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University Council

October 11, 2019

UNIVERSITY CURRICULUM COMMITTEE – 2019-2020
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Dear Colleagues:

The attached proposal from the Franklin College of Arts and Sciences for a new major in Cybersecurity and Privacy (M.S. Non-Thesis) will be an agenda item for the October 18, 2019, Full University Curriculum Committee meeting.

Sincerely,

John Maerz, Chair
University Curriculum Committee

cc: Provost S. Jack Hu
Dr. Rahul Shrivastav

Institution: University of Georgia

Date Completed at the Institution: 12/01/2018

Name of Proposed Program/Inscription: Cybersecurity and Privacy (M.S.)

Degree: Master of Science (M.S.)

Major: Cybersecurity and Privacy

CIP Code: 11100301

School/Division/College: Franklin College of Arts and Sciences

Department: Computer Science

Anticipated Implementation Date: Fall 2020

Requesting Differential Tuition Rate ___ Yes[1] _X_ No

Delivery Mode (Check all that apply):

On-campus, face-to-face only	X
Off-campus location, face-to-face only (specify the location):	
Online Only *If this program will be offered online, within two weeks after Board approval, the USG institution must upload requisite information into Georgia ONmyLINE using the institutional PDA account.* *See Appendix II for the specific questions involved for Georgia ONmyLINE.*	
Combination of on-campus and online (specify whether 50% or more is offered online for SACSCOC)	
Combination of off-campus and online (specify whether 50% or more is offered online for SACSCOC)	
Hybrid, combination delivery, but less than 50% of the total program is online based on SACSCOC	
Contractual Location (specify the location and timeframe/start and end dates):	

[1] All documents and forms requesting a differential tuition rate must be submitted to the Office of Fiscal Affairs prior to Academic Affairs Review of the Degree Proposal.

1) **Forecast:** If this program was not listed on one of the past two-year academic forecasts provide an explanation concerning why it was not forecasted, but is submitted at this time.

   This program was not included in the University of Georgia's Academic Forecast because it had not been submitted through the faculty governance process.

2) **Academic Framework:** Within the context of strategic planning of all resources and divisions within short-term and long-term perspectives, provide a narrative that explains campus leadership review and attention to newly institutionally approved programs within the last four years, low-producing programs, and post-approval enrollment analyses prior to approving the proposed program for submission to the system office.

   The Office of Instruction reviews newly institutionally approved programs, low-producing programs, and post-approval enrollment to monitor and assess future viability of all programs.

3) **Rationale:** Provide the rationale for proposing the new academic program. *(In other words, does the state need the program; should your institution offer the program; and can your institution develop and implement the program.)*

   Security and privacy vulnerabilities affect every technology we use, from wearable and portable devices, such as smartwatches and smartphones, to national critical infrastructure, such as the power grid and air traffic control systems. The proposed program in Cybersecurity and Privacy (M.S.) is committed to helping meet the nation's cybersecurity research and educational needs and to working with colleagues in academia, industry, and government to further satisfy this critical need.

   On October 31, 2017, "the National Science Foundation (NSF) announced $74.5 million in funding for foundational research and education that aims to address the growing cybersecurity challenge. This investment, through the NSF Secure and Trustworthy Cyberspace (SaTC) program, is critical to achieving a safe, secure, resilient and trustworthy cyberspace, including associated critical infrastructure such as the energy grid and transportation systems." "The Secure and Trustworthy Cyberspace program is poised to strengthen our nation's competitive edge through safer and more secure cyber systems, and to develop the knowledge base that will lead to a well-trained cyber workforce," said Jim Kurose, NSF assistant director for Computer and Information Science and Engineering (CISE)." Safeguarding cyberspace requires a wealth of expertise from many disciplines, and we are especially excited about the interdisciplinary, highly collaborative nature of this portfolio across a wide range of research areas" (https://www.nsf.gov/news/news_summ.jsp?cntn_id=243566&WT.mc_id=USNSF_51&WT.mc_ev=click).

   The need for expertise in the broad field of cybersecurity has grown tremendously in recent years. *Forbes Magazine* reports, "Some estimate that between $9 and $21 trillion of global economic value creation could be at risk if companies and governments are unable to

successfully combat cyber threats" (http://www.forbes.com/sites/frontline/2015/07/13/why-cybersecurity-leadership-must-start-at-the-top/).

The Computer Science Department at UGA has six faculty members whose research areas are in cybersecurity and privacy. The Computer Science Department at UGA has established an Institute for Cybersecurity and Privacy (ICSP). The National Security Agency and Department of Homeland Security named the UGA Institute for Cybersecurity and Privacy a National Center of Academic Excellence in Cybersecurity Research.

In addition, the Computer Science Department has established a Graduate Certificate in Cybersecurity. All of the above make the Computer Science Department very well qualified to offer an M.S. in Cybersecurity and Privacy. Currently, Georgia Tech offers a Cybersecurity (M.S.) that was effective spring 2019 and will be offered online. https://www.bizjournals.com/atlanta/news/2018/08/09/georgia-tech-introduces-online-cyber-security.html. They have also offered a face-to-face version since 2002 according to the article above (http://www.iisp.gatech.edu/masters-degree). But, the state does not have an M.S. program in Cybersecurity and Privacy. The proposed M.S. program will have a big impact by having graduates who have the expertise and the skills in cybersecurity and privacy.

4) **Mission Fit and Disciplinary Trends:** Description of the program's fit with the institutional mission and nationally accepted trends in the discipline (explain in narrative form). If the program is outside the scope of the institutional mission and sector, provide the compelling rationale for submission.

