UNIVERSITY FACULTY SENATE FORMS

Academic Program Approval

This form is a routing document for the approval of new and revised academic programs. Proposing department should complete this form. Detailed instructions for the proposal should be followed. A checklist is available to assist in the preparation of a proposal. For more information, call the Faculty Senate Office at 831-2921.

Submitted by: _____Kenneth E Barner_____ phone number (302) 831-6937

Department: Electrical and Computer Engineering email address Barner@udel.edu

Date: October 10, 2016

Action: Add a dual MS degree program in IS&TM and Cybersecurity
　　　　(Example: add major/minor/concentration, delete major/minor/concentration, revise major/minor/concentration, academic unit name change, request for permanent status, policy change, etc.)

Effective term 17F
　　　　(use format 04F, 05W)

Current degree_____ *MS in Cybersecurity with concentration in* **Security** *Management* _
　　　　(Example: BA, BACH, BACJ, HBA, EDD, MA, MBA, etc.)

Proposed change leads to the degree of: ____**Dual** *MS in IS&TM/Cybersecurity*_____
　　　　(Example: BA, BACH, BACJ, HBA, EDD, MA, MBA, etc.)

Proposed name: *no change*_____
　　　　Proposed new name for revised or new major / minor / concentration / academic unit
　　　　(if applicable)

Revising or Deleting:

　　　Undergraduate major /
Concentration:_____*NA*_____
　　　　(Example: Applied Music – Instrumental degree BMAS)

　　　Undergraduate minor:_____*NA*_____
　　　　(Example: African Studies, Business Administration, English, Leadership, etc.)

　　　Graduate Program Policy statement change*: See Attachment*
　　　　(**Must attach** your Graduate Program Policy Statement)

　　　Graduate Program of Study:____ *MS in IS&TM and MS in Cybersecurity*_
　　　　(Example: Animal Science: MS Animal Science: PHD Economics: MA Economics: PHD)

　　　Graduate minor / concentration:

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Note: all graduate studies proposals must include an electronic copy of the Graduate Program Policy Document, either describing the new program or highlighting the changes made to the original policy document.

This is attached

List new courses required for the new or revised curriculum. How do they support the overall program objectives of the major/minor/concentrations)?
(Be aware that approval of the curriculum is dependent upon these courses successfully passing through the **Course Challenge** list. If there are no new courses enter "None")

None

Supply support letter from the Library, Dean, and/or Department Chair if needed
(all new majors/minors will need a support letter from the appropriate administrator.)

See below the College of Engineering dean's letter of support

Insert Deans' letters here

UNIVERSITY OF DELAWARE.

College of Engineering
OFFICE OF THE DEAN

102 Du Pont Hall
Newark, DE 19716-3101
Phone: 302-831-2401
Fax: 302-831-8179

October 31, 2016

Kenneth Barner,
Professor & Chair
Department of Electrical and Computer Engineering

Re: Masters of Science in Cybersecurity and Masters of Science in Information Systems & Technology Management

Dear Professor Barner:

I am pleased to write in strong support of the proposed dual MS degree program in Cybersecurity and Information Systems & Technology Management to be offered jointly by the College of Engineering Department of Electrical and Computer Engineering and the Lerner College of Business and Economics Department of Accounting and Management Information Systems. This is the kind of innovative program that can provide visible leadership for the University and collaborating colleges in a critical area of national need.

The proposed dual degree program is a natural extension to the College of Engineering ECE Department's Cybersecurity MS degree. The College of Engineering is committed to providing the necessary resources to support that successful program, which is now in its third year of operation. The program continues to see steady and healthy enrollment increases.

I wish you the best of luck in this important initiative.

Sincerely,

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Babatunde A. Ogunnaike
William L Friend Chaired Professor
and Dean

cc: M. Matthews

Supply a resolution for all new majors/programs; name changes of colleges, departments, degrees; transfer of departments from one college to another; creation of new departments; requests for permanent status. See example of resolutions.

