ARIZONA STATE UNIVERSITY

PROPOSAL TO ESTABLISH A NEW UNDERGRADUATE CERTIFICATE

The completed and signed proposal should be submitted by the Dean's Office to: curriculumplanning@asu.edu.

Before academic units can advertise undergraduate certificates or include them in their offerings as described in the university catalogs, they must be recommended for approval by the Senate Curriculum and Academic Programs Committee and the University Senate, and be approved by the Office of the University Provost.

Definition and minimum requirements:

These are the minimum requirements for approval. Individual undergraduate certificates may have additional requirements.

An undergraduate certificate is a programmatic or linked series of courses from a single field or one that crosses disciplinary boundaries and may be freestanding or affiliated with a degree program. The certificate provides a structured and focused set of courses that can be used to enhance a student's baccalaureate experience or professional development.

An undergraduate certificate program:

- Requires a minimum of 15 credit hours of which at least 12 credit hours must be upper division
- Requires a minimum grade of "C" or better for all upper-division courses
- Consists of courses that must directly relate in whole or large part to the purpose of the certificate. Example: Geographic area certificates must include only courses specific to the title of the certificate, other than a non-English language
- Is cross disciplinary; or,
    - Certified by a professional or accredited organization/governmental agency; or,
    - Clearly leads to advanced specialization in a field; or,
    - Is granted to a program that does not currently have a major

College/School/Institute:	New College of Interdisciplinary Arts and Sciences
Department/Division/School:	Mathematical and Natural Sciences
Proposed certificate name:	Applied Cybersecurity
Requested effective date:	Spring 2019

Delivery method and campus or location options: select all locations that apply

☐ Downtown Phoenix ☒ Polytechnic ☒ Tempe ☐ Thunderbird ☒ West ☐ Other: _____

☐ **Both** on-campus **and** ☐ ASU Online* - (check applicable campus(es) from options listed above)

☐ ASU Online only (all courses online and managed by ASU Online)

Note: Once students elect a campus or online option, students will not be able to move between the on-campus and the ASU Online options. Approval from the Office of the University Provost and Philip Regier (Executive Vice Provost and Dean) is required to offer programs through ASU Online. Please contact Ed Plus then complete the ASU Online Offering form in Curriculum ChangeMaker to begin this request.

Proposal Contact

Name:	Lara Ferry	**Title:**	Professor and Director
Phone number:	602-543-2817	**Email:**	Lara.Ferry@asu.edu

DEAN APPROVAL(S)

This proposal has been approved by all necessary unit and College/School levels of review. I recommend implementation of the proposed organizational change.

College/School/Division Dean name: New College of Interdisciplinary Arts and Sciences/Dean Todd Sandrin

Signature _____ **Date:** 7/9/2018

College/School/Division Dean name: *(if more than one college involved)* WP Carey AND Ira A Fulton Schools of Engineering/Amy Hillman and Kyle Squires See attached emails

Signature _____ **Date:** / /20

Note: An electronic signature, an email from the dean or dean's designee, or a PDF of the signed signature page is acceptable.

1. Overview

Provide a brief description of the new certificate.

This collaborative program, between the New College of Interdisciplinary Arts and Sciences, the W.P. Carey School of Business, and the Ira A. Fulton Schools of Engineering, is specifically designed to meet the "One University in Many Places" mandate. The goal is to build competencies in security operations; risk assessment; network security; and governmental and regulatory compliance in an interdisciplinary learning setting. Building upon core skills that students bring with them from their majors, students practice dealing with cyber threats and resolving such issues from multiple perspectives. This is an ideal supplement for students interested in careers in cybersecurity, such as Security Operations Center (SOC) Analyst, Information Security Engineer, Cyber Risk Analyst, Network Security Engineer, and ultimately Chief Information Security Officer (CISO), in both the private sector and within government agencies (FBI, Homeland Security, NSA, DOD).

