

# Board of Trustees Meeting

**February 2, 2021  
1:00 – 1:30 PM**

**Florida Polytechnic University  
WEBEX TELECONFERENCE MEETING**

**Dial In: 1-415-655-0001 | Access Code: 178 505 0950#**

## MEMBERS

Cliff Otto, Chair	Mark Bostick, Vice Chair	Dr. W. Earl Sasser
Dr. Laine Powell	Gary C. Wendt	Bob Stork
Connor Coddington	Beth Kigel	Dr. Ala' J. Alnaser
Lyn Stanfield	Dr. Narendra Kini	

## AGENDA

- |      |   |                                     |
|------|---|-------------------------------------|
| I.   | Call to Order   | Cliff Otto, Chair                   |
| II.  | Roll Call   | Kristen Wharton                     |
| III. | Public Comment  | Cliff Otto, Chair                   |
| IV.  | <a href="#">Re-approve Bachelor of Science in Cyber Security Engineering degree</a> | Dr. Terry Parker<br>EVP and Provost |
| V.   | Closing Remarks and Adjournment   | Cliff Otto, Chair                   |

**Florida Polytechnic University  
Board of Trustees  
February 2, 2021**

**Subject:** Re-approval of the Bachelor of Science in Cyber Security Engineering Degree

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**Proposed Action**

To re-approve the Bachelor of Science degree program in Cyber Security Engineering.

**Background Information**

The Cyber Security Engineering Degree was formally approved by the Board of Trustees at the May 20, 2020 meeting. Unfortunately, I have to ask the Board for reapproval of this degree program so that it can be formally reviewed by the Board of Governors staff.

The relevant facts are:

- The degree program approved in May and the degree program for which I am requesting your formal approval are exactly the same (noting a few small updates have been made).
- The degree program process includes a request for comment from the state college system and comments from the common prerequisite workgroup for the state. When the degree program was approved in May, we had received the state college comments, but had not received inputs from the common prerequisite workgroup.
- Planning and Operations for/with COVID have taxed our campus and other campuses as well. We finally received the inputs from the common prerequisite workgroup in November. We submitted the degree program to the Board of Governors for review last week. The importance of an early spring semester submission is to avoid a review backlog that has been present in the past after the first spring semester BOG meeting.
- A degree program cannot be listed in the state inventory of degree programs until it has been reviewed, and a campus may not recruit for the degree program until the degree is listed in the state inventory.
- The board regulation that specifies degree program approval notes a timeline that includes submittal to the Board of Governors office for degree programs within four weeks of BOT approval. Because of this timeline, the BOG will not accept the proposal approval from May.

I respectfully request your approval for the degree program so that we can submit it the BOG for review.

Information regarding this degree:

- The Bachelor of Science in Cybersecurity Engineering prepares engineers to be cybersecurity professionals with the knowledge, skills, and abilities to conceptualize,

design, engineer, test, and implement all components of a cyber-physical, network system. This includes hardware, software, networking, and human interfaces of the system. The program encompasses computer engineering, electrical engineering, computer science, engineering, science, and mathematics. The program educates students in the fundamental core of cybersecurity engineering of physical systems and its cutting-edge, high-impact areas focusing on industrial plants, smart-grid and hardware security.

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**Supporting Documentation:** Cyber Security Engineering Degree Proposal

**Prepared by:** Dr. Terry Parker, EVP & Provost

Board of Governors, State University System of Florida  
**REQUEST TO OFFER A NEW DEGREE PROGRAM**

In Accordance with BOG Regulation 8.011

(Please do not revise this proposal format without prior approval from Board staff)

Florida Polytechnic University  
Institution Submitting Proposal

Fall 2021  
Proposed Implementation Term

Not Applicable  
Name of College(s) or School(s)

Dept. of Electrical & Computer Engineering  
Name of Department(s)/Division(s)

Cyber-Security  
Academic Specialty or Field

Bachelor of Science in Cybersecurity  
Engineering  
Complete Name of Degree

29.0207  
Proposed CIP Code (2020 CIP)

The submission of this proposal constitutes a commitment by the university that, if the proposal is approved, the necessary financial resources and the criteria for establishing new programs have been met prior to the initiation of the program.

\_\_\_\_\_  
Date Approved by the University Board of Trustees

\_\_\_\_\_  
President's Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Board of Trustees Chair's Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Provost's Signature

\_\_\_\_\_  
Date

**PROJECTED ENROLLMENTS AND PROGRAM COSTS**

Provide headcount (HC) and full-time equivalent (FTE) student estimates of majors for Years 1 through 5. HC and FTE estimates should be identical to those in Table 1 - Appendix A. Indicate the program costs for the first and the fifth years of implementation as shown in the appropriate columns in Table 3 in Appendix A. Calculate an Educational and General (E&G) cost per FTE for Years 1 and 5 (Total E&G divided by FTE).

Implementation Timeframe	HC	FTE	E&G Cost per FTE	E&G Funds	Contract & Grants Funds	Auxiliary/ Philanthropy Funds	Total Cost
Year 1	20	19	\$38,410	\$729,787			\$729,787
Year 2	45	43					
Year 3	83	76					
Year 4	107	98					
Year 5	120	111	\$11,607	\$1,288,425			\$1,288,425

Note: This outline and the questions pertaining to each section **must be reproduced** within the body of the proposal to ensure that all sections have been satisfactorily addressed. Tables 1 through 4 are to be included as Appendix A and not reproduced within the body of the proposals because this often causes errors in the automatic calculations.