WHEREAS, the Lerner College of Business and Economics has offered a successful program for the MS in IS&TM for 14 years offering graduate students skills for the successfully implementation and management of IT in business and

WHEREAS, the College of Engineering has offered a successful program for the MS in Cybersecurity for 2 years offering graduate students skills for the successfully implementation of cybersecurity in government and business and

WHEREAS, the Lerner College of Business and Economics has received many inquiries over the last several years from individuals who are interested in pursuing careers in IT and Cybersecurity in business and

WHEREAS, the Lerner College of Business and Economics and the College of Engineering have proposed the creation of a Dual Degree MS program in IS&TM and Cybersecurity, and

WHEREAS, the existing graduate programs already provide a majority of all the courses and administrative framework for such a dual degree, and

WHEREAS, the proposed dual degree contributes to one of the milestones on the University's "path to prominence" to achieve excellence in professional education; be it therefore

RESOLVED, that the Faculty Senate recommends the approval of the dual MS in IS&TM and Cybersecurity degree program.

Explain, when appropriate, how this new/revised curriculum supports the 5 goals of undergraduate education: http://www2.udel.edu/gened/

n/a

Identify other units affected by the proposed changes:
(This would include other departments/units whose courses are a required part of the proposed curriculum. Attach permission from the affected units. If no other unit is affected, enter "None")

This a Dual MS degree program approved by the faculties of the Lerner College of Business and Economics and the College of Engineering.

Describe the rationale for the proposed program change(s):
(Explain your reasons for creating, revising, or deleting the curriculum or program.)

The MS in Information Systems & Technology Management degree prepared students for careers in information systems; including, business and software systems analysis, data mining, and the management of information technology in business. The MS in Cybersecurity prepares students for careers in secure software and systems; including, the design of secure software and business information systems and security analytics. We see significant synergy in these two MS programs and our intent is to leverage them for the benefit and students, the University, and the world. The graduates of this program will be ideally positioned to address the inter-related challenges of well-designed and secure information systems faced by all businesses and governments in our modern world.

Program Requirements:
(Show the new or revised curriculum, as it should appear in the Course Catalog. If this is a revision, be sure to indicate the changes being made to the current curriculum and **include a side-by-side comparison** of the credit distribution before and after the proposed change.) **See example of side by side.**

- See attached document

ROUTING AND AUTHORIZATION: (Please do not remove supporting documentation.)

Department Chairperson _____ Date 10/20/16

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Dean of College_____ _tunde ogunnaike_ _____Date_ 2/10/2017_
(By signing above, the Dean confirms that their college policies and bylaws have been followed correctly during consideration of the request described in this form.
The approval actions that were taken at the college level were (check all that apply) :
_____XX_____college faculty vote; ____XX_____college curriculum approval _____n/a___ college senate approval

Chairperson, College Curriculum Committee_____ _Ajoy_ _____Date____ 2/10/17 _____

Chairperson, Senate Com. on UG or GR Studies_____Date_____

Chairperson, Senate Coordinating Com._____Date_____

Secretary, Faculty Senate_____Date_____

Date of Senate Resolution_____Date to be Effective_____

Registrar _____Program Code_____Date_____

Vice Provost for Academic Affairs & International Programs_____Date_____

Board of Trustee Notification_____Date_____

ROUTING AND AUTHORIZATION: (Please do not remove supporting documentation.)

Department Chairperson _____Date____

Dean of College_____Date_____
(By signing above, the Dean confirms that their college policies and bylaws have been followed correctly during consideration of the request described in this form.
The approval actions that were taken at the college level were (check all that apply) :
_____XX_____college faculty vote; ____XX_____college curriculum approval _____n/a___ college senate approval

Chairperson, College Curriculum Committee_____Date_____

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Chairperson, Senate Coordinating Com._____Date_____

Secretary, Faculty Senate_____Date_____

Date of Senate Resolution_____Date to be Effective_____

Registrar _____Program Code_____Date_____

Vice Provost for Academic Affairs & International Programs_____Date_____

Board of Trustee Notification_____Date_____

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Masters of Science in Information Systems & Technology Management
Masters of Science in Cybersecurity
(MS in IS&TM / MS in Cybersecurity) Dual Degree Proposal

Part I. Program History

The Alfred Lerner College of Business and Economics has offered the MS in Information Systems & Technology Management degree since Fall 2002. The Department of Electrical & Computing Engineering in the College of Engineering has offered the MS in Cybersecurity since Fall 2014. The MS in IS&TM prepares students for careers in information systems; including, business and software systems analysis, data mining, and the management of information technology in business. The MS in Cybersecurity prepares students for careers in secure software and systems; including, the design of secure software and business information systems and security analytics. The purpose of this dual degree proposal is to leverage the synergies between these two programs.