The Master of Science in Cybersecurity and Privacy will fit the mission of the University of Georgia as it provides the necessary expertise of graduates in the high-demand area of cybersecurity and privacy. One of the missions of UGA is its commitment to excellence in public service, economic development, and technical assistance activities designed to address the strategic needs of the state of Georgia. This program will support this mission of UGA by providing a well-trained workforce in cybersecurity and privacy.

This program will also support the mission of the newly created UGA Institute for Cybersecurity and Privacy, which is housed in the Department of Computer Science, and is part of the Franklin College of Arts and Sciences that will advance research with implications for economic vitality and national security. It also enhances the mission of the Georgia Informatics Institute for Research and Education (GII) that was established in fall 2016 at UGA (http://gii.uga.edu).

This major also fits in with the trends in the nation. In order to meet the immediate demand for cybersecurity and privacy, many universities across the U.S. have recently introduced cybersecurity programs at the graduate level. More information on the top 25 master's degrees in cybersecurity can be found at the website: https://www.cyberdegrees.org/listings/top-online-masters-in-cyber-security-programs/. A few universities have cybersecurity and privacy degrees at the graduate level, such as the New Jersey Institute of Technology (http://catalog.njit.edu/graduate/computing-sciences/computer-science/cyber-security-privacy-

ms/). We expect the number of new graduate cybersecurity and privacy programs to increase substantially in the near future because of the high demand in the expertise in this area.

5) **Description and Objectives:** Program description and objectives (explain in narrative form).

The Computer Science Department is proposing a new master's program in Cybersecurity and Privacy. This program will be useful for all students, particularly in the fields of computer science, mathematics, and engineering. The program aims to develop expertise in various aspects of computer security and privacy, such as networking, operating systems, network and systems security, and data and communications privacy. The need for expertise in the broad field of cybersecurity has grown tremendously in recent years. *Forbes Magazine* reports that "some estimate that between $9 and $21 trillion of global economic value creation could be at risk if companies and governments are unable to successfully combat cyber threats" (http://www.forbes.com/sites/frontline/2015/07/13/why-cybersecurity-leadership-must-start-at-the-top/). In addition, the U.S. government has initiatives to expand cybersecurity education and the professional workforce, such as part of the Comprehensive National Security Initiative (https://www.coursehero.com/file/11441186/cybersecurity/); the executive branch will "begin a campaign to promote cybersecurity awareness and digital literacy from our boardrooms to our classrooms and begin to build the digital workforce of the 21st century." The proposed program is intended to help provide a well-trained workforce to meet the increasing demand for cybersecurity and privacy experts in the modern economy.

6) **Need:** Description of the justification of need for the program. (Explain in narrative form why the program is required to expand academic offerings at the institution, the data to provide graduates for the workforce, and/or the data in response to specific agency and/or corporation requests in the local or regional area, and/or needs of regional employers.) (A list of resources, not exhaustive, is available on the public web link along with the proposal form at: http://www.usg.edu/academic_programs/new_programs)

Students majoring in Computer Science, as well as related mathematical and engineering disciplines, would benefit from the proposed program as new courses will be designed and existing courses will be restructured to include material that will support the program. This program will attract new graduate students whose main interests are in cybersecurity and privacy to the institution. This is very consistent with the "USG Cybersecurity Initiative" that will focus all of the cyber education and training resources across USG in order to meet the needs of the U.S. Army Cyber Command, the National Security Agency, the financial transaction processing industry, and the health informatics/electronic medical records industry. The initiative aims to create a cybersecurity workforce of sufficient scale, quality, and capability to meet the needs of Georgia companies, military installations, government agencies and other institutions." For more information please refer to: http://gov.georgia.gov/press-releases/2014-12-10/deal-state-acts-high-demand-career-initiative-report. Also note the report from Information Systems Audit and Control Association, Inc. (ISACA): "Cybersecurity skills are in high demand, as threats continue to plague enterprises around the world. An overwhelming majority of students surveyed by ISACA recognizes this and plan to work in a position that requires cybersecurity knowledge. However, one in five report that their universities do not offer cybersecurity courses and less than half feel they will have the adequate skills and knowledge when they graduate"

(http://www.isaca.org/cyber/pages/cybersecurity-fundamentals-certificate/aspx).This proposed M.S. program is in line with the UGA strategic plan (https://provost.uga.edu/_resources/documents/UGA_Strategic_Plan_2020_-_October_30_2012.pdf) on pages 11, 14, and 19.

7) **Demand:** Please describe the demand for the proposed program. Include in this description the supporting data from 1) existing and potential students and 2) requests from regional industries. How does the program of study meet student needs and employer requirements in terms of career readiness and employability, requirements to enter the profession, post-graduate study, and disciplinary rigor at the level required for professional success and advanced educational pursuits? *(In other words, how does the program of study prepare students for the next step?)*

In the Department of Computer Science, which has over 1,100 undergraduate students, current courses related to the proposed M.S. program have experienced increasing enrollments. Nationally, a large number of universities have started programs in cybersecurity. At a national level, cybersecurity programs are experiencing an undiminished and sustained upward trend. A formal survey of undergraduate Computer Science majors was conducted in upper-level computer science courses to determine interest in a master's program. The students were asked "If an M.S. degree in Cybersecurity and Privacy was available in the Computer Science Department at UGA next year, please indicate your level of interest in pursuing such degree: 0: No Interest, 1: Not sure, 2: Would consider, 3. Probably Yes, 4: Definitely Yes. Please circle only one choice." Of the 266 students responding, 175 indicated interest in pursuing a master's degree in Cybersecurity and Privacy. Therefore, we expect a strong demand for such a degree.

8) **Duplication:** Description of how the program does not present duplication of existing academic offerings in the geographic area, within the system as a whole, and within the proposing institution regardless of academic unit. If similar programs exist, indicate why these existing programs are not sufficient to address need and demand in the state/institution's service region and how the proposed program is demonstrably different or complementary to other USG degrees and majors.