# Introduction

## I. Program Description and Relationship to System-Level Goals

- A. Briefly describe within a few paragraphs the degree program under consideration, including (a) level; (b) emphases, including majors, concentrations, tracks, or specializations; (c) total number of credit hours; and (d) overall purpose, including examples of employment or education opportunities that may be available to program graduates.**

The Bachelor of Science in Cybersecurity Engineering prepares engineers to be cybersecurity professionals with the knowledge, skills, and abilities to conceptualize, design, engineer, test, and implement all components of a cyber-physical network system. This includes hardware, software, networking, and human interfaces of the system. The program encompasses computer engineering, electrical engineering, computer science, engineering, science, and mathematics. The program educates students in the fundamental core of cybersecurity engineering of physical systems and its cutting-edge, high-impact areas focusing on industrial plants, smart-grid, and hardware security.

The curriculum starts with developing in students a strong background in engineering math and science before expanding into engineering topics within the framework of hardware-based computer engineering and electrical engineering blended with software-based computer science. The hardware-based computer engineering includes microcomputer and computer architecture. The curriculum emphasizes cyber physical security with concentrations Industrial Control Systems Security, Smart-grid Security, and Hardware Security.

The cybersecurity engineering program is distinct from other Bachelor of Science programs in cybersecurity because as an engineering program it encompasses a comprehensive view of system design. The program's emphasis on the security of cyber physical systems requires seven (7) new courses of 21 credits.

The program is structured to satisfy the ABET general program requirements with 36 credits (minimum 30) of math and science, 65 credits of engineering topics (minimum 45) and 18 credits of broad humanities. The program provides breadth from the required courses and depth through the concentration courses. The curriculum is also structured to meet ABET program requirements for cybersecurity engineering through required courses and these include

- Probability, statistics, and cryptographic topics.
- Discrete mathematics and information theory
- Application of protective technologies and forensic techniques
- Consideration of legal, regulatory, privacy, ethics, and human behavior topics as appropriate to the program.

Students holding this degree are employable in government, military, and private sector, and will have a solid foundation to pursue advanced study in computer science, electrical or computer engineering at the graduate level.

- B. Please provide the date when the pre-proposal was presented to CAVP (Council of Academic Vice Presidents) Academic Program Coordination review group. Identify any concerns that the CAVP review group raised with the pre-proposed program and provide a brief narrative explaining how each of these concerns has been or is being addressed.**

The pre-proposal was presented to the Council of Academic Vice Presidents Academic Coordinating Group on April 23, 2019. There were no concerns expressed.

- C. If this is a doctoral level program please include the external consultant's report at the end of the proposal as Appendix D. Please provide a few highlights from the report and describe ways in which the report affected the approval process at the university.**

Not Applicable.

**D. Describe how the proposed program is consistent with the current State University System (SUS) Strategic Planning Goals. Identify which specific goals the program will directly support and which goals the program will indirectly support (see link to the SUS Strategic Plan on [the resource page for new program proposal](#)).**

The proposed B.S. in Cybersecurity Engineering directly supports several SUS Strategic Plan goals in several ways. These include the program area content itself and its direct connection with the University's Advanced Mobility Institute with its work in autonomous systems where cyber-security is a critical engineering outcome. The addition of cyber-security engineers to our interdisciplinary, industry-sponsored senior capstone experience will enhance the desirability for industry-partners to want to contribute projects with more dimensions as these students will add an important element of complexity and need to the design. Specifically, the program will directly support the following SUS Strategic Plan Goals:

- Teaching and Learning Strategic Priorities for a Knowledge Economy
  - Goal: increase the number of degrees awarded in STEM and other areas of strategic emphasis.
- Scholarship, Research, and Innovation: Excellence
  - Goal: Strengthen the Quality and Reputation of Scholarship, Research, and Innovation
    - Improve the quality and impact of scholarship, research, and commercialization activities.
    - Increase undergraduate participation in research to strengthen the pipeline of researchers pursuing graduate degrees.
  - Goal: Increase Research Activity and Attract More External Funding
    - Attract more research funding from external (federal and private) sources
- Community and Business Engagement
  - Goal: Increase Community and Business Workforce
    - Increase the percentage of graduates who continue their education or are employed full-time.

**E. If the program is to be included in a category within the Programs of Strategic Emphasis as described in the SUS Strategic Plan, please indicate the category and the justification for inclusion. The Programs of Strategic Emphasis Categories are:**

- Critical Workforce:
  - Education
  - Health
  - Gap Analysis
- Economic Development:
  - Global Competitiveness
- Science, Technology, Engineering, and Math (STEM)

Please see the Programs of Strategic Emphasis (PSE) methodology for additional explanations on program inclusion criteria at [the resource page for new program proposal](#).

The program's CIP code was [added to the Programs of Strategic Emphasis](#) area for STEM at the [August 28-29, 2019 Board of Governors Meeting](#) at Florida Gulf Coast