

**New Program Proposal
 Master of Science in Information Systems Technology
 with a Concentration in Security and Analytics
 Coastal Carolina University**

Summary

Coastal Carolina University requests approval to offer a program leading to the Master of Science in Information Systems Technology with a Concentration in Security and Analytics, to be implemented in Spring 2016 through online instruction. The following chart provides the stages of review for the proposal. The Committee on Academic Affairs and Licensing (CAAL) voted to recommend approval of the proposal. Committee questions, institutional responses, and the program proposal are enclosed.

| Stages of Consideration | Date | Comments |
|---|-------------|--|
| Program Planning Summary received and posted for comment | 5/15/14 | Not Applicable |
| Program Planning Summary considered by ACAP through electronic review | 7/30/14 | N.B. The following comments were in response to the original Program Summary titled <i>Information and Security Analytics</i> (2014). The official application, <i>Information Systems Technology with a Concentration in Security and Analytics</i> , includes helpful revisions (2015). <u>Comments and questions from ACAP members</u> <ul style="list-style-type: none"> • The importance of security issues warrants this type of degree. • Is the balance of core, elective, and thesis coursework adequate to cover the complexity of the subject? • The College of Charleston representative noted that the College offers a specialization in Cybersecurity within the M.S. in Computer and Information Science and has recently created a 12 credit graduate certificate of Cybersecurity. |
| Program Proposal Received | 5/1/15 | Not Applicable |
| ACAP Consideration | 6/11/15 | ACAP members discussed the need for the proposed program. The representative from USC Columbia stated the following: <ul style="list-style-type: none"> • USC Columbia is moving into this field of data analytics, and has a certificate already in Cybersecurity Studies). • USC faculty are concerned that there is no mention of graduate courses in the field. • USC also operates the IBM Center for Innovation which includes data analytics and believes the proposal should include these. |

| Stages of Consideration | Date | Comments |
|---|---------|---|
| Comments and suggestions from CHE staff sent to the institution | 6/17/15 | Staff requested the following revisions or explanations: <ul style="list-style-type: none"> • The change of name of the proposed degree • Credit hour requirements for elective courses and clarification of the concentration • Components of external programmatic assessments • The role of CSCI courses in the student learning assessment process • Course titles that explain components of the curriculum taught or to be taught by individual faculty members. |
| Revised Program Proposal Received | 6/25/15 | The revised proposal satisfactorily addressed the requested revisions. |
| CAAL Consideration | 7/15/15 | CAAL comments and requests for clarification: <ul style="list-style-type: none"> • Tuition in-state vs. out-of-state and online attendance vs. brick-and-mortar attendance • Asynchronous delivery facilitating skills growth. • Security <i>and</i> Analytics necessitate program breadth. Is depth in either compromised? • Plans for external reviewers from <i>both</i> fields • Future offering as a joint MS-MBA degree. • Compliments to the CCU Office of Institutional Research for the Assessment of Need. • Thorough student learning outcomes assessment is present; more external programmatic assessment is encouraged. • Program ranking among regional or national competitors. • The College of Charleston offers similar studies. Responses from Coastal Carolina University: <ul style="list-style-type: none"> • Rates will remain in-state for in-state students and out-of-state for out-of-state students. • Professors remain available asynchronously. • Course meetings, group projects, and senior these include synchronicity to cultivate team-building. • The program remains more focused than a Masters in Computer Sci. or in Info. Systems. • ABET accreditation facilitates external advisory through the faculty's external contacts. • MS-MBA collaborations have begun already through cross registration in Digital Forensics and Security, Data Analytics, and the MBA certificate in Fraud. • Direct measures are evident; indirect measures such as external assessment through advisory boards will be implemented. • The proposed program differs from the College of Charleston Master of Computer Science degree offered in Security only and the CofC graduate certificate in Cybersecurity. • This program is <i>unique</i>, with few if any known direct competitors with one degree offering both fields. |

Recommendation

The Committee on Academic Affairs and Licensing recommends that the Commission approve the program leading to the Master of Science in Information Systems Technology with a Concentration in Security and Analytics, to be implemented in Spring 2016.

***Institutional Responses to Commissioner Questions
about Program Proposals considered at the July 15, 2015 CAAL meeting***

Coastal Carolina University, M.S., Information Systems Technology

- 1. Recruitment area and tuition: Given the program is 100% online, will you recruit and or accept applicants from outside your nominal service area? If so have you accurately estimated the cost and time for authority to recruit? Will you charge different tuition for in area, out of area and will the online tuition be different from residential tuition?***

Response: Currently, Coastal is accepting applications from qualified students in 25 states for online programs (<http://www.coastal.edu/online/authorizations.html>). We are hopeful that this base will expand with the State Authorization Reciprocity Agreement (SARA). However, we have sufficient interest within our undergraduate population to meet most of our enrollment goals for this program. We are confident that, with additional recruiting within our student body and existing authorized states, we will meet our goals. Coastal does not currently charge online tuition at other than our regular tuition. Any such pricing would be approved by the Board of Trustees and would be based on market analysis and cost of offerings.

- 2. Synchronous delivery (similar to a question in the previous Program request): Will you require some form of synchronous attendance to achieve student collaboration? Please explain who will determine and what factors will be considered in deciding how much of the course will be synchronous... will these times be proscribed before course enrollment? Will attendance be taken? Will a minimum attendance record be required?***

Response: The actual course delivery will be completely asynchronous, in order to provide maximum flexibility to the enrolled students, regardless of their work schedules, time-zones, etc. However, office hours would be available both synchronously *and* asynchronously, to accommodate both types of students (some on campus), and student collaboration will occur as students, themselves, determine for project completion. These parameters would be made available to students before enrollment in the program, and explicitly explained prior to each course. As far as attendance requirements, the program would follow CCU's existing policies in the online area in which students are required to log in and respond within the first week, and on time completion of all online homework, exams, projects, and other requirements constitutes attendance. Distance learning courses must require an initial online submission within the session drop/add period (first week). Students who do not submit may be dropped from the roster. For reporting purposes, an absence in a distance learning course is operationally defined as a missed online submission deadline – such as a quiz, assignment, or discussion post (ACAD 133). Likewise, considering the financial aid area, the same practice of timely submission of assignments, taking quizzes, and logging into the CMS site for regular work, etc. would constitute attendance for their purposes as well.