A. This proposed certificate (check one):

- ☒ is cross disciplinary; or
- ☐ is certified by a professional or accredited organization/governmental agency; or,
- ☒ clearly leads to advanced specialization in a field; or,
- ☐ is granted to a program that does not currently have a major

B. Why should this be a certificate rather than a concentration or a minor?

Students canenroll in this program from a variety of degree/entry points presently on three physical campuses, with several of the courses also being on-line to serve all campuses. Further, this certificate represents an interdisciplinary approach to the practice of cybersecurity. Coursework comes from multiple related, but discrete, disciplines (CIS, CSE, IFT, SER, ACO), each with slightly different approaches to how issues in cybersecurity are handled. By exposing students to these different thought domains, students have a more complete skill set and will be able to integrate and lead effectively within a variety of workplace settings upon entering the workforce.

C. Affiliation

If the certificate program is affiliated with a degree program, include a brief statement of how it will complement the program. If it is not affiliated with a degree program, incorporate a statement as to how it will provide an opportunity for a student to gain knowledge or skills not already available at ASU.

This is meant to complement the Applied Computing (ACO) degree offered in New College, the Computer Information Systems (CIS) degree offered by WP Carey, and the Fulton degree programs in Computer Science and Engineering (CSE; Tempe) and Information Technology (IFT) and Software Engineering (SER) at Poly, among others. We have tried to envision the complete spectrum of source points from which a student might enter this program. It is specifically designed to encourage students from one program to take courses from another program, to encourage cross-disciplinarity and communication. It will complement existing concentrations in those degree programs with unique aspects, such as the experiential learning requirement, that is not a part of any of those concentrations currently.

D. Demand

Explain the need for the new certificate (e.g., market demand, interdisciplinary considerations).

The market demand for trained cyber professionals currently outpaces production 10 to 1 (source: local NBC news broadcast 1/27/2018). See also https://www.isc2.org/News-and-Events/Press-Room/Posts/2018/02/27/ISC2-Finds-84-percent-of-Cybersecurity-Workers-are-Open-to-New-Opportunities. And, see: 1.8 Million person gap in cybersecurity positions: https://www.isc2.org/h/-/media/Files/Research/GISWS-Report-N-America-.ashx As many schools within ASU have a stake in this career field, we have selected this collaborative approach to serving ASU students, writ large.

E. Projected enrollment

What are enrollment projections for the first three years?

	1st Year	**2nd Year** (Yr. 1 continuing + new entering)	**3rd Year** (Yr. 1 & 2 continuing + new entering)
Number of Students (Headcount)	25	35	55

2. Support and Impact

A. Faculty governance

Attach a supporting letter from the chair of the academic unit verifying that the proposed certificate has received faculty approval through appropriate governance procedures in the unit and that the unit has the resources to support the certificate as presented in the proposal, without impacting core program resources.

B. Other related programs

Identify other related ASU programs and outline how the new certificate will complement these existing ASU programs. (If applicable, statements of support from potentially affected academic unit administrators need to be included with this proposal submission.)

We believe we have captured all related programs as a part of planning this proposal. Peripheral programs such as in the College of Public Service and Community Solutions politely declined to be a part of the certificate, as this is a bit too far afield for their students' interest, but gave support for the effort.

C. Letter(s) of support

Provide a supporting letter from each college/school dean from which individual courses are taken.

3. Academic Curriculum and Requirements

A. Knowledge, competencies, and skills

List the knowledge, competencies, and skills (learning outcomes) students should have when they complete this proposed certificate. Examples of program learning outcomes can be found at (https://uoeee.asu.edu/assessment).

Graduates of this program will be able to:

- create secure networks and detect threats to those networks
- identify the key strategies for keeping information secure
- communicate the risk of breach to a wide audience including team members and supervisors
- assess risk and develop strategies for minimizing risk relative to the costs and other factors that vary in different settings
- provide specific application of protection tools, or develop said tools, in a real-world setting
- pass industry-level proficiency exams, such as the Certified Information Systems Security Professional (CISSP), upon completion of the program (note: students are not required to sit for the exam as part of the certificate). Certifications such as CISSP are valued by many employers.

B. Enrollment criteria

Describe the procedures and any qualifications for enrollment in the proposed certificate. If they are identical to the admission criteria for the existing major and degree program under which this certificate will be established, please note that.

Students declare this certificate with an advisor in New College. Other students should meet with their advising staff. Those advisors will communicate to New College that the student wants to add this to their academic plan, along with a demonstration that the necessary requirements have been met. New College will provide the necessary permissions so long as the requirements are met. Students should have completed at least 45 units in their declared majors and have a 2.0 or better cumulate GPA.