There is not currently a major in Cybersecurity and Privacy at the University of Georgia. In Georgia, these are the programs that are currently offered at the different public schools within the University System of Georgia:

Institution Name	**Title of Existing Program**	**Link to Existing Program Information**	**Notes**
Georgia Southern University	Graduate Certificate in Cybercrime Cyber Defense Certificate	https://cogs.georgiasouthern.edu/admission/certificate-in-cybercrime-online/	

Augusta University	Information Security Management (M.S.)	http://catalog.augusta.edu/preview_program.php?catoid=28&poid=4230	
Clark Atlanta University	Computer Science (M.S.) with a concentration in Computer Networks and Security	http://www.cau.edu/department-of-computer-and-information-science/computer-and-information-science-graduate-programs.html	Fifteen (15) hours of concentration electives, including a graduate thesis (if applicable). Concentration electives are available in Computer Network and Security, Computer Architecture, and Information Systems.
Columbus State University	Applied Computer Science (M.S.) with a concentration in Cyber Defense	https://cs.columbusstate.edu/cae-ia/	
Georgia Institute of Technology	Cybersecurity (M.S.)	https://pe.gatech.edu/degrees/cybersecurity https://www.gatech.edu/academics/degrees/masters/cybersecurity-ms-cybersecurity	Program is also offered online
Kennesaw State University	Master of Science in Information Technology	http://ccse.kennesaw.edu/it/programs/msit.php	
Middle Georgia State University	Information Technology (M.S.I.T.)	https://mga.edu/information-technology/programs.php	
University of North Georgia	Graduate Certificate in Cybersecurity	https://ung.edu/mike-cottrell-college-of-business/academic-programs/masters/cybersecurity-graduate-certificate.php	

University of West Georgia	Master of Business Administration (M.B.A.), Business Intelligence and Cyber Security	https://www.westga.edu/academics/program_page.php?program_id=295	

Our proposed degree program concentrates on both cybersecurity and privacy issues. Our program contains both conventional computer security topics, such as authentication and authorizations, and emerging topics, such as data privacy protection and network intrusion preventions. None of the above related M.S. degree programs offered in the state of Georgia explicitly are addressing the emerging privacy protection aspect in their degree programs. We consider privacy protection an essential component of the degree, and our program aims to train students with both hands-on skills on cybersecurity attacks and defenses, as well as privacy awareness and common defense techniques, such as differential privacies. The emphasis on both cybersecurity and privacy aspects makes our program unique among the programs offered in the state of Georgia.

9.) Collaboration: Is the program in collaboration with another USG Institution, TCSG institution, private college or university, or other entity? Yes ___ or No _X___ (place an X beside one)

If yes, list the institution below and include a letter of support from the collaborating institution's leadership (i.e., President or Provost and Vice President for Academic Affairs) for the proposed academic program in Appendix I.

N/A

10.) Admission Criteria: List the admission criteria for the academic program, including standardized test and grade point average requirements for admission into the program. Also, at what point (e.g., credit hours completed) are students admitted to the program.

Admissions requirements will align with the current admissions standards set by the Graduate School and the Franklin College of Arts and Sciences. Completed applications will include the UGA graduate application, Bachelor's degree from a regionally accredited institution in Computer Science or a related discipline, three letters of recommendation, statement of purpose, a minimum 3.0 GPA, GRE test score. Applicants will need to meet all Graduate School requirements.

Students with insufficient background in Computer Science must first take undergraduate Computer Science courses to remedy any deficiencies in addition to their graduate program requirements. A sufficient background in Computer Science must include at least the following courses (or equivalents):

- CSCI 1301-1301L, Introduction to Computing and Programming
  (alternative option: CSCI 7010, Computer Programming)
- CSCI 1302, Software Development
- CSCI 1730, Systems Programming

- CSCI 2610, Discrete Mathematics for Computer Science
- CSCI 2670, Introduction to Theory of Computing
- CSCI 2720, Data Structures
- MATH 2200, Analytic Geometry and Calculus
- MATH 2250, Calculus I for Science and Engineering

11.) Curriculum

a. Specify whether the proposed program requires full-time study only, part-time study only, or can be completed either full time or part time.

Full-Time only

b. If the proposed program will be offered online, describe measures taken by the academic unit to sufficiently deliver the program via distance education technologies and provide instructional and learning supports for both faculty and students in a virtual environment. Will the program be offered in an asynchronous or synchronous format?

The program will not be offered online.

c. List the entire course of study required to complete the academic program. Include the course prefixes, course numbers, course titles, and credit hour requirement for each course. Indicate the word "new" beside new courses. Include a program of study.

<u>Required Courses (22-23 hours)</u>
- CSCI 6250, Cyber Security (4 hours)
- CSCI 6260, Data Security and Privacy (4 hours)
- CSCI 6720, Computer Systems Architecture (4 hours)
- CSCI 6730, Operating Systems (4 hours)
- CSCI 6760, Computer Networks (4 hours)
- CSCI 7200, Master's Project (2-3 hours)

<u>Elective Courses (7-8 hours)</u>
Choose two courses from:
- CSCI 6270, Introduction to Computer Forensics (4 hours)
- CSCI 8240, Software Security and Cyber Forensics (4 hours)
- CSCI 8250, Advanced Cyber Security (4 hours)
- CSCI 8260, Computer Network Attacks and Defenses (4 hours)
- CSCI 8960, Privacy-Preserving Data Analysis (4 hours)
- MATH 6450, Cryptology and Computational Number Theory (3 hours)

Cybersecurity spans all aspects of computer systems and networks, from hardware to software, to systems' architecture and design. To complete the program in Cybersecurity and Privacy (M.S.), students must complete 22-23 hours of mainstream cybersecurity courses in

Computer Science, including CSCI 7200, Master's Project, with at least 12 hours of graduate coursework. Students must additionally complete 7-8 hours of elective coursework related to Cybersecurity and Privacy, and CSCI 3030 or equivalent if they have not already taken a suitable ethics course.