- 3. Purpose, Pg 4.... In addition to skills of design, implement and evaluate will students be capable of or certified for the operation of a company's IT systems?***

Response: Yes. Given appropriate prior undergraduate training and provided the students can demonstrate they are capable/skilled enough to design, implement and evaluate such systems, students should be capable of operating a company's IT systems from the security and analytics applications perspective. They may also apply for appropriate certifications.

***Institutional Responses to Commissioner Questions
about Program Proposals considered at the July 15, 2015 CAAL meeting***

- 4. Scope a breadth of program, Pg12... security and analytics are two completely different fields. Other programs deal with each individually. Please explain how a graduate of this program will have sufficient depth to be functional in both fields... might they not only be half prepared in each field?**

Response: While the proposed master's program is not as broad as, for example, the MS in Computer Science or in Information Systems or in information Technology, specifically, this new program deals with two important and growing sub fields: security and analytics. While the core and elective courses will adequately prepare graduate students to be successful in these areas, students who want to be more expert in security or in analytics can pursue their capstone electives or thesis in any one of the two areas.

In addition, the fields of security and privacy are synergistic. The next generation of security, privacy and forensics applications heavily depends on the analytics, most especially on big data analytics. At the same time, security for the analytics and cloud/sensor-based big data analytics infrastructure is a big problem in the industry as well and requires particular attention.

Admission criteria and the UG preparation as indicated in page 8 of the proposal should ensure that the students are well prepared to be successful in the areas of security *and* analytics. Admission criteria for this program are similar to those for other graduate programs at CCU. However, for Undergraduates (UG) with non-CS/IS/IT majors, UG course credits (equivalent to the required coursework for CCU UG CS/IS/IT Majors) in: (a) Computer Networks or Information Security, (b) Programming or Web Development, (c) Database Design or SQL Development, and (d) Elementary Statistics or Business Statistics are required. Such students may come from other Science/Math/Business majors, perhaps with a minor in CS/IS/IT, or they may have related work experience. If the prospective student doesn't have the above UG credits but all other admission criteria are satisfactory, the student can be accepted on a probationary basis with the condition that the student needs to obtain undergraduate credits with grades of 'C' or better in the above mentioned courses prior to taking any graduate coursework for the program.

- 5. Capacity to build program, Pg13... with the need for 15 new courses, describe the departments capacity to build all new courses such that they are effective and meet student timelines.**

Response: The Coastal Office of Online Learning (COOL) supports and has invested in the development of the online courses, which are Quality Matters (QM) certified via the requirements of a COOL grant. Four faculty are involved in the development of these courses and have been provided adequate time and funding to facilitate this development. Some of these courses are already being taught this summer to the students in other graduate programs, as elective courses. Therefore, the courses are already built and ready for delivery.

- 6. Resources Pg17 (same question as the above program request) ... to what degree will this new program add to use of on line teaching resources (i.e., – will this be a significant addition, and if so does the school have proven capacity for effective delivery?)**

Response: CCU has a significant investment in the online teaching resources through the Coastal Office of Online Learning (COOL) programs. Though this new program is 100% online and a significant addition to online teaching resources, the school has enough current capacity for the effective delivery of the first five years of the program.

***Institutional Responses to Commissioner Questions
about Program Proposals considered at the July 15, 2015 CAAL meeting***

- 7. External Program review, Pg20 Success of this program will depend on a close coupling of course content with industry needs. Please describe the method and frequency of external review of the program to include both the discipline of security and analytics.**

Response: We will extend our existing external review board (that we already have in place at the undergraduate level for ABET accreditation purposes). Preliminarily, we will meet twice per year for the first four years of this new program, to ensure that we can adapt to any required changes rapidly, and then, afterwards, we will move back to a once per year model, as we already follow for the undergraduate programs. We will solicit membership to this committee based on contacts that our faculty have in the respective disciplines of security and analytics.

- 8. Certifications, Pg 22... the proposal suggests that there are a number of certificates that graduates could earn, but that none will be required for graduation. None the less will certificate achievement be tracked as a measure of program relevance and success?**

Response: While certification such as CISSP or CAP would not be required for graduation, achievement of those certificates by the students in the program could be tracked as a measure of program relevance and success. This can easily be added to our current assessment plan.

- 9. Assessment of Need – Observation – Excellent data provided by the survey conducted by CCU Office of Institutional Research, Assessment and Analysis.**

Response: Looks like it is an observation/comment and not a question. Thanks for the compliment.

- 10. - References include the SC Department of Employment and Work 2013 report, the SC Department of Labor and Workforce demand data and the Bureau of Labor Statistics 2013 report. All are excellent resources and clearly show the need. Have you/will you work closely on programmatic needs with any particular businesses and industries in the area as USC Columbia partnered with IBM when they set up the IBM Center for Innovation?**

Response: We have currently not identified a single contact in our area with which to collaborate, but we will work closely with the various security and analytics companies in the Horry-Georgetown area and other nearby counties in the state to identify and satisfy their technical skillset needs. In addition, we will actively seek out collaboration with national/global analytics and security companies to help identify their technical skillset needs.

- 11. How does the Career Services Center coordinate and communicate new programs like this with economic growth needs?**

Response: We are actively working with the Career Services Center for the internships/job opportunities for students in our undergraduate programs. This will continue for the proposed graduate program. The possibility of internships and early job placements should mirror what already occurs.

Name of Institution

Coastal Carolina University (CCU)

Name of Program (include concentrations, options, and tracks)

Master of Science in Information Systems Technology with Concentration in Security and Analytics

Program Designation

- Associate's Degree
- Master's Degree
- Bachelor's Degree: 4 Year
- Specialist
- Bachelor's Degree: 5 Year
- Doctoral Degree: Research/Scholarship (e.g., Ph.D. and DMA)
- Doctoral Degree: Professional Practice (e.g., Ed.D., D.N.P., J.D., Pharm.D., and M.D.)

Does the program qualify for supplemental Palmetto Fellows and LIFE Scholarship awards?