Students will need to take CSE 365 OR IFT 302 (iCourse) to enter into the certificate program (this will count towards the first three units of the 15-unit certificate requirement). We have ensured that the pre-requisites for CSE 365 and IFT 302 are such that students can enroll in one of these courses from any imaginable degree entry point.

Students then must take a course from Group A (Security Operations and Risk Management), Group B (Systems and Network Security) OR Group C (Forensics/Cyber Crime), and Group D (Policy), and then also Group E (Applied Project).

Curricular Structure does not lend itself easily to the listing of courses following this group strategy, so we append a table at the end of this document. Group E (Applied Project) courses are listed under D. Curricular Structure - Other Curricular Requirements.

Students must complete their A - D requirements prior to enrolling in their Group E (Applied Project). Students may take more than one semester of applied project, but only 3 units will count towards the certificate.

Students must complete at least 6 unique units that do not count towards their Bachelor's degree, or any concentrations that they might be pursuing as a part of that degree.

Students must take courses from at least 2 different prefixes.

C. Program Map

Attach a copy of the "proposed" map for this certificate program. Instructions on how to create a "proposed certificate map" in BAMM can be found in the Build a Major Map Training Guide.

D. Curricular structure

Provide the curricular structure for this certificate. Be specific in listing required courses and specify the total minimum number of hours required for the certificate.

Required certificate courses				
Prefix	**Number**	**Title**	**Is this a new Course?**	**Credit Hours**
CSE	365	Information Assurance	No	3
		OR	(Select one)	
IFT	302	Foundations of Information and Computer System Security	No	
			(Select one)	
			Section sub-total:	3
Elective certificate courses				
Prefix	**Number**	**Title**	**Is this a new Course?**	**Credit Hours**
Choose one course from **Group A Security Operations:**				
ACO	461	Security Operations OR	No	3
CIS	401	Managing Cyber Risks in Enterprise Business Processes OR	No	3
IFT	481	Information System Security	No	3
Choose one course from **Group B: Systems and Network Security** or **Group C: Forensics/Cyber Crime**				
Group B: Systems and Network Security				
ACO	431	Network Security OR	No	3
CSE	466	Computer Systems Security OR	No	3
CSE	468	Computer Network Security OR	No	3
IFT	458	Middleware Programming and Database Security OR	No	3
IFT	475	Security Analysis	No	3
Group C: Forensics/Cyber Crime				
ACO	350	Systems Programming OR	No	3

CSE	469	Computer and Network Forensics OR	No	3
IFT	482	Network Forensics	No	3
Choose one course from **Group D: Policy**				
ACO	351	Governance, Risk and Compliance OR	No	3
CIS	402	Privacy, Ethics and Compliance Issues OR	No	3
CSE	467	Data and Information Security OR	No	3
IFT	483	Developing Security Policy	No	3
			Section sub-total:	9

Other certificate requirements **E.g. –** Capstone experience, internship, clinical requirements, field studies, foreign language skills as applicable	**Credit Hours**
ACO 484 Internship or ACO 499 Individualized Instruction, OR	3
CIS 440 Capstone in Information Systems OR,	
CSE 485 Computer Science Capstone Project I or CSE 486 Computer Science Capstone Project II, OR	
IFT 401 Information Technology Capstone Project I or IFT 402 Information Technology Capstone Project II,	
Section sub-total:	3
Total minimum credit hours required for certificate	**15**

E. Minimum residency requirement
How many hours of the certificate must be ASU credit?

15

F. New courses
Provide a brief course description for each new course.

none

Note: All new required courses should be submitted in Curriculum Changemaker and ready for Provost's Office approval before this certificate is put on Curriculum and Academic Programs Committee (CAPC) agenda.

4. Administration and Resources

A. Administration

How will the proposed certificate be administered (including admissions, student advisement, retention, etc.)?

Each college offering courses in the certificate program can approve the adding of students to the certificate program. The colleges and their advising team leaders will meet annually (virtually or in person), as part of the catalog revision cycle, to discuss best practices, lessons learned, changes to admission policy, changes to catalog copy, changes to degree requirements, etc.