The MS in IS&TM program emphasizes the latest theories and skills for analyzing business information systems, working with modern databases, large data sets, and computer networks, managing both large and small information systems projects, and for developing information systems solutions to business problems. The MS in Cybersecurity program emphasizes the latest theories and skills to address the most challenging cybersecurity issues facing the world today. The graduates of this program will be ideally positioned to address the inter-related challenges of well-designed and secure information systems faced by all businesses and governments in our modern world. The program will be jointly administered by the Department of Accounting & MIS in the Alfred Lerner College of Business and the Department of Electrical & Computing Engineering in the College of Engineering.

Part II. Admission

Students desiring to pursue the joint MS in IS&TM/MS in Cybersecurity must apply directly to the degree program and must meet the admissions requirements of both programs (See the University catalog for those requirements). The admissions directors for each program will evaluate the application separately and will apply the same criteria as specified in their respective programs. The prospective student is encouraged to see the admissions policies for both programs in the graduate catalog. Whereas the MS in IS&TM program accepts both the GMAT and GRE exams, scores for the GRE will be required for admission to the dual degree program. All application materials must be submitted by way of the Office of Graduate Studies online applications process.

The MS in IS&TM/MS in Cybersecurity is a joint degree program. As such, the joint programs must be completed and the dual degree is conferred simultaneously. Students admitted to the MS in IS&TM/MS in Cybersecurity joint degree program who later decide they only want to complete one of the degrees must apply separately to the desired program for admission as a candidate in that program. Students who complete the single degree (MS in IS&TM or MS in Cybersecurity) may not at a later date be admitted to the dual degree program. In such case the student would be required to complete all

requirements for the second degree. A student who is initially admitted to either degree and who decides to pursue the dual degree must apply for admission to the dual degree prior to receiving the first degree and must complete the requirements for the dual degree prior to any degree being granted.

Admission to the MS in IS&TM/MS in Cybersecurity program is highly selective and is based upon a combination of professional work experience, prior academic grades, Graduate Record Exam (GRE) scores, letters of recommendation, and an interview. Please refer to the "Graduate Admissions" chapter in this catalog. Applicants are required to send a copy of their recent resume along with the completed application. Two letters of recommendation and an essay are required. Students in the MS in IS&TM/MS in Cybersecurity program are admitted for initial enrollment in either the fall (September) or spring (February) semester. Admissions decisions are made on a rolling basis throughout the year. To expedite consideration for admission, applications should be submitted by February 1 for full-time applicants seeking financial aid, May 1 for applicants seeking fall admission, and November 1 for applicants seeking spring admission. Admission decisions may be made after these dates if space is still available; however, students are strongly encouraged to apply early.

Part III. Academic

The MS in IS&TM/MS in Cybersecurity combines the core courses of both programs with a selected number of advanced courses from both programs. Candidates for the MS in IS&TM/MS in Cybersecurity degree must complete a total of 48 credit hours, divided into core IS&TM courses (15 hours), core Cybersecurity courses (15 hours), advanced IS&TM elective courses (3 hours), and advanced Cybersecurity concentration and electives (15 hours). Full-time students should be able to complete the program in 24 months including courses during the winter and summer terms. Part-time students normally take from three to four years to earn their degrees.

Core IS&TM and Cybersecurity Courses:

IS&TM core courses:

ACCT 804:	Data Management	(3 credits)
ACCT 806:	Systems Analysis & Implementation	(3 credits)
MISY 810:	Telecomm & Networks I (cross-listed CPEG 810)	(3 credits)
MISY 850:	Security & Control	(3 credits)
MISY 805:	Current Issues in MIS	(3 credits)

Cybersecurity core courses (pick 5 courses – 15 credits):

CPEG 665:	Introduction to Cybersecurity	(3 credits)
CPEG 697:	Advanced Cybersecurity	(3 credits)
CPEG 694:	System Hardening and Protection	(3 credits)
CPEG 695:	Digital Forensics	(3 credits)
CPEG 676:	Secure Software Design	(3 credits)
CPEG 671:	Pen Test & Reverse Engineering	(3 credits)
CPEG 672:	Applied Cryptography	(3 credits)

