapore					Saudi Arabia					United States- Maryland					United States					Bahrain									
	47					55										45					30					45									
Total CHs.	138					160					124					120					120					132									
Years	4					4					4					4					4					4									
	Course		Course Hours				Course		Course Hours				Course		Course Hours				Course		Course Hours				Course		Course Hours								
CH			L	T	P	CH			L	T	P	CH			L	T	P	CH			L	T	P	CH			L	T	P						
												Techniques and Tools					Investigative Process*																		
5	Ethical Hacking							8				Architecture of Secure Operating System	3										Security in Data Protocols						Ethical Hacking	3	2	3			
6	Web development security							4					2										Web Application Security/ Web Development & Security						Entrepreneurship and Digital Innovation						
	Training Field					Industrial Practice					Cooperative Summer Training Program (COOP) (Completed 90 credit hours)																								
Level 4 - Semester 1																																			
1	Mobile & Wireless Security											Mobile & Wireless Security	3					Applied Wireless Network Security*																	



	Sana'a University	National University of Singapore					Imam Abdulrahman Bin Faisal					Capitol Technology University					Southeast Missouri State University					Bahrain University											
	Faculty of Computer and IT	Computing					Computer Science and Information Technology s					Cyber and Information Security					HARRISON COLLEGE OF BUSINESS AND COMPUTING					College of Information Technology											
	Department of Cybersecurity and Digital Forensics	Computer Science					Bachelor of Science					Bachelor of Science					Information Technology and Cybersecurity					Department of Information Systems											
	Cybersecurity	Information Security					Cyber Security and Digital Forensics					Cyber and Information Technology					Cybersecurity					Cybersecurity											
	Republic of Yemen	Singapore					Saudi Arabia					United States- Maryland					United States					Bahrain											
	47	55										45					30					45											
Total CHs.	138	160					124					120					120					132											
Years	4	4					4					4					4					4											
	Course	Course Hours					Course	Course Hours					Course	Course Hours					Course	Course Hours					Course	Course Hours							
		CH	L	T	P	C H		L	T	P	C H	L		T	P	C H	L	T		P	C H	L	T	P		C H	L	T	P				
2	Software Security										Secure Software Design and Engineering	3					Introduction to Incident Handling and Malicious Code*/Malware Analysis/Reverse Engineering*																
3	Cloud Computing							4				3										Cloud Computing							Cloud Computing I				
4	Elective (1)							8			Elective Course	3					HU-331or HU-332 Arts and Ideas											ITCY Elective 1					
5	Graduation Project (1)											3					Senior Design Project I*											Senior Project	3	2	3		
Level 4 - Semester 2																																	
1	Penetration Security										Security Threats & Vulnerabilities	3					Penetration Testing*												3	2	3		
2	Secure Coding										Information Systems and Organisations						Applied Cryptography											Security Risk Assessment and Countermeasures	3	2	3		
3	Elective (2)											3					Elective Course											ITCY Elective 2	3	23			
4	Graduation Project (2)										Cybersecurity Computing Project						Project Implementation											ITCY Elective 3	3	2	3		



	Sana'a University					National University of Singapore					Imam Abdulrahman Bin Faisal					Capitol Technology University					Southeast Missouri State University					Bahrain University				
	Faculty of Computer and IT					Computing					Computer Science and Information Technology s					Cyber and Information Security					HARRISON COLLEGE OF BUSINESS AND COMPUTING					College of Information Technology				
	Department of Cybersecurity and Digital Forensics					Computer Science					Bachelor of Science					Bachelor of Science					Information Technology and Cybersecurity					Department of Information Systems				
	Cybersecurity					Information Security					Cyber Security and Digital Forensics					Cyber and Information Technology					Cybersecurity					Cybersecurity				
	Republic of Yemen					Singapore					Saudi Arabia					United States- Maryland					United States					Bahrain				
	47					55										45					30					45				
Total CHs.	138					160					124					120					120					132				
Years	4					4					4					4					4					4				
	Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours				Course	Course Hours			
		CH	L	T	P		CH	L	T	P		CH	L	T	P		CH	L	T	P		CH	L	T	P		CH	L	T	P
5											Elective Course	3														ITCY Elective 4				



Annex- 20, Matrix of Mapping Program PILO's with Courses

I =Introduction; A=Advanced; E=Extension;

L/S=Level/ Semester; CH=Credit Hour(s); L=Lecture; E/T=Exercise/Tutorial; Lab=Computer Laboratory;

#	L/S	Course Code	Course Title	C	H	CH Distribution		Program Intended Learning Outcomes (PILOs)															
								Knowledge and Understanding			Intellectual Skills				Professional & practical skills				General & Transferable Skills				
						L	E/T	Lab	A1	A2	A3	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3	D4
1	L1/S1		Islamic Culture	3	3			I		I													
2		ARB	Arabic Language (1)	3	3			I										I					
3		ENG	English Language (1)	3	3													I					
4			Introduction to Computer	3	2		2	I										I					
5		CYS	Cybersecurity fundamentals	3	3			I	I		I				I								
6			Mathematics (1)	3	2	2		I							I								
7	L1/S2		Arabic Language (2)	3	3			I										I					
8			English Language (2)	3	3													I					
9			National Culture	2	2			I															
10		CS	Programming Fundamentals	3	2		2	I						I									
11			Mathematics (2)	3	2	2		I			I				I					I			
12		CS	Discrete Mathematics	3	2	2		I				I			I						I		
13	L2/S1	CYS	Information Security	3	2	-	2		I		I					I						I	
14			Computer Networks (1)	3	2		2	I						I	I								
15			Computer programming	3	2		2	I						I	I								
16			Operating Systems	3	2		2	I			I			I	I								
17			Probability and statistics	3	2	2		I				I			I		I				I		
18			Arabic Israel Conflict	2	2		-	I															
19	L2/S2		Database Systems	3	2		2	I					I		I								
20			Computer Networks (2)	3	2		2	A						A	A					A	A		
21			Data Structures and Algorithms	3	2		2	I	I				I	I	I			I		I	I		
22			Linear Algebra	3	2	2		A					A		A					A			
23			Object Oriented Programming	3	2		2		A				A	A			A	A		A		A	
24			Communication Skills	3	2	2		A											A				
25			Introduction to Linux	2	1		2		I			I			I	I		I			I		