B. Resources

What are the resource implications for the proposed certificate, including any projected budget needs? Will new books, library holdings, equipment, laboratory space and/or personnel be required now or in the future? If multiple units/programs will collaborate in offering this certificate please discuss the resource contribution of each participating program. Letters of support must be included from all academic units that will commit resources to this certificate.

None

C. Primary faculty

List the primary faculty participants regarding this proposed certificate. For interdisciplinary certificates, please include the relevant names of faculty members from across the University.

Name	**Title**	**Area(s) of Specialization as they relate to proposed certificate**
Kuai Xu	Professor	Applied Computing (New College)
Kim Jones	Professor of Practice	Cyber Security (New College)
Paul Steinbart	Professor	Computer Information Systems (WPC)
Kevin Gary	Associate Professor	CIDSE - Poly (IAFSE)
Gail-Joon Ahn	Professor	CIDSE (IAFSE)
Adam Doupe	Assistant Professor	CIDSE (IAFSE)

5. Additional Materials

A. Complete and attach the Appendix document.

B. Provide one or more model programs of study (if appropriate).

C. Attach other information that will be useful to the review committees and the Office of the Provost.

ARIZONA STATE UNIVERSITY

PROPOSAL TO ESTABLISH A NEW UNDERGRADUATE CERTIFICATE

APPENDIX

OPERATIONAL INFORMATION FOR UNDERGRADUATE CERTIFICATES

(This information is used to populate the Degree Search/catalog website.

Please consider the student audience in creating your text.)

1. **Proposed Certificate Name:** Applied Cybersecurity

2. **Marketing Description**
Optional. 50 words maximum. The marketing description should not repeat content found in the program description.

In this certificate program, traditional computing skills are balanced with communication, critical-thinking and problem-solving skills, which are further honed by applying these skills in real-world settings. Students benefit from experts in research and industry, balancing both perspectives, and graduate with a mastery of the industry's critical knowledge, skills and abilities.

3. **Program Description (150 words maximum)**
The applied cybersecurity certificate program is designed to build competencies in security operations, risk assessment, network security, and governmental and regulatory compliance in an interdisciplinary learning setting. Building upon core skills that students bring with them from their majors, students practice dealing with cyber threats and resolving issues from multiple perspectives. This certificate is an ideal supplement for students interested in careers in cybersecurity in both the private sector and within government agencies (FBI, Homeland Security, NSA, DOD) in positions such as:

- chief information security officer
- cyber risk analyst
- information security engineer
- network security engineer
- security operations center analyst

The program is offered through a collaboration between the New College of Interdisciplinary Arts and Science, the Ira A. Fulton Schools of Engineering and the W. P. Carey School of Business**.**

4. **Contact and Support Information**

Building code and room number: *(Search ASU map)*	FAB N100
Program office telephone number: (*i.e. 480/965-2100*)	602/543-3000
Program Email Address:	MNSadvising@asu.edu
Program Website Address:	https://newcollege.asu.edu/mathematical-natural-sciences-degree-programs

5. **Program Requirements**
Remember to attach a copy of the "proposed" map for this certificate program. Instructions on how to create a "proposed certificate map" in BAMM can be found in the Build a Major Map Training Guide.

6. **Enrollment Requirements**
If applicable, list any special enrollment requirements applicable to this certificate in addition to the standard text. Enrollment requirements for all undergraduate certificates include the following text:

A student pursuing an undergraduate certificate must be enrolled as a degree-seeking student at ASU. Undergraduate certificates are not awarded prior to the award of an undergraduate degree. A student already holding an undergraduate degree may pursue an undergraduate certificate as a nondegree-seeking graduate student.

To enroll in this certificate program, students should have completed at least 45 credit hours in their declared majors and have a 2.00 cumulative GPA or better.

Students should pay attention to the prerequisites needed for required certificate courses and make sure to complete prerequisite courses prior to enrolling in the certificate program.

CSE 365 Information Assurance has prerequisites of CIS 235, CSE 220 or CSE 240.

Pre-requisites for CIS 235: CIS 105, 200 or 220; MAT 210, 211, 270 or 271

Pre-requisites for CSE 220: CSE 205

Pre-requisites for CSE 240: ACO 102 or CSE 205 or a GIS major with GIS 222

IFT 302 Foundations of Information and Computer System Security has prerequisites of IFT 259, and HSE 230, PSY 230 or STP 226.