- Yes
- No

Proposed Date of Implementation

Spring 2016

CIP Code

11.1003

Delivery Site(s)

Online Instruction

Delivery Mode

- Traditional/face-to-face*
*select if less than 50% online
- Distance Education
 - 100% online
 - Blended (more than 50% online)
 - Other distance education

Program Contact Information (name, title, telephone number, and email address)

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Institutional Approvals and Dates of Approval

| | |
|----------------------|-------------------|
| Curriculum Committee | November 17, 2014 |
| Graduate Council | December 3, 2014 |
| Faculty Senate | February 4, 2015 |
| Provost | February 09, 2015 |
| President | February 10, 2015 |
| Board of Trustees | May 09, 2014 |

Background Information

State the nature and purpose of the proposed program, including target audience and centrality to institutional mission. (1500 characters)

The curriculum proposed for this new Online M.S. degree includes the necessary theory and principles, as well as the application and practice, to meet the user's secure information service and data analytics needs. The proposed M.S. degree program will prepare graduates to design, implement, and evaluate secure technology systems and infrastructure, as well as to derive knowledge/decisions from collected information to solve real world problems. While the curriculum is targeted towards industry needs, graduates will also be encouraged to pursue further research in the areas of Information Security and Data Analytics. For students who have a well-rounded background in Application Development, Networking, Databases and Statistics, the program is designed such that the balance of core, elective, and capstone coursework will help prepare them to be experts in the areas of Information Security and Data Analytics. This program will be designed to allow a student with a Bachelor's Degree in a related field to complete this Online Master's Degree at CCU in approximately 18 months. This degree proposal directly supports CCU's mission to offer graduate programs of national and regional significance in Science and Business. It further supports the institution's mission by preparing knowledgeable, productive, and responsible graduates to contribute positively to the economic development of the region, in this case through the design and development of secure information services and by creating actionable insights from data through expert use of information services.

List the program objectives. (2000 characters)

The mission of the proposed Online M.S. program in Information Systems Technology (IST) with Concentration in Security and Analytics is to prepare future leaders in the areas of Information Security and Data Analytics through critical examination of both academic and practical applications of various segments of the Information Security and Data Analytics industry. The faculty seeks to challenge, engage, and cultivate students in becoming skilled and knowledgeable Information Security and Data Analytics professionals. To that end, the program will prepare graduates to:

- 1) Engage with the IST (Information Systems Technology) professional or academic communities through superior communication and leadership skills to contribute to the knowledge bases of fields such as Information Security and Data Analytics.
- 2) Apply analytical approaches, critical thinking, and technical skills to a domain of work in the IST field, specifically Information Security and Data Analytics.
- 3) Explore and extend creative use of emerging Information System Technologies in a secure manner.
- 4) Analyze, evaluate, design and implement information services to enhance the value of information in a variety of professional and academic settings.
- 5) Derive and effectively communicate actionable insights from a vast quantity and variety of data.
- 6) Critically evaluate and manage information security policies, principles, processes, services and technologies to manage risks and security threats when applied to different IST settings, and evaluate the current state of IST infrastructure and architecture so as to design and implement solutions in order to ensure a *secure* IST infrastructure.

Assessment of Need

Provide an assessment of the need for the program for the institution, the state, the region, and beyond, if applicable. (1500 characters)

There is a critical *shortage* of Information Security and Data Analytics specialists who can understand, develop, and maintain secure information infrastructure as well as convert the ever increasing data into valuable insights. The Bureau of Labor Statistics Occupational Outlook Handbook indicates about a 25% increase in demand for employment of Information Security/Data Analytics professionals over the next 10 years. Neighboring states such as AL, GA, NC and VA have few graduate programs in Information Security/Data Analytics/Information Systems/Information Technology. Currently, there are not any public institutions that offer a master's program specifically in Information Systems Technology or Information Security and Analytics in the state of South Carolina, although the Univ. of South Carolina (USC)-Columbia offers graduate courses in information security and data analytics as part of their graduate programs in Computer Science or graduate certificates in Information Security / Business Analytics. USC-Columbia has a Center for Information Assurance Engineering and, recently, USC-Columbia also has partnered with IBM to set up the IBM Center for Innovation, specializing in the areas of analytics and higher education industry solutions. Also, no public institution offers a master's program in *both* Information Security and Data Analytics outside of South Carolina. Therefore, the applicant pool is potentially much larger. In a recent survey conducted by CCU's Office of Institutional Research, Assessment and Analysis, 114 current undergraduate students representing a cross-section of several different majors responded, and about 21.1% (n=24) of those who responded expressed interest in pursuing this program. About 49.2% (n=56) of the respondents indicated they would at least consider pursuing this program, if it were available. Given the documented undergraduate student interest in the proposed M.S. program, based on this recent survey, it is logical to assume that, with the increase in the state's capacity to serve students in this discipline, some of CCU's out-of-state students would opt to remain in SC for graduate study and contribute to the state's intellectual capital. The program may also attract SC residents who currently seek degrees in adjacent states with higher capacity. This Online program will also be attractive to the working adults who wish to advance their knowledge and careers in Information Security and Analytics.

Employment Opportunities

Is specific employment/workforce data available to support the proposed program?

Yes

No

If yes, complete the table and the component that follows the table on page 4. If no, complete the single narrative response component on page 5 beginning with "Provide supporting evidence."

| Employment Opportunities | | | |
|--|--------------------------------|------------------------------|--|
| Occupation | Expected Number of Jobs | Employment Projection | Data Source |
| Information Security Architects/Engineers | 18,600 | 17% (Faster than avg.) | Bureau of Labor Statistics Occupational Outlook Handbook 2012-13 |
| Chief Information Security Officers/Chief Data Officers/Top Executives | 261,500 | 11% (Faster than avg.) | Bureau of Labor Statistics Occupational Outlook Handbook 2012-13 |
| IT Security Analyst/Consultant | 27,400 | 37% (Much faster than avg.) | Bureau of Labor Statistics Occupational Outlook Handbook 2012-13 |
| Computer and Information Research Scientists/ Data Scientists | 4,100 | 15% (Faster than avg.) | Bureau of Labor Statistics Occupational Outlook Handbook 2012-13 |
| ETL Engineer/Data Warehouse Specialists/ BI Specialists/Developers | 222,600 | 22% (Much faster than avg.) | Bureau of Labor Statistics Occupational Outlook Handbook 2012-13 |
| Database Administrators/Architects | 17,900 | 15% (Faster than avg.) | Bureau of Labor Statistics Occupational Outlook Handbook 2012-13 |