The proposed program requires students to first acquire the foundations of computer and network security and privacy, which will be achieved via five required core courses. As security threats focus on computer architecture, computer operating systems and computer networks, the first three classes are foundational computer science. The mainstream cybersecurity classes for beginning graduate students are:

- CSCI 6250, Cyber Security
- CSCI 6260, Data Security and Privacy
- CSCI 6720, Computer Systems Architecture
- CSCI 6730, Operating Systems
- CSCI 6760, Computer Networks

While the Operating Systems and Computer Networks courses do not embed "security" in the course title, they do include important security concepts. For instance, the Operating System course teaches concepts such as process isolation and access control. The Computer Networks course includes material related to the confidentiality, integrity, and authenticity of network communications. In addition, it teaches basic concepts related to Web security.

d. State the total number of credit hours required to complete the program, but do not include orientation, freshman year experience, physical education, or health and wellness courses that are institutional requirements as defined in the Academic and Student Affairs Handbook, Section 2.3.1 and the Board Policy Manual, 3.8.1.

This program requires 30 credit hours.

e. Within the appendix, append the course catalog descriptions for new courses and their prerequisite courses. Include the course prefixes, course numbers, course titles, and credit hour requirements.

See Appendix I

f. If this is an undergraduate program, how does or would the department/institution use eCore, eMajor, or dual enrollment?

N/A

g. If this is a doctoral program, provide the names of four external reviewers of aspirational or comparative peer programs complete with name, title, institution, e-mail address, telephone number, and full mailing address. External reviewers must hold the rank of associate professor or higher in addition to other administrative titles.

N/A

12) Program of Study – Undergraduate Only

N/A

Program of Study – Graduate Only

Courses *(list acronym, number, and title)*	**Semester**	**Hours**
Required Courses		
CSCI 6250, Cyber Security	Spring	4
CSCI 6260, Data Security and Privacy	Fall	4
CSCI 6720, Computer Systems Architecture	Fall	4
CSCI 6730, Operating Systems	Spring	4
CSCI 6760, Computer Networks	Fall	4
CSCI 7200, Master's Project	Summer	2-3
Elective Courses (Choose two courses)		
CSCI 8240, Software Security and Cyber Forensics	Spring	4
CSCI 8250, Advanced Cyber Security	Spring	4
CSCI 8260, Computer Network Attacks and Defenses	Spring	4
CSCI 8960, Privacy-Preserving Data Analysis	Spring	4
CSCI 6270 Introduction to Computer Forensics	Spring	4
MATH 6450 Cryptology and Computational Number Theory	Spring	3

13) Alternative Curricular Pathway: What alternative curricular pathways exist (for example for students who were not admitted to the major but are still in satisfactory standing at the institutional level)? Please describe them below and describe how these students are advised about the alternative(s).

N/A

14) Prior Learning Assessment: Does the program include credit for prior learning assessment? How will credit be assessed and for what specific courses in the curriculum inclusive of prerequisites? If this is not applicable, indicate "NA" in this section.

N/A

15) Open Educational Resources: Does the program include open educational resources that have been assessed for quality and permissions, can be connected with related curricular resources, and are mapped to learning outcomes? If this is not applicable, indicate "NA" in this section.

N/A

16) Waiver to Degree-Credit Hour (if applicable):

- All bachelor's degree programs require 120 semester credit hours.
- Master's level programs have a maximum of 36 semester hours. Semester credit hours for the program of study that are above these requirements require a waiver to degree-credit hour request with this proposal.
- State whether semester credit-hours exceed maximum limits for the academic program and provide a rationale.
- This is not applicable for specialist in education and doctoral programs.

This program does not exceed the maximum master's level program limit.

17) Student Learning Outcomes: Student Learning outcomes and other associated outcomes of the proposed program (provide a narrative explanation).

a. Students in this program should be able to defend against common cybersecurity and privacy attacks by having knowledge of information security, including secure programming and known practices.

b. Students will be able to use their enhanced and improved hands-on experiences and skills to address various security and privacy issues.

c. Students should be able to make risk assessment to IT design decisions.

18) Assessment: Describe institutional programmatic assessments that will be completed to ensure academic quality, viability, and productivity.

For every related course offered, the learning outcome is evaluated based on both student performance in projects and exams as well as feedback collected from students through anonymous surveys.

All graduate students are advised by the Graduate Coordinator of the Computer Science Department. The administrator, in conjunction with the Department Head, will be responsible for coordinating course offerings, maintaining student records, promoting activities, securing additional funding, and consulting with the department's graduate program and curriculum committees regarding courses in the certificate program.

All academic programs are reviewed annually to assess the program outcomes and student learning outcomes. Students completing the Cybersecurity and Privacy (M.S.) are required to take all the major courses that will encompass the student learning outcomes for the program.

In addition, the new major will be assessed as part of the UGA comprehensive program review carried out every seven years.

19) Accreditation: Describe disciplinary accreditation requirements associated with the program (if applicable, otherwise indicate NA).

N/A

20) SACSCOC Institutional Accreditation: Is program implementation contingent upon SACSCOC action (e.g., substantive change, programmatic level change, etc.)?
Please indicate Yes or No: __No__

ENROLLMENT SECTION *(Consult with Enrollment Management)*

21) Recruitment and Marketing Plan: What is the institution's recruitment and marketing plan? What is the proposed program's start-up timeline

The department will utilize a number of venues for recruitment and marketing of its proposed program by including it on the department's website, mailing and emailing a department newsletter to Computer Science departments nationwide, and attending nationwide recruitment events for graduate students. This proposed program will begin in fall 2020 or as soon as USG approval is secured.