Advanced IS&TM and Cybersecurity:

IS&TM courses (pick 1 – 3 credits):

MISY 873: IT and Organizational Effectiveness	(3 credits)
MISY 840: IT Project Management	(3 credits)
MISY 830: Data Intelligence & Analytics	(3 credits)

Cybersecurity courses (pick a minimum of 3 course from one of the following areas of concentration & 2 other courses – 15 credits):

Secure Software:

CPEG 670: Web Applications Security	(3 credits)
CPEG 621: Algorithm Design and Analysis	(3 credits)
CISC 663: Operating Systems	(3 credits)
CISC 672: Compiler Construction	(3 credits)
OR CPEG 621: Compiler Design	(3 credits)
CISC 675: Software Engineering Principles and Practices	(3 credits)
CISC/CPEG 611: Software Process Management	(3 credits)
CISC/CPEG 612: Software Design	(3 credits)
CISC/CPEG 613: Software Requirements Engineering	(3 credits)
CISC/CPEG 614: Formal Methods in Software Engineering	(3 credits)
CISC/CPEG 615: Software Testing and Maintenance	(3 credits)
CPEG 676: Secure Software Design	(3 credits)

Secure Systems:

ELEG 635: Digital Communications	(3 credits)
ELEG 658: Advanced Mobile Services	(3 credits)
ELEG 617: The Smart Grid	(3 credits)
CPEG 696: Topics in Cybersecurity (Simulations)	(3 credits)
ELEG 812: Wireless Digital Communications	(3 credits)
CPEG 675: Embedded Computer Systems	(3 credits)
CISC/CPEG 651: Computer Networks	(3 credits)
CPEG 853: Network Management	(3 credits)
CPEG 673: Virtualization and Cloud Security	(3 credits)
CISC 866: Multi-Agent Systems	(3 credits)
CPEG 674: SCADA Systems and Security	(3 credits)
CPEG 853: Computer System Reliability	(3 credits)

Security Analytics:

ELEG 815: Analytics 1 – Statistical Learning	(3 credits)
ELEG/FSAN 817: Large Scale Machine Learning	(3 credits)
CISC 683: Introduction to Data Mining	(3 credits)
CISC 637: Database Systems	(3 credits)
CPEG 657: Search and Data Mining	(3 credits)
CISC 681: Artificial Intelligence	(3 credits)
CISC 684: Introduction to Machine Learning	(3 credits)
CISC 689: Topics: Artificial Intelligence: Machine Learning	(3 credits)
ELEG 630: Information Theory	(3 credits)

Students may apply for the MS in IS&TM/MS in Cybersecurity on either a part-time or full-time basis. Full-time students are expected to complete the program in two years. Part-time students are expected to complete the program in approximately four years. Transfers of coursework earned elsewhere and waivers of courses are allowable under the same provisions as the MS in IS&TM and MS in Cybersecurity programs separately, except that none of the coursework specific to the MS program may be waived on the basis of undergraduate coursework. Dual degree students must complete a minimum of 48 credits of coursework at the graduate level. Students are expected to maintain continuous enrollment in every regular semester (fall and spring) throughout their program.

Part IV. Financial Aid

Students in the MS in IS&TM/MS in Cybersecurity program may compete for the same sources of financial assistance as available to MS in IS&TM or MS in Cybersecurity students. See the individual MS program policy statements for specifics. The same criteria for financial assistance apply. Financial assistance may come from either MS programs. To apply for a financial aid package, simply check the appropriate box(es) on the graduate application.

Other Financial Aid Opportunities

Other Fellowships and Internship opportunities are occasionally available through the University. Interested students should check the Office of Graduate Studies website at http://www.udel.edu/gradoffice/applicants and the Lerner College Graduate and Executive Programs website http://www.gep.udel.edu/ for the most current opportunities.

Residence Hall Directorships

The University hires Residence Hall Directors from among the ranks of its graduate students. Candidates are chosen for their superior leadership and communication skills, as well as the capability to provide guidance to undergraduates. Hall Directors are eligible for room and board, and full tuition waivers. Contact the Office of Housing and Residence Life at (302) 831-8423 for additional information as soon as possible. Applicants are usually interviewed around mid-April.