Provide additional information regarding anticipated employment opportunities for graduates. (1000 characters)

As per the South Carolina Department of Employment and Workforce report (2013), there is a strong growth predicted for Information Security and Analytics professionals in the state. As per this report, between 2012 and 2022, it is expected that the need for these professionals will increase by 20%. A recent search from CareerBuilder website/SC Works Online job banks indicates that South Carolina employers had a total of 318 unique, open, unfilled positions related to Information Security and 239 unique, open, unfilled positions related to Data Analytics. This number is expected to increase significantly, as the SC Department of Labor and Workforce projects a 20% increase in demand for employment of Information Security/Data Analytics professionals over the next decade. According to the Bureau of Labor Statistics (2013) report, overall expected national growth for the Information Security and the Data Analytics/ Scientist related occupations will be about 35% and 15%, respectively. Clearly, there is a need for this kind of training.

Provide supporting evidence of anticipated employment opportunities for graduates, including a statement that clearly articulates what the program prepares graduates to do, any documented citations that suggests a correlation between this program and future employment, and other relevant information. Please cite specific resources, as appropriate. (3000 characters)

Note: Only complete this if the Employment Opportunities table and the section that follows the table on page 4 have not previously been completed.

Not Applicable. Employment Opportunities table and the component that follows the table are completed on page 4.

Will the proposed program impact any existing degree programs and services at the institution (e.g., course offerings or enrollment)?

Yes

No

If yes, explain. (500 characters)

CCU currently has about 320 undergraduate majors in Computer Science, Information Systems and Information Technology combined. It is anticipated that some of these existing students will likely select the new master's program to advance their education if it is a better fit for their interests, skills, and career goals. The proposed M.S. program will also likely interact with the existing graduate programs in Business offered at CCU with a possibility of future dual M.S.-MBA./M.S.-M.Acc. degree programs that offer interested students an opportunity to graduate with dual master's degrees. In short, the only impacts would be positive ones.

List of Similar Programs in South Carolina

| Program Name/Courses | Institution | Similarities | Differences |
|---|---|---|--|
| Master of Science in Computer and Information Sciences | Program jointly offered by College of Charleston and Citadel (CofC-Citadel) | Cybersecurity and Information Systems related focus in the curriculum | CofC -Citadel graduate program is not an online program. Also, the curricular focus of the related program is not in the area of Data Analytics but in areas such as Computer Science and Software Engineering. |
| Graduate certificate in Cybersecurity | Program jointly offered by College of Charleston and Citadel (CofC-Citadel) | Cybersecurity related focus in the curriculum | Curricular focus of the CofC-Citadel program is not in the area of Data Analytics. Also, the program offered by CofC-Citadel is only a certificate program and not a full graduate program or a totally 100% online program. |
| Graduate certificate in Cybersecurity and Information Assurance | University of South Carolina at Columbia (USC-Columbia) | Cybersecurity related focus in the curriculum | Curricular focus of the USC-Columbia program is not in the area of Data Analytics. Also, the program offered by USC-Columbia is only a certificate program and not a full graduate program or a totally 100% online program. |
| Graduate certificate in Business Analytics | University of South Carolina at Columbia (USC-Columbia) | Analytics related focus in the curriculum | Curricular focus of the USC-Columbia program is not in the area of Information Security. Also, the program offered by USC-Columbia is only a certificate program and not a full graduate program or a totally 100% online program. |
| Graduate courses offered by USC in the area of Data Analytics | University of South Carolina at Columbia (USC-Columbia) | Graduate courses in a. Scientific/Data Visualization b. Data Mining and Warehousing c. Decision Support Systems d. Big Data Analytics | <i>Proposed CCU Courses:</i> Data Management and Analytics, Semantic Web Technologies and Data Fusion <i>Existing USC-Columbia Courses:</i> Machine Learning , Bayesian Networks and Pattern Recognition, Quantitative Methods in Business, CRM and Data Mining, Intelligent Information Systems Design for Business Decision Making, Neural Information Processing |
| Graduate courses offered by USC in the area of Information Security | University of South Carolina at Columbia (USC-Columbia) | Graduate courses in a. Digital Forensics b. Secure Networking c. Secure Software Development | <i>Proposed CCU Courses:</i> Secure Cloud Computing, Intro. to Cybersecurity and Information Assurance, Intelligence and Security Analysis, Security Patterns, Security Policy and Risk Assessment <i>Existing USC-Columbia Courses:</i> Information Security Principles, Intro. to Cryptography, Security and Privacy for Wireless Networks, Information Warfare, Secure Database Systems, Formal Methods in Computer Security, Distributed Systems Security |

Description of the Program

| Projected Enrollment | | | | | | |
|----------------------|-----------|--------------|-----------|--------------|-----------|--------------|
| Year | Fall | | Spring | | Summer | |
| | Headcount | Credit Hours | Headcount | Credit Hours | Headcount | Credit Hours |
| 2015-2016 | 15 | 135 | 18 | 164 | N/A | N/A |
| 2016-1017 | 30 | 269 | 31 | 282 | N/A | N/A |
| 2017-2018 | 33 | 301 | 31 | 283 | N/A | N/A |
| 2018-2019 | 34 | 302 | 32 | 284 | N/A | N/A |
| 2019-2020 | 34 | 303 | 32 | 285 | N/A | N/A |

Besides the general institutional admission requirements, are there any separate or additional admission requirements for the proposed program?

- Yes
 No

If yes, explain. (1000 characters)

Admission criteria for this program are similar to those for other graduate programs at CCU. However, for Undergraduates (UG) with non-CS/IS/IT majors, UG course credits (equivalent to the required coursework for CCU UG CS/IS/IT Majors) in: (a) Computer Networks or Information Security, (b) Programming or Web Development, (c) Database Design or SQL Development and (d) Elementary Statistics or Business Statistics are required. Such students may come from other Science/Math/Business majors, perhaps with a minor in CS/IS/IT, or they may have related work experience. If the prospective student doesn't have the above UG credits but all other admission criteria are satisfactory, the student can be accepted on a *probationary* basis with the condition that the student needs to obtain undergraduate credits with grades of 'C' or better in the above mentioned courses prior to taking any graduate coursework for the program. Candidates seeking admission to this program will submit the following materials in addition to the standard admission requirements:

1. Resume/Vitae; and
2. A personal statement indicating career goals and reasons for interest in this specific program.

Are there any special articulation agreements for the proposed program?