22) Enrollment Projections: Provide projected enrollments for the program specifically during the initial years of implementation.

a. Will enrollments be cohort-based? Yes____ or No__X___ (place an X beside one)

b. Explain the rationale used to determine enrollment projections.

The number of undergraduate students in the Computer Science Department at UGA is more than 1,100, the number of students enrolled in the Computer Science (M.S.) program is more than 120, and the number of the students in the Computer Science (Ph.D.) program is more than 70. Our conservative enrollment projection assumes that in year one, five of the existing M.S. students will shift into the new program and 15 new students will enter the new program. We conservatively estimate new enrollments to increase in year two and beyond. This is based on the survey that we have conducted. Of the 266 students responding, 175 indicated interest in pursuing a master's degree in Cybersecurity and Privacy. And according to the survey, 14 are not sure and 37 are not interested because some of them will be graduating. Therefore, from the survey above, we expect a strong demand for such a degree.

If projections are not met, the Graduate Program Committee in the Computer Science Department, chaired by the Graduate Coordinator, will develop a recruitment strategy to increase enrollment.

	First FY	Second FY	Third FY	Fourth FY
I. ENROLLMENT PROJECTIONS				
Student Majors				
Shifted from other programs	5	5	2	2
New to the institution	15	20	23	23
Total Majors	20	25	25	25

23) Faculty

a. Provide the total number of faculty members that will support this program: _10___

b. Submit your SACSCOC roster for the proposed degree. Annotate in parentheses the person who will have administrative responsibility for the program. Indicate whether any positions listed are projected new hires and currently vacant.

Faculty Name	**Rank**	**Courses Taught (including term, course number & title, credit hours (D, UN, UT, G)**	**Academic Degrees & Coursework (relevant to courses taught, including institution & major; list specific graduate coursework, if needed)**	**Current Workload**	**Other Qualifications & Comments (related to courses taught)**
Suchendra Bhandarkar	Professor	**Fall** CSCI 6720, Computer Systems Architecture, 4.0 (UT/G)	Ph.D. Computer Engineering, Syracuse University M.S. Computer Engineering, Syracuse University B. Tech. Electrical Engineering	5 credit hours/sem.	Ph.D. dissertation: "3-D Object Recognition from Qualitative Surface Descriptions"

			Indian Institute of Technology, India		
Michael Cotterell	Lecturer	**Spring** CSCI6730, Operating System, 4.0 (UT/G)	Ph.D. Computer Science, University of Georgia B.S. Computer Science, University of Georgia	12 credit hours/sem.	Ph.D. dissertation: "Supporting Open Science in Big Data Frameworks and Data Science Education"
Le Guan	Assistant Professor	**Spring** CSCI 8965 Internet of Things Security(G)	Ph.D. Computer Science, Institute of Information Engineering, Chinese academy of Sciences, China B. Eng. University of Science and Technology of China, China	5 credit hours/sem.	Ph.D. dissertation: "Research on the Protection of Cryptographic Keys in Commodity Platforms"
Maria Hybinette	Associate Professor	**Fall** CSCI 4730/6730 Operating Systems, 4.0 (UT/G)	Ph.D. Computer Science, Georgia Institute of Technology M.S., Computer Science, Georgia Institute of Technology	5 credit hours/sem.	Ph.D. dissertation: "Interactive Parallel Simulation Environments"

			B.S. Mathematics and Computer Science, Emory University		
Manijeh Keshtgari	Lecturer	**Fall** CSCI 4760/6760, Computer Networks, 4.0 (UT	Ph.D. Computer Engineering, Sharif University of Technology M.S. Electrical & Computer Engineering, Colorado State University B.S. Computer Engineering, Shiraz University	12 credit hours/sem.	Ph.D. dissertation: 'Survivability of Networks M.S. thesis: "Performance Evaluation of FDDI-II Networks"
Kyu Hyung Lee	Assistant Professor	**Fall** CSCI 4730/6730, Operating Systems, 4.0 (UT/G) **Spring** CSCI 8240, Software Security and Cyber Forensics, 4.0 (UT)	Ph.D. Computer Science, Purdue University M.S. Computer Engineering, Hong-Ik University, South Korea B.S. Computer Engineering, Hong-Ik University, South Korea	5 credit hours/sem.	Ph.D. dissertation: "Selective Logging for Accurate, Space Efficient Forensic Analysis and Reducible Execution Replay" M.S. thesis: "PFC: Transparent Optimization of Existing Prefetching Strategies for Multi-level Storage Systems"

Jaewoo Lee	Assistant Professor	**Fall** CSCI 3360, Data Science I, 4.0 (UT) **Spring** CSCI 8960, Privacy Preserving Data Analysis, 4.0 (G)	Ph.D. Computer Science, Purdue University M.S. Computer Science, Yonsei University, South Korea	5 credit hours/sem.	Ph.D. dissertation: "Achieving Practical Differential Privacy" M.S. thesis: "Efficiently Tracing Clusters over High-dimensional Data Streams"
Kang Li	Professor	**Spring** CSCI 8250, Advanced Network Security, 4.0 (G) **Spring** CSCI 8260, Computer Network Attacks and Defenses, 4.0(G)	Ph.D. Computer Science and Engineering, Oregon Health and Science University B.S. Computer Science and Engineering, Tsinghua University, China	5 credit hours/sem.	Ph.D. dissertation: "Modeling the Bandwidth Sharing Behavior of Congestion Controlled Flows"
Roberto Perdisci	Associate Professor	**Spring** CSCI 4760/6760, Computer Networks, 4.0 (UT/G)	Ph.D. Computer Engineering, University of Cagliari, Italy M.S. Electronic Engineering, University of Cagliari, Italy	5 credit hours/sem.	Ph.D. thesis: "Statistical Pattern Recognition Techniques for Intrusion Detection in Computer Networks, Challenges and Solutions" M.S. thesis: "Alarm Clustering for Intrusion Detection Systems in Computer Networks"
Wenwen Wang	Assistant Professor	**Spring 2020** **CSCI 8000**	Ph.D	5 credit hours/sem	

		Cybersecurity 4.0 (G)	University of Chinese Academy of Sciences		

c. Does the institution require additional faculty to establish and implement the program? Yes or No. __No__. Please indicate your answer in the space provided.