Part V. Departmental Operations

Graduate assistantship or other assignments may require the use of departmental laboratories or other facilities. Keys to laboratories, etc., are maintained in the separate Department offices and will be issued based on faculty and Department Chair approval.

Any assignments that require the expenditure of departmental funds (e.g. data collection activities) require departmental approval in advance and are processed through the approving Department.

October 13, 2016

Dear Professor Barner:

The Department of Accounting and Management Information Systems is pleased to support the proposed MS in ISTM and MS in Cybersecurity dual degree to be offered jointly by our departments. The proposed program offers opportunity for our students to broaden their skill set and the focus of the program is aligned with the needs of many employers.

Our department will support the new joint program by providing the MIS courses described in the proposal. The Department of Accounting and MIS has the necessary expertise to staff these courses.

Sincerely,

Scott Jones, Professor & Chairperson
Department of Accounting and MIS

UNIVERSITY OF DELAWARE.

Department of Electrical
& Computer Engineering

OFFICE OF THE CHAIR

Newark, DE 19716-3130
Phone: 302-831-2405
Fax: 302-831-4375

October 15, 2016

College of Engineering Educational Activities Committee and
Faculty Senate Graduate Studies Committee

Re: Academic Program Application for dual MS degree program in IS&TM and Cybersecurity

The Department of Electrical and Computer Engineering supports the proposed MS in IS&TM and MS in Cybersecurity dual degree program to be offered jointly by the ECE and Accounting and MIS Departments. The ECE faculty unanimously approved the proposed dual degree, which is a natural complement to ECE's existing MS in Cybersecurity degree. The proposed dual degree will provide students with a unique opportunity to gain broad and complementary skills that are in high demand with many employers.

The ECE Department has the necessary expertise to carry out the courses described in the dual degree proposal. Please feel free to contact me if I can provide additional information or assistance.

Sincerely,

Kenneth E. Barner
Professor & Chair, Ph.D.

October 13, 2016

Dear Professor Barner:

The Department of Accounting and Management Information Systems is pleased to support the proposed MS in ISTM and MS in Cybersecurity dual degree to be offered jointly by our departments. The proposed program offers opportunity for our students to broaden their skill set and the focus of the program is aligned with the needs of many employers.

Our department will support the new joint program by providing the MIS courses described in the proposal. The Department of Accounting and MIS has the necessary expertise to staff these courses.

Sincerely,

Scott Jones, Professor & Chairperson
Department of Accounting and MIS

December 6, 2016

To: Kenneth Barner, Professor and Chair, Dept. of Electrical and Computer Engineering

From: Kathleen McCoy, Chair CIS

Subject: Dual MS Degree Program in IS&TM and Cybersecurity

The department of Computer and Information Sciences supports the proposed MS in IS&TM and MS in Cybersecurity dual degree program to be offered jointly by the ECE and Accounting and MIS Departments. The proposed duel degree program complements the existing MS in Cybersecurity, which our department strongly supported, and builds in complementary skills in IS&TM. We are happy to support the inclusion of departmental courses as options within the program (all of which are already included in the MS in Cybersecurity). These include:

CISC 663:	Operating Systems	(3 credits)
CISC 672:	Compiler Construction	(3 credits)
CISC 675:	Software Engineering Principles and Practices	(3 credits)
CISC/CPEG 611:	Software Process Management	(3 credits)
CISC/CPEG 612:	Software Design	(3 credits)
CISC/CPEG 613:	Software Requirements Engineering	(3 credits)
CISC/CPEG 614:	Formal Methods in Software Engineering	(3 credits)
CISC/CPEG 615:	Software Testing and Maintenance	(3 credits)
CISC/CPEG 651:	Computer Networks	(3 credits)
CISC 866:	Multi-Agent Systems	(3 credits)
CISC 683:	Introduction to Data Mining	(3 credits)
CISC 637:	Database Systems	(3 credits)
CISC 681:	Artificial Intelligence	(3 credits)
CISC 684:	Introduction to Machine Learning	(3 credits)
CISC 689:	Topics: Artificial Intelligence: Machine Learning	(3 credits)

Sincerely,

Kathleen F. McCoy
Professor and Chair
Department of Computer and Information Sciences
University of Delaware
mccoy@udel.edu