Pre-requisites for HSE 230: MAT 117 or higher, and HSE 101 or PSY 101

Pre-requisites for PSY 230: PSY 101 and MAT 119 or higher

Pre-requisites for STP 226: MAT 117 or higher

Pre-requisites for IFT 259: IFT 201

Pre-requisites for IFT 201: IFT 101, as well as pre- or co-requisites of MAT 243, and IFT 102 or SER 200

7. Keywords

List no more than 5-7 keywords that can be used to search for this program. Keywords should be specific to the proposed program.

Cyber, Information Security, Cybercrime, Data Breach, Prevention, Malware, Computing, Computer

8. Delivery/Campus Information Options: On-campus only (ground courses and/or iCourses)

Note: Once students elect a campus or online option, students will not be able to move between the on-campus and the ASU Online options. Approval from the Office of the Provost and Philip Regier (Executive Vice Provost and Dean) is required to offer programs through ASU Online.

9. Campus/Locations: indicate **all** locations where this program will be offered.

☐ Downtown Phoenix ☒ Polytechnic ☒ Tempe ☐ Thunderbird ☒ West ☐ Other: _____

2018 - 2019 CERTIFICATE Map
Applied Cybersecurity (Proposed)

Program Requirements

The certificate in applied cybersecurity consists of a minimum of 15 upper-division credit hours earned at ASU. Six credit hours must be unique and not count towards a student's undergraduate degree. All courses used to satisfy requirements for the certificate must be passed with a "C" (2.00) or better. Students must select courses from more than one prefix to fulfill certificate requirements.

Students must take CSE 365 or IFT 302 and one course each from groups A, B or C, and D; then one course from Group E for a total of five courses or 15 credit hours. It is recommended that the Group A course be taken concurrently with CSE 365 or IFT 302. The Group B or C and D courses must be taken after successful completion of CSE 365 or IFT 302. Group A through D courses must be completed successfully before enrolling in the Group E required course.

Required Courses -- 3 credit hours

CSE 365: Information Assurance or IFT 302: Foundations of Information and Computer System Security (3)

Electives -- 9 credit hours

Group A - Security Operations and Risk Management -- 3 credit hours

ACO 461: Security Operations (3)
CIS 401: Managing Cyber Risks in Enterprise Business Processes (3)
IFT 481: Information System Security (3)

Group B - Systems and Network Security OR Group C - Forensics/Cyber Crime -- 3 credit hours

Group B - Systems and Network Security:
ACO 431: Network Security (3)
CSE 466: Computer Systems Security (3)
CSE 468: Computer Network Security (3)
IFT 458: Middleware Programming and Database Security (3)
IFT 475: Security Analysis (3)

Group C - Forensics/Cyber Crime:
ACO 350: Systems Programming (CS) (3)
CSE 469: Computer and Network Forensics (3)
IFT 482: Network Forensics (3)

Group D - Policy -- 3 credit hours

ACO 351: Governance, Risk and Compliance (3)
CIS 402: Privacy, Ethics and Compliance Issues (3)
CSE 467: Data and Information Security (3)
IFT 483: Developing Security Policy (3)

Group E - Project -- 3 credit hours

Students may take more than one semester of Applied Project but only three credit hours will count towards the certificate.
ACO 484: Internship or ACO 499: Individualized Instruction (3)
CIS 440: Capstone in Information Systems (L) (3)
CSE 485: Computer Science Capstone Project I (L) or CSE 486: Computer Science Capstone Project II (L) (3)
IFT 401: Information Technology Capstone Project I or IFT 402: Information Technology Capstone Project II (3)

Depending on a student's undergraduate program of study, prerequisite courses may be needed in order to complete the requirements of this certificate.

ASU New College of Interdisciplinary Arts and Sciences
Arizona State University

May 17, 2018

To: Todd Sandrin, Dean and Professor
New College of Interdisciplinary Arts and Sciences

From: Lara Ferry, Director and Professor
School of Mathematics and Natural Sciences

Subject: Applied Cybersecurity Certificate

Attached please find the Proposal to Establish the Certificate in Applied Cybersecurity. This interdisciplinary proposal is a joint effort between faculty in the School of Mathematics and Natural Sciences, the Ira A. Fulton Schools of Engineering, and the W.P. Carey School of Business.