Describe the institutional plan for recruiting additional faculty members in terms of required qualifications, financial preparations, timetable for adding faculty, and whether resources were shifted from other academic units, programs, or derived from other sources. Explain clearly whether additional faculty hires can be supported with institutional funds.

The Computer Science Department has six faculty in the area of cybersecurity and privacy.

24) Fiscal, Tuition, and Estimated Budget

a. Describe the resources that will be used specifically for the program.

All resources needed for the program are pre-existing. We will utilize the current resources (personnel, library, equipment, laboratory, and computing) available at the departmental and university levels.

b. Does the program require a tuition cost structure different from or above a regular tuition designation for the degree level? Yes _____ or No ___X____ (place an X beside one)

c. Does the program require a special fee for the proposed program? Yes ____ or No__X___ (place an X beside one)

d. If the program requires a different tuition cost structure or special fee, such requests require approval through both the Committee on Academic Affairs (for the academic program) and the Committee on Fiscal Affairs (for the tuition increase or special fee designation). The resultant tuition and/or fee request for a new degree is to be submitted to both the academic affairs and fiscal affairs offices. Complete Appendix III that includes information for a differential tuition cost structure involving a proposal for a new academic program.

N/A

e. Note: The web link for approved tuition and fees for USG institutions is located at the following url: http://www.usg.edu/fiscal_affairs/tuition_and_fees

f. Budget Instructions: Complete the form further below and **provide a narrative to address each of the following**:

g. For Expenditures (*ensure that the narrative matches the table*):

i. Provide a description of institutional resources that will be required for the program (e.g., personnel, library, equipment, laboratories, supplies, and capital expenditures at program start-up and recurring).

- All faculty resources needed for the program are pre-existing. We currently have six faculty in cybersecurity and privacy, and those faculty will be teaching the core courses. Other listed faculty in Section 16 above will teach the elective courses as well as the prerequisite ones. No new administrative staff are needed. The administrative staff in the Computer Science Department will be able to handle the new load, and the new duties are already built into their job descriptions.

- Personnel expenditures for each fiscal year are calculated using average-per-course instructional costs associated with offering graduate-level required courses offered that year. In our calculations, the average instructional cost for each course is taken to be $21,000, whereas for courses that are common to the M.S. and Ph.D. programs in Computer Science, we take the average instructional cost to be $6,000. The average instructional cost is calculated using the average faculty salary multiplied by the average instructional EFT and divided by the average course load.

- For the first year, the expenditure is determined based on offering three required courses (CSCI 6720, CSCI 6260, and CSCI 6760). In the second year, the expenditure is based on offering three required courses (CSCI 6250, CSCI 6730, and an 8000-level elective course).

ii. If the program involves reassigning existing faculty and/or staff, include the specific costs/expenses associated with reassigning faculty and staff to support the program (e.g., cost of part-time faculty to cover courses currently being taught by faculty being reassigned to the new program, or portion of full-time faculty workload and salary allocated to the program).

Neither faculty nor staff hiring or reassignments are necessary.

h. For Revenue (*ensure that the narrative matches the table*):

i. If using existing funds, provide a specific and detailed plan indicating the following three items: source of existing funds being reallocated; how the existing resources will be reallocated to specific costs for the new program; and the impact the redirection will have on units that lose funding.

Existing and authorized faculty lines budgeted for instruction will be utilized to cover the program instructional costs. Since the required courses are already offered, and only the class sizes are expected to expand, then no reallocation of existing resources is required.

ii. Explain how the new tuition amounts are calculated.

Tuition is calculated based on the 2019-2020 University of Georgia rate for master's students of $370/credit hour or a rate of $4,439 for 12 or more credit hours.

iii. Explain the nature of any student fees listed (course fees, lab fees, program fees, etc.). Exclude student mandatory fees (i.e., activity, health, athletic, etc.).

No additional fees are to be charged.

iv. If revenues from Other Grants are included, please identify each grant and indicate if it has been awarded.

N/A

v. If Other Revenue is included, identify the source(s) of this revenue and the amount of each source.

N/A

i. Revenue Calculation: Provide the revenue calculation, in other words, the actual calculation used to determine the projected tuition revenue amounts for each fiscal year involving start-up and implementation of the proposed program.

	Fall	Spring	Summer	Total
Year One: 20 students	20 students x $4,439 = $88,780	20 students x $4,439 = $88,780	20 students x $370 x 2 credits = $14,800 Or 20 students x $370 x 3 credits = $22,200	$192,360 Or $199,760
Year Two: 25 students	25 students x $4,439 = $110,975	25 students x $4,439 = $110,975	25 students x $370 x 2 credits = $18,500 Or 25 students x $370 x 3 credits = $27, 750	$240,450 Or $249,700
Year Three: 25 students	25 students x $4,439 = $110,975	25 students x $4,439 = $110,975	25 students x $370 x 2 credits = $18,500 Or 25 students x $370 x 3 credits = $27, 750	$240,450 Or $249,700
Year Four: 25 students	25 students x $4,439 = $110,975	25 students x $4,439 = $110,975	25 students x $370 x 2 credits = $18,500 Or 25 students x $370 x 3 credits = $27, 750	$240,450 Or $249,700

j. When Grand Total Revenue is not equal to Grand Total Costs:

i. Explain how the institution will make up the shortfall. If reallocated funds are the primary tools being used to cover deficits, what is the plan to reduce the need for the program to rely on these funds to sustain the program?