- Yes
 No

If yes, identify. (1000 characters)

No special articulation agreements are proposed. CCU is interested in establishing cooperative relationships with other institutions across the state, as they have the potential to serve as feeder programs for this proposed Information Security and Data Analytics-centric Master of Science in Information Systems Technology degree program. In turn, this program could also serve as a feeder program to other doctoral programs in the state. Coursework taken at other accredited programs would be open to review for transferability. The current Computer Science and Information Systems faculty have established a record of collaborative work with other individuals and programs throughout the state, and this is expected to continue.

Curriculum

Select one of the following charts to complete: Curriculum by Year **or** Curriculum by Category

| Curriculum by Year | | | | | |
|---------------------------|--------------|----------------------|--------------|----------------------|--------------|
| Course Name | Credit Hours | Course Name | Credit Hours | Course Name | Credit Hours |
| Year 1 | | | | | |
| Fall | | Spring | | Summer | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| Total Semester Hours | | Total Semester Hours | | Total Semester Hours | |
| Year 2 | | | | | |
| Fall | | Spring | | Summer | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| Total Semester Hours | | Total Semester Hours | | Total Semester Hours | |
| Year 3 | | | | | |
| Fall | | Spring | | Summer | |
| | | | | | |
| | | | | | |
| | | | | | |
| Total Semester Hours | | Total Semester Hours | | Total Semester Hours | |
| Year 4 | | | | | |
| Fall | | Spring | | Summer | |
| | | | | | |
| | | | | | |
| | | | | | |

| Curriculum by Year | | | | | |
|---------------------------|---------------------|----------------------|---------------------|----------------------|---------------------|
| Course Name | Credit Hours | Course Name | Credit Hours | Course Name | Credit Hours |
| Total Semester Hours | | Total Semester Hours | | Total Semester Hours | |
| Year 5 | | | | | |
| Fall | | Spring | | Summer | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| Total Semester Hours | | Total Semester Hours | | Total Semester Hours | |

| Curriculum by Category* | | | | | |
|--|------------------------|---|--------------------------------|---|-----------------------|
| I. CORE COURSES | 15 Credit Hours | II. ELECTIVE COURSES | 12 Credit Hours | III CAPSTONE COURSES | 6 Credit Hours |
| IST 650 – Information Systems Technology in Context | 3 Credit Hours | Security Concentration Elective Courses | 6 Credit Hours Required | Thesis Option | 6 Credit Hours |
| IST 660-Intro to Cybersecurity and Information Assurance | 3 Credit Hours | IST 665-Secure Networking | 3 Credit Hours | IST 799 Research Thesis | 6 Credit Hours |
| IST 661- Security Policy and Risk Assessment | 3 Credit Hours | IST 666 Secure Software Development | 3 Credit Hours | Non-Thesis Option | 6 Credit Hours |
| IST 670-Data Management and Analytics | 3 Credit Hours | IST 667 Intelligence and Security Analysis | 3 Credit Hours | IST 659-Sp. Topics in Information Systems Tech. | 3 Credit Hours |
| IST 671-Data Mining and Knowledge Discovery | 3 Credit Hours | CSCI 534-Digital Forensics | 3 Credit Hours | IST 669-Sp. Topics in Information Security | 3 Credit Hours |
| | | Analytics Concentration Elective Courses | 6 Credit Hours Required | IST 679-Sp. Topics in Data Analytics | 3 Credit Hours |
| | | IST 675-Semantic Web Technologies | 3 Credit Hours | | |
| | | IST 676-Data Fusion | 3 Credit Hours | | |
| | | IST 677-Data Visualization | 3 Credit Hours | | |
| | | CSCI 575-Decision Support Systems | 3 Credit Hours | | |
| | | | | | |

* Add category titles to the table (e.g., major, core, general education, concentration, electives, etc.)

Total Credit Hours Required 33 Credit Hours

Course Descriptions for New Courses

| Course Name | Description |
|---|---|
| IST 650: Information Systems Technology in Context | This course introduces the issues that impact the design, development, and use of secure information systems. Organizational, social, legal, and ethical topics include: secure systems analysis and design, privacy issues, and the current legal landscape of information security and privacy. |
| IST 660: Intro to Cybersecurity and Information Assurance | This course is designed to provide an introduction to Cybersecurity and Information Assurance. It covers the fundamental concepts necessary to understand the security threats and technical defenses. The course includes an overview of security planning and implementing security technology. |
| IST 661: Security Policy and Risk Assessment | Prereq: IST 660. This course addresses ethical, legal and risk analysis/assessment/management policies and issues within which professionals shall practice and studies how they impact privacy, fair information practices and content control. |
| IST 665: Secure Networking | Prereq: IST 660. This course covers the applications and practice of Cryptography in securing wired/wireless networks and Internet. Cryptography related techniques would be studied to secure network infrastructure, firewalls and related topics. |
| IST 666: Secure Software Development | Prereq: IST 660. This course covers development of security requirements and the design, development and implementation of secure mobile and web applications. Principles of Secure Development Lifecycle, application vulnerabilities, secure design and coding will be covered in depth. |
| IST 667: Intelligence and Security Analysis | Prereq: IST 660. This course offers an advanced overview of the various structured analytical techniques used in the intelligence and security professions for conducting in-depth analysis and assessment. Emphasis will be placed on application of computer based models/applications for analysis. |
| IST 670: Data Management and Analytics | This course deals with the data management process for analytics, including analysis, design, data acquisition, cleaning, transformation, quality, structure, and security of the databases. Course also explores how the data relate and aggregate in analytic databases that could then be used by analytical tools. |
| IST 671: Data Mining and Knowledge Discovery | Prereq: IST 670. This course covers the techniques, the principles and methodologies involved in data mining. The course covers the ability to apply, analyze and evaluate different machine learning schemes and data mining algorithms. |
| IST 675: Semantic Web Technologies | Prereq: IST 670. This course provides an introduction to transition from Traditional Web to Semantic Web Technologies. Topics covered include the representation of structured web documents/resources in XML and RDF, Ontology Engineering, Web Ontology Language, and Semantic Web applications. |
| IST 676: Data Fusion | Prereq: IST 670. This course covers the introduction to the concepts, techniques, and issues surrounding distributed data access, collection, fusion and delivery techniques of information from multiple sensors and sources of data. |
| IST 677: Data Visualization | Prereq: IST 670. The course covers the visualization tools, concepts and representations for the analysis and understanding of complex data/insights visually and how to design and create effective interactive visualizations. |
| IST 659:Sp. Topics in Information Sys. Tech (IST)–Security Patterns | Prereq: Completion of Core Courses. This course examines the field of security design patterns. Students will survey a set of security patterns, study implementation options for selected patterns, and contribute additional pattern documentation to improve the effectiveness and usability of selected patterns for the general community. |
| IST 669:Sp Topics in Info Security – Secure Cloud Computing | Prereq: Completion of Core Courses. This course explores the fundamentals of cloud computing and addresses the cloud security related risks, issues and challenges associated with the cloud by exploring the security architectures, cloud software security, and cloud networking security tools and techniques. |
| IST 679:Sp. Topics in Data Analytics - Big Data Analytics | Prereq: Completion of Core Courses. This covers the fundamental concepts of Big Data management and analytics. This course is designed to equip students with the analysis, design and development of the applications that deal with very large volumes of data as well as in proposing scalable solutions for business and scientific applications. |
| IST 799: Research Thesis | Prereq: Completion of Core Courses. In this course, students design, implement, and present, both orally and in writing, an original research project. Specifically, the student will have delineated a research topic; conducted a literature review; developed appropriate methodology for investigating a topic; collected and analyzed data; and interpreted the results. |