This proposal was approved by the New College Undergraduate Curriculum Committee. Please approve this proposal and forward it for further approvals. We are requesting an expedited review and launch for this timely certificate.

School of Mathematical and Natural Sciences
Physical Address: PO Box 37100, Mail Code 2352, Phoenix, AZ 85069-7100
Shipping Address: 4701 West Thunderbird Road, Glendale, AZ 85306-4908
Voice (602) 543-6050 Fax: (602) 543-6073

Appendix A: Course Layout according to Group Structure

Group A: SOC/Risk	Group B: System/Network Sec	Group C: Forensic/Cyber Crime	Group D: Policy	Group E: Project
IFT 481(i)	IFT 475(i)	IFT 482(i)	IFT 483(i)	IFT 401/2(i)
ACO 461	IFT 458(i)	CSE 469	CSE 467	CSE 485/6
CIS 401	CSE 466	ACO 350	ACO 351	ACO 484/499
	CSE 468		CIS 402	CIS 440
	ACO 431			

Certificate requirements:

1. Students must take CSE365 *or* IFT302(i), and one course each from groups A, B *or* C, D; and then E, for a total of 5 courses or 15 units.
2. Group A courses may be taken at the same time as CSE365 or IFT302, and this is encouraged whenever possible.
3. Group B/C, and D, courses should be taken after CSE365 or IFT302
4. Students must complete Group A - D courses prior to enrolling in Group E courses.
5. 6 units must be unique and not counted towards the BS or BA degree
6. 6 units must be from different colleges or prefixes.
7. Each college offering the courses in this concentration may have additional requirements for the students in the concentration, for example, Fulton Schools of Engineering my request that all units beyond the 6 mentioned in item 6 above be completed in FSE

(i) Denotes courses available as i-Courses, increasing our reach to students. Note that this program could readily roll out as an ASU Online degree, even in partnership with the Plus Alliance institutions, adding their on-line courses to the matrix.

From:	Kyle Squires
To:	Amy Hillman (DEAN); Patricia Friedrich
Cc:	Stacey Kimbell; James Collofello; Jeremy Helm
Subject:	RE: University-wide Certificate in Cybertechnology and Information Security (CyTIS)
Date:	Tuesday, April 10, 2018 9:42:49 AM
Attachments:	image001.png

Also supportive and approve. - Kyle

From: Amy Hillman (DEAN)
Sent: Tuesday, April 10, 2018 9:30 AM
To: Patricia Friedrich <Patricia.Friedrich@asu.edu>; Kyle Squires <squires@asu.edu>
Cc: Stacey Kimbell <kimbell@asu.edu>
Subject: Re: University-wide Certificate in Cybertechnology and Information Security (CyTIS)

Thank you, we are supportive and approve.

Amy

Amy Hillman, PhD
Dean and Rusty Lyon Chair of Strategy
Arizona State University
W. P. Carey School of Business
amy.hillman@asu.edu | Ph: 480.965.3402

ASU W. P. Carey School of Business
Arizona State University

Where Business is Personal®

From: Patricia Friedrich <Patricia.Friedrich@asu.edu>
Date: Tuesday, April 10, 2018 at 8:45 AM
To: Amy Hillman <AMY.HILLMAN@asu.edu>, Kyle Squires <squires@asu.edu>
Cc: Stacey Kimbell <kimbell@asu.edu>
Subject: FW: University-wide Certificate in Cybertechnology and Information Security (CyTIS)

Dear Amy, dear Kyle:

I hope you are doing well. I am attaching the proposal for the university-wide Cyber Certificate (CyTIS). Since we are partnering with your units, I am told we need approval by the three deans. In lieu of signatures, an email note confirming your approval will also be sufficient. Todd will sign it as soon as I receive your replies.

Thank you so much,

Patty

Patricia Friedrich, PhD
Associate Dean for Academic Programs,
New College of Interdisciplinary Arts and Sciences
Professor of Linguistics/Rhetoric and Composition,
School of Humanities, Arts, and Cultural Studies
Arizona State University P. O. Box 37100
4701 W. Thunderbird Rd. Mail Code 3051
Phoenix, AZ, USA 85069-7100
voice 602 543-6046