N/A. There is no shortfall because there is no new cost as a result of offering this new program.

ii. If the projected enrollment is not realized, provide an explanation for how the institution will cover the shortfall.

There will be no budget shortfall and there will be no additional cost to the University, as these courses will continue to be taught by the existing faculty members.

iii. If the projected enrollment is not realized, what are your next action steps in terms of bolstering the program, potentially altering the program, teach-outs, a planned phase-out, etc.?

The department will invest more in recruitment by going to more graduate recruitment events, recruiting from neighboring universities, and increasing the advertisement for the program.

I. EXPENDITURES	First FY Dollars	Second FY Dollars	Third FY Dollars	Fourth FY Dollars
Personnel – reassigned or existing positions				
Faculty **(see 23.g.ii)**	$193,548	$199,354	$283,640	$283,640
Part-time Faculty **(see 23.g.ii)**				
Graduate Assistants **(see 23.g.ii)**				
Administrators **(see 23.g.ii)**				
Support Staff **(see 23.g.ii)**				
Fringe Benefits				
Other Personnel Costs				
Total Existing Personnel Costs	$193,548	$199,354	$283,640	$283,640

EXPENDITURES (Continued)				
Personnel – new positions (see 23.g.i)				
Faculty				
Part-time Faculty				
Graduate Assistants				
Administrators				
Support Staff				
Fringe Benefits				
Other personnel costs				
Total New Personnel Costs	$0	$0	$0	$0
Start-up Costs (one-time expenses) (see 23.g.i)				
Library/learning resources				
Equipment				
Other				
Physical Facilities: construction or renovation (see section on Facilities)				
Total One-time Costs	$0	$0	$0	$0
Operating Costs (recurring costs – base budget) (see 23.g.i)				
Supplies/Expenses				
Travel				
Equipment				
Library/learning resources				
Other				
Total Recurring Costs				
GRAND TOTAL COSTS	$193,548	$199,354	$205,334	$211,494

III. REVENUE SOURCES				
Source of Funds				
Reallocation of existing funds **(see 23.h.i)**	$0	$0	$0	$0
New student workload				
New Tuition **(see 23.h.ii)**	$192,360 or $199,760	$240,450 or $249,700	$240,450 or $249,700	$240,450 or $249,700
Federal funds				
Other grants **(see 23.h.iv)**				
Student fees **(see 23.h.iii)** Exclude mandatory fees (i.e., activity, health, athletic, etc.).				
Other **(see 23.h.v)**				
New state allocation requested for budget hearing				
GRAND TOTAL REVENUES	$192,360 or $199,760	$240,450 or $249,700	$240,450 or $249,770	$240,450 or $249,770
193-5				
Nature of Revenues				
Recurring/Permanent Funds				
One-time funds				
Projected Surplus/Deficit (Grand Total Revenue – Grand Total Costs) (see 20.h.i. & 20.h.ii).	$-1,188 or $6,212	$41,096 or $50,346	$35,116 or $44,436	$28,956 or $38,276

25) Facilities/Space Utilization for New Academic Program Information

Facilities Information — Please Complete the table below.

			Total GSF
a.	**Indicate the floor area required for the program in gross square feet (gsf). When addressing space needs, please take into account the projected enrollment growth in the program over the next 10 years.**		8,000
b.	**Indicate if the new program will require new space or use existing space. (Place an "x" beside the appropriate selection.)**		
	Type of Space		**Comments**
i.	Construction of new space is required (x).-→	N/A	
ii.	Existing space will require modification (x). →	N/A	
iii.	If new construction or renovation of existing space is anticipated, provide the justification for the need.		N/A
iv.	Are there any accreditation standards or guidelines that will impact facilities/space needs in the future? If so, please describe the projected impact.		No
v.	Will this program cause any impact on the campus infrastructure, such as parking, power, HVAC, other? If yes, indicate the nature of the impact, estimated cost, and source of funding.		No
vi.	Indicate whether existing space will be used.	X	Existing facilities will be sufficient
c.	**If new space is anticipated, provide information in the spaces below for each category listed:**		
i.	Provide the estimated construction cost.		
ii.	Provide the estimated total project budget cost.		
iii.	Specify the proposed funding source.		
iv.	What is the availability of funds?		
v.	When will the construction be completed and ready for occupancy? (Indicate semester and year).		
vi.	How will the construction be funded for the new space/facility?		
vii.	Indicate the status of the Project Concept Proposal submitted for consideration of project authorization to the Office of Facilities at the BOR. Has the project been authorized by the BOR or appropriate approving authority?		
d.	**If existing space will be used, provide information in the space below.**		
	Provide the building name(s) and floor(s) that will house or support the program. Indicate the campus, if this is part of a multi-campus institution and not physically located on the main		

	campus. Please do not simply list all possible space that could be used for the program. We are interested in the actual space that will be used for the program and its availability for use.			
	Boyd Graduate Studies building (home of Computer Science) will house and support the program. Classroom spaces on south campus will be used for classes.			
e.	**List the specific type(s) and number of spaces that will be utilized (e.g. classrooms, labs, offices, etc.)**			
i.	**No. of Spaces**	**Type of Space**	**Number of Seats**	**Assignable Square Feet (ASF)**
	5	Classrooms	40	12,500
		Labs (dry)		
		Labs (wet)		
		Meeting/Seminar Rooms		
		Offices		
		Other (specify)	5 offices with each one has 8 seats	3,000
Total Assignable Square Feet (ASF)				
ii.	If the program will be housed at a temporary location, please provide the information above for both the temporary space and the permanent space. Include a time frame for having the program in its permanent location.			