Faculty

| Faculty and Administrative Personnel | | | | |
|---|---------------------------|--|--|---|
| Rank | Full- or Part-time | Courses Taught or To be Taught, Including Term, Course Number & Title, Credit Hours | Academic Degrees and Coursework Relevant to Courses Taught, Including Institution and Major | Other Qualifications and Comments (i.e., explain role and/or changes in assignment) |
| Assistant Professor | Full Time | IST 670- Data Management and Analytics (3) F, S IST 671-Data Mining and Knowledge Discovery (3) F, S IST 675-Semantic Web Technologies (3) F, S IST 665-Secure Networking (3) F, S | PhD CSE., University of Louisville, KY EMCS 630 - Data Base Design (3) EMCS 694 - Internet App Dev (3) CECS 694 - Data Warehousing and Data Mining (3) CIS 675 - Management Info Systems (3) CECS 508 - Numerical Analysis (3) CECS 542 - Comp Control and Real-Time Programming (3) | Prior teaching / research experience in these areas Dissertation – Intrusion Detection and Response Model for Mobile Ad hoc Networks (Utilizing Data Analytics for Network Security) |
| Assistant Professor | Full Time | IST 650- Info Systems Tech in Context (3) F, S IST 660- Intro to Cybersecurity and Assurance(3) F, S IST 666- Secure Software Development(3) F, S IST 659- Sp. Topics in Info Sys Tech (3) F, S | PhD CIS Nova Southeastern University, FL MCIS 0652: Computer Security (3 hours) DCIS 0770: Software Engineering (3 hours) DCIS 765: Secure Systems Analysis & Design (3 hours) DCIS 730: Information Security (3 hours) MCIS 623: Legal & Ethical Aspects of Computing (3 hours) MCIS 680- Human Computer Interaction (3 hours) | Prior teaching / research experience in these areas DCIS 0830: Project in Info Security (4) DCIS 0875: Project in Privacy (4) |
| Associate Professor | Full Time | CSCI 575-Decision Support Systems(3) S IST 679-Sp. Topics in Data Analytics – Big Data Analytics (3) S | PhD CIS Nova Southeastern University, FL DCIS 735 Knowledge Management (3) DCIS 710 Decision Support Systems(3) DCIS 750 Database Systems (3) MBAMS 630 Stats Analysis Managers(3) – Univ of Mass - Boston MBA 600 Math Analysis – Managers (3) – Univ of Mass - Boston MBAMS 650 Object Orient Info Sys (3) – Univ of Mass - Boston | Prior teaching experience in these areas |
| Assistant Professor | Full Time | IST 669 – Sp. Topics in Information Security – Secure Cloud Computing (3) F, S CSCI 534 – Digital Forensics (3) F,S | PhD Computer Science., Clemson University, SC CPSC 851: Software Systems for Data Communications (3) CPSC 881: Selected Topics (Wireless Sensor Networks) (3) CPSC 881: Selected Topics (Cyberinfrastructure) (3) CPSC 622: Operating Systems (3) CPSC 852: Internetworking (3) CIS 657: Operating Systems (3) - Syracuse University, NY | Prior research/teaching experience in these areas |
| Assistant Professor | Full Time | IST 661 – Security Policy and Risk Assessment (3) F, S IST 667 – Intelligence and Security Analysis(3) F, S | PhD Foreign Affairs [Intel] University of Virginia, VA GFAG 509 Introduction to Quantitative Methods (3) GFAG 809 Political Applications of Applied Multivariate Analysis (3) GFIR 833 Science and Philosophy in International Relations (3) GFIR 511 International Law (3) GFIR 507 Ideological Influence on International Relations (3) GFIR 505 Theories of International Relations (3) | Prior teaching and Military experience in these areas |
| Assistant Professor* | Full Time | IST 676 – Data Fusion (3) F, S IST 677 – Data Visualization (3) F, S IST 679 – Sp. Topics in Data Analytics – Big Data Analytics (3) F, S | TBD | TBD |

Note: Individuals should be listed with program supervisor positions listed first. Identify any new faculty with an asterisk next to their rank.

Total FTE needed to support the proposed program (i.e., the total FTE devoted just to the new program for all faculty, staff, and program administrators):

Faculty 2.5

Staff 0.25

Administration 0.25

Faculty /Administrative Personnel Changes

Provide a brief explanation of any additional institutional changes in faculty and/or administrative assignment that may result from implementing the proposed program. (1000 characters)

Current Computing Sciences (CS) department faculty and Intelligence and Security program faculty will staff the proposed new program. One member of the CS faculty may be reassigned one course release per semester to recruit, retain and advise graduate students, as well as to fulfill the duties of scheduling courses and assisting the Department Chair and Dean with budget and resource management. Additional administrative support may be necessary to assist with the new program, which could be fulfilled with a part-time position. One additional faculty line has been accounted for in the budget supporting the new hire during the second year of the program. As enrollments increase in the degree programs offered by the CS department, it may be necessary to increase the number of full-time faculty in the future to maintain the student-to-faculty ratio. However, any future hires will be triggered by student demand and justified by increased tuition revenues. New faculty hires should possess a Ph.D. and/or relevant experience in the area of CS/IS/IT.

Library and Learning Resources

Identify current library/learning collections, resources, and services necessary to support the proposed program and any additional library resources needed. (1000 characters)

Kimbel Library provides access to 1,091 print and online periodicals relevant to the proposed program. Of these, 37.9% represent core titles in the relevant subject areas. A minimum 37 subject areas were identified for the proposed M.S program. In the Library of Congress Classification areas reviewed, Kimbel library holds 4,148 titles in all supporting areas. Of the 4,148 total titles owned, 948 (22.9%) are print, 3,197 (77%) are e-books, and 3 (0.1%) are media items. Of the 4,148 titles analyzed, 563 (13.6%) were published prior to 2000. Average publication year of the collection is 2004 (or average age eight years); median publication year is 2007 (or median age 5 years); and the most frequent publication year is 2009.

Based on the budget allocated to the library in this proposal (\$6,775 per year), the library is likely to be expected to reach a sufficient percentage of core titles within the first five years of the program, and it can also make judicious use of electronic resources and resources, such as PASCAL Delivers or interlibrary loan, to supplement the program's needs as it develops.

Student Support Services

Identify academic support services needed for the proposed program and any additional estimated costs associated with these services. (500 characters)

The proposed program will leverage the existing student support services, such as the Learning Assistance Center, Counseling Services, Moodle support and Technical Support from Student Computing Services, among others. The students who would require accommodations due to a disability, whether it is physical, learning or mental, will be provided with the means necessary to achieve their goals, such that each student becomes successful and is given equal opportunity to achieve his/her fullest potential. The program will also leverage CCU's Center for Teaching Excellence to Advance Learning with respect to any special support that may be needed for instruction within distance learning environments. No new support services are needed or requested.

Physical Resources

Identify any new instructional equipment needed for the proposed program. (500 characters)

For the security-related courses, the students can use freely available virtualization software and open source tools such as Network Security Toolkit, OWASP tools, Nessus, Metasploit and Wireshark. For analytics-related courses, students can utilize open source tools such as R, MySQL, Knime, Hadoop, Protégé, Jena, SPARQL, and FLORA-2. For tools such as SAS, Oracle, Matlab, Tableau, and Globalytica, we will leverage the industry's academic alliances program to obtain free time-limited licenses. Sufficient instructional resources are currently available to support this Online program.

Will any extraordinary physical facilities be needed to support the proposed program?

Yes

No

Identify the physical facilities needed to support the program and the institution's plan for meeting the requirements, including new facilities or modifications to existing facilities. (1000 characters)

The CS department already has 6,513 square feet of office and lab space. Since the proposed M.S program would be offered as an Online program, we will leverage the existing resources from CCU's Coastal Office of Online Learning (COOL) center for the synchronous and asynchronous delivery of the Online courses in the proposed M.S program. We will work with the COOL Center to develop high quality, high value Online courses, Online course components, and the Online curriculum. We will leverage the collaboration of COOL with Information Technology Services and Media Services to advance the Online learning resources and infrastructure.

The proposed program will make use of a dedicated lecture capture room and a dedicated video conferencing room available in the University to provide for and meet the distance learning needs of the students. The proposed M.S program requires no additional physical plant requirements. Any further changes will be dictated by growth in enrollment.

Financial Support

| Estimated New Costs by Year | | | | | | |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|--------------------|
| Category | 1st | 2nd | 3rd | 4th | 5th | Total |
| Program Administration | \$34,971 | \$35,671 | \$36,384 | \$37,112 | \$37,854 | \$181,992 |
| Faculty and Staff Salaries | \$128,574 | \$131,146 | \$147,681 | \$150,635 | \$153,648 | \$711,684 |
| Graduate Assistants | \$15,000 | \$65,000 | \$65,000 | \$65,000 | \$65,000 | \$275,000 |
| Equipment | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Facilities | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Supplies and Materials | \$1,000 | \$1,000 | \$1,000 | \$1,000 | \$1,000 | \$5,000 |
| Library Resources | \$6,775 | \$6,775 | \$6,775 | \$6,775 | \$6,775 | \$33,875 |
| Other* | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Total | \$186,320 | \$239,592 | \$256,840 | \$260,522 | \$264,277 | \$1,207,551 |
| Sources of Financing | | | | | | |
| Category | 1st | 2nd | 3rd | 4th | 5th | Total |
| Tuition Funding | \$187,276 | \$345,542 | \$366,469 | \$367,694 | \$368,578 | \$1,635,559 |
| Program-Specific Fees | | | | | | |
| State Funding (i.e., Special State Appropriation)* | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Reallocation of Existing Funds* | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Federal Funding* | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Other Funding* | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| Total | \$187,276 | \$345,542 | \$366,469 | \$367,694 | \$368,578 | \$1,635,559 |
| Net Total (i.e., Sources of Financing Minus Estimated New Costs) | \$956 | \$105,950 | \$109,629 | \$107,172 | \$104,301 | \$428,008 |

*Provide an explanation for these costs and sources of financing in the budget justification.

Budget Justification

Provide a brief explanation for the other new costs and any special sources of financing (state funding, reallocation of existing funds, federal funding, or other funding) identified in the Financial Support table. (1000 characters)

Note: Institutions need to complete this budget justification *only* if any other new costs, state funding, reallocation of existing funds, federal funding, or other funding are included in the Financial Support table.

NOTE: Faculty salaries in the cost section of the budget include the salary for a new faculty hire, in addition to the salaries for the existing faculty corresponding to their load. The Administrative Support (AS) of the unit will also need to be increased somewhat and is reflected in the budgeted cost. The need for AS is, in part, related to the rapid growth of the current programs at the undergraduate level. With the addition of a graduate program, AS will need to be augmented with a .25 hire. The new program would also require some graduate assistants (GAs) to ensure the quality of the program. Fringe Benefits (24% of the salary) are included in the salaries. Program administration costs are based on 25% of Director's salary plus fringe benefits. Years 2 to 5 costs are based on a 2% increase in salaries. Cost is also allocated for procuring the library resources mentioned in this proposal, such that the library is likely to be expected to reach a sufficient percentage of core titles within the first five years of the program. Tuition funding is based on the enrollment trend survey that was conducted internally within the University and on the average of in-state and out-of-state tuition rates. Tuition fees are estimated to cover the cost of this new program. No funding will be requested from the state.

Evaluation and Assessment

Programmatic Assessment: Provide an outline of how the proposed program will be evaluated, including any plans to track employment. Identify assessment tools or software used in the evaluation. Explain how assessment data will be used. (3000 characters)

The program will perform continuous assessment of Student Learning Outcomes (SLO) and of the program itself. SLO's are assessed using both direct and indirect methods, with at least one direct method of assessment per objective. Direct assessment methods generally evaluate the skills of students by testing factual knowledge (e.g.: test questions). Indirect methods generally evaluate the interpretation of learning achieved (e.g.: survey questions). The main data sources (each with numerous individual data points) for the assessment include: Course data reported via Faculty Course Assessment Reports (FCARs) and survey-based questions from the exit evaluations. Assessment of these outcomes will come from a variety of sources: both inside and outside of normal graded material. For example, the exit survey/evaluations and student assignment performance are examples of outside and inside of the normal graded material, respectively.

The SLO's can be mapped to the Program Objectives (PO) and are evaluated using the same process employed to evaluate the PO. Evaluation methods at the course level include evaluating at least two sources from appropriate assessments in the courses; in addition, exam questions, assignments, and course surveys may be used. Department-level evaluation methods include an exit survey.

The department will assess the program on an annual basis at the end of each academic year. The initial program assessment will include the following:

1. Review of admission criteria, particularly scores and written materials;
2. Review of student course survey/course evaluations;
3. Review of FCARs and faculty reflections;
4. Review of exit evaluations related to the program;
5. Review of post-programmatic surveys, including surveying recent graduates or alumni and their employers.

The assessment data will be reviewed annually and findings reported to the program faculty as well as to the University Assessment Committee for review. In addition, the program will use the findings to assess and recommend any program changes that may improve the overall quality and operation of the program.

Student Learning Assessment

| Expected Student Learning Outcomes | Methods of/Criteria for Assessment |
|--|---|
| Write and present: (1) review (2) architecture, or (3) methodology that is potentially applied in IST professional practice or publishable in academic outlets. | Portfolio, Comprehensive exam, Thesis Report and Project Report collected in the courses: IST 659, IST 799, IST 669 and IST 679 |
| Ability to analyze and implement processes and systems to transform raw business data to useful information and knowledge for a given problem. | Case briefs, Special applied project and Exams collected in: IST 660, IST 670, IST 676, and CSCI 575 |
| Develop innovative technology approaches to solve problems in a novel manner. | Project Report and Thesis Report collected in the courses: IST 659, IST 799, IST 669 and IST 679 |
| Effectively evaluate and communicate the threats/vulnerabilities of IST infrastructure and the effectiveness of technologies and systems available to secure an organization's IST infrastructure. | Case briefs, Exams and Written assignments collected in: IST 665, IST 666 and IST 660 |
| Effectively apply the policies and principles of risk management as they get implemented in IST industry. | Exams, Case briefs and Written assignments collected in: IST 650, IST 661 and CSCI 534 |
| Effectively communicate the knowledge discovered or the decision obtained by applying analytics/data mining methods/visualization techniques for a given problem. | Exams, Written assignments and Special applied projects collected in: IST 675, IST 676 and IST 671. |

CSCI 534 Digital Forensics: Study of techniques, tools and processes used to discover digital evidence. Topics include collection, preservation, presentation, and preparation of computer based evidence for the purpose of criminal law enforcement and civil litigation. Role in proposed curriculum: This course is a possible elective of the security concentration in the curriculum. Student performance on term projects, written assignments and case briefs from this course will be used to assess the program learning outcomes. Effective application of the policies and principles of risk management as they get implemented in IST industry will be emphasized.

CSCI 575 Decision Support Systems: A study of decision support systems. Topics include computerized decision support and business intelligence systems, modeling, and methodologies. Course will cover data and web mining concepts, knowledge management technologies, collaboration techniques, and intelligent systems. Course includes a research-based focus to explore current advances in the field. Role in the proposed curriculum: This course is a possible elective of the analytics concentration. As above, student term projects, exams and case briefs will be used to assess the program learning outcomes. The emphasis is on transforming raw business data into useful information and knowledge for a given problem.

Will the proposed program seek program-specific accreditation?

- Yes
 No

If yes, provide the institution's plans to seek accreditation, including the expected timeline for accreditation. (500 characters)

The Information Security aspect of the program's curriculum is aligned with the current Information Assurance Education content standards outlined by the National Center of Academic Excellence (NCAE). The NCAE accreditation is optional, but once this M.S. program is established, CCU will most likely seek accreditation through NCAE within two years. This accreditation will allow for an additional element of quality for the program and improve the career prospect of the students graduated from the program, but it is not required.

Will the proposed program lead to licensure or certification?

- Yes
 No

If yes, explain how the program will prepare students for licensure or certification. (500 characters)

The curriculum is designed such that it will expose students to the Common Body of Knowledge prescribed for the International Information Systems Security Certification Consortium (ISC)² certifications and Institute for Operations Research and Management Science - Certified Analytics Professional (INFORMS CAP) certification, that are accepted widely in the Industry. However, such certification is not required.

Teacher or School Professional Preparation Programs

Is the proposed program a teacher or school professional preparation program?

- Yes
 No

If yes, complete the following components.

Area of Certification

Please attach a document addressing the South Carolina Department of Education Requirements and SPA or Other National Specialized and/or Professional Association Standards.