#	L/S	Course Code	Course Title	C	H	Program Intended Learning Outcomes (PILOs)																	
						CH Distribution			Knowledge and Understanding			Intellectual Skills				Professional & practical skills				General & Transferable Skills			
						L	E/T	Lab	A1	A2	A3	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3	D4
26	L3/S1		Network Security	3	2			2		A		A			A		A		A		A		A
27			Cryptography	3	2			2		A		A			A		A		A		A		A
28			Database Security	3	2			2	A						A	A				A	A		
29			Web Design	3	2			2	I						I	I							
30			Research Methodology	3	2	2			I		I			I		I				I		I	
31			Programming language for Cybersecurity	3	2			2		A	A			A	A			A	A			A	A
32	L3/S2		Mobile Application programming	3	2			2	A					A	A	A			A				A
33			Software engineering	3	2	-		2		A				A	A		A		A		A		A
34			Security Risk management	3	2			2		A	A	A	A			A		A			A	A	
35			Computer Ethics	3	3			-			I		I				I			I	I		
36			Ethical Hacking and Penetration Testing	3	2			2		E	E	E	E			E			E		E	E	E
37			Web development security	3	2			2		A	A	A		A			A		A			A	A
38			Field Training	3					E	E	E	E	E			E		E		E	E	E	
39	L4/S1		Mobile & Wireless Security	3	2			2		E				E	E			E		E			E
40			Software Security	3	2			2		A				A	A	A	A		A		A	A	
41			Project Management	3	2			2		E	E	E	E			E		E		E	E		
42			Elective (1)	3	2			2															
43			Graduation Project (1)	3	3			-	E		E	E	E			E	E			E	E	E	
44	L4/S2		Cloud Computing and Security	3	2			2		E		E			E		E	E			E		E
45			Information Security management system	3	2			2			E	E	E	E			E	E			E	E	
46			Digital Forensics	3	2			2			A		A			A	A				A		A
47			Elective (2)	3	2			2															
48			Graduation Project (2)	3	3			-		E	E			E	E			E	E	E	E	E	E
49	I		IoT Security	3	2			2		E		E				E							E



#	L/S	Course Code	Course Title	C	H	CH Distribution		Program Intended Learning Outcomes (PILOs)															
								Knowledge and Understanding			Intellectual Skills				Professional & practical skills				General & Transferable Skills				
						L	E/T	Lab	A1	A2	A3	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3	D4
50			Reverse Engineering						E				E	E			E	E	E	E	E		
51			Operating System Security	3	2		2			A				A				E	A			A	
52			Cybersecurity Threats and Attack Analysis	3	2		2			A								A	A	A			A
53			AI in Cybersecurity	3	2		2			A				A				A				A	A
54			Cybersecurity Governance, Policy and Privacy	3	2		2			A	A			A		A		A		A	A	A	
55			Blockchain Technologies and applications	3	2		2			E				E		E		E				E	E



Program Learning Outcomes (PILOs):

ILOs Type		Program Intended Learning Outcomes (PILOs)
A	Knowledge and Understanding	A 1: Demonstrate an understanding of theoretical knowledge and practical concepts, mathematics, computing and social science fundamentals related to cybersecurity. A 2: Explain, discuss and express security issues and requirements, software components and application, vulnerabilities, threats, attack and risk activities in cybersecurity environment. A 3: Conscious about security policy and planning, professional ethics, crimes legal and organizational responsibilities to maintain business continuity.
B	Cognitive/Intellectual Skills	B 1: Recognize, identify and classify cybersecurity requirements, crimes, threats, vulnerabilities, risks, networks tools and technologies in cybersecurity practices. B 2: Analysis and evaluate the impact of computing-based system on society, business and individual, computing system security and digital forensics issues based on professional ethics and legal responsibilities, cybersecurity rules and standards. B 3: Propose suitable cybersecurity solutions, plan, policy, technologies, tools and techniques to meet the society and business continuity needs. B 4: Design, integrate and test a secure computer and network systems, software components and applications that meet organization and individual needs.
C	Practical and Professional Skills	C 1: Apply and practice theoretical and practical principles of cybersecurity, computing science and mathematics to detect, defend and maintain a business continuity and secure computing-based system assets. C 2: Use cybersecurity standards, and digital forensics concept, tools and techniques to solve and investigate a security problem in cybersecurity practices.



		C 3: Employ cybersecurity frameworks, tools, techniques and technologies to implement, operate, manage and monitor a secure computer and network systems in the presence of threats and risks in different platforms. C 4: Test, troubleshoot, and develop a secure computer and networks systems, software components and applications that meet organization and individual needs.
D	General and Transferable Skills	D 1: Communicate effectively to convince ideas and proposed solutions in different environments. D 2: Function individually, leader or as a team member to accomplish a common goal based on professional, legal and ethical responsibilities in cybersecurity practices. D 3: Use creative thinking, research skills in solving cybersecurity problem to contribute in improve the enterprise's security and performance. D 4: Keep up with modern cybersecurity skills, standards, tools and techniques for personal professional development and life-long self-learning.