Chief Business Officer or Chief Facilities Officer Name & Title	**Phone No.**	**Email Address**
	Signature	
Note: A Program Manager from the Office of Facilities at the System Office may contact you with further questions separate from the review of the new academic program.		

FINAL NOTE:

Appendices that do not apply to the proposed program should not be attached.

APPENDIX I

Use this section to include letters of support, curriculum course descriptions, and recent rulings by accrediting bodies attesting to degree level changes for specific disciplines, and other information.

Course Description

Course Prefix/Number	Credit Hours	Course Title	Course Description
CSCI 6720	**4**	**Computer Systems Architecture**	Functional components and structure of computing systems. Topics include principles of combinational and sequential logic, number systems and computer arithmetic, hardware subsystem design and test, I/O and memory subsystem principles and techniques, instruction set architecture and implementation, pipelining and system-level parallelism, interconnection networks, trends.
CSCI 6250	**4**	**Cyber Security**	Basic concepts of computer security and the theory and current practices of authentication, authorization, and privacy mechanisms in modern operating systems and networks.
CSCI 6260	**4**	**Data Security and Privacy**	This course will examine security and privacy issues related to protecting personal data in various environments (for example: cloud computing, smart grid, and internet of things), cover the fundamentals and principles of data security and privacy, and explore computational and statistical techniques for constructing secure and private systems.
CSCI 6270	**4**	**Introduction to Computer Forensics**	The course covers both the principles and practice of computer forensics. Topics include computer crime, software vulnerabilities, intellectual property, privacy issues, countermeasures, methods and standards for extraction, preservation, and deposition of legal evidence in a court of law.
CSCI 6760	**4**	**Computer Networks**	In-depth coverage of computer networks, including: digital data transmission and encoding, layered protocol models, Internet protocol, Internet client-server software, and network design methodology.

CSCI 6730	**4**	**Operating Systems**	Coverage of the key concepts in modern operating systems. Specific topics include process management, synchronization mechanisms, scheduling strategies, deadlock detection/avoidance, memory management, file systems, protection and security, and distributed systems. Concepts will be reinforced through programming projects using a realistic operating system.
CSCI 7200	**2-3**	**Master's Project**	Applied research project under the direction of the major professor for the Computer Science Non-thesis MS degree. As part of the requirements, a comprehensive report must be prepared detailing the student's procedures and findings regarding the completed project work.
CSCI 8240	**4**	**Software Security and Cyber Forensics**	Exploration of both the foundation and recent advances in software security and cyber forensics. Topics will include software vulnerability analysis, advanced attack and defense techniques, cybercrime investigation and forensics, and security and forensics in different platforms (e.g., mobile, cloud computing, web application).
CSCI 8250	**4**	**Advanced Cyber Security**	Recent advances in computer networks and system security. Fast and secure network systems, secure storage systems, high performance intrusion detection systems, and efficient anti-abuse systems.
CSCI 8260	**4**	**Computer Network Attacks and Defenses**	This is an advanced course on computer and network security. The course will mainly focus on reading and analyzing recent top- tier research publications in the field of computer security and privacy and on the research and development of systems that can enforce security and privacy in the real world.
CSCI 8960	**4**	**Privacy-Preserving Data Analysis**	An introduction to the privacy preservation problems, as well as algorithmic and statistical techniques for data privacy, in modern data analysis, such as machine learning and data mining. Approaches include randomized

			algorithms, synthetic data generation, stability analysis, and so on.
CSCI 8965	**4**	**Internet of Things Security(G)**	Introduction to security problems associated with the emerging Internet of Things (IoT) technologies, including privacy disclosure and data manipulation. Topics studied include architectural differences leading to such issues, how adversaries launch attacks by either exploiting software vulnerabilities or physically hacking into the hardware, and mitigation techniques, such as trusted booting.
MATH 6450	**3**	**Cryptology and Computational Number Theory**	Recognizing prime numbers, factoring composite numbers, finite fields, elliptic curves, discrete logarithms, private key cryptology, key exchange systems, signature authentication, and public key cryptology.

Sample Program of Study

Semester	Course ID	Course Title	Hours
Fall	CSCI 6760 CSCI 6720 CSCI 6260 *Total Semester Credit Hours*	Computer Networks Computer Systems Architecture Data Security and Privacy *Total Semester Credit Hours*	4 4 4 *12*
Spring	CSCI 6730 CSCI 6250 CSCI 8260 CSCI 8960 *Total Semester Credit Hours*	Operating Systems Computer Security Computer Network Attacks and Defenses Privacy-Preserving Data Analysis *Total Semester Credit Hours*	4 4 4 4 *16*
Summer	CSCI 7200 *Total Semester Credit Hours*	Master's Project *Total Semester Credit Hours*	2-3 *2-3*
Total			**30-31**

Approvals on File

Proposal: Major in Cybersecurity and Privacy (M.S. Non-Thesis)

College: Franklin College of Arts and Sciences

Department: Computer Science

Proposed Effective Term: Fall 2020

Department:

- Computer Science Department Head, Dr. Thiab Taha, 2/5/19

School/College:

- Franklin College of Arts and Sciences Associate Dean, Dr. Jean Martin-Williams, 3/19/19

Graduate School:

- Graduate School Interim Dean, Dr. Ron Walcott, 9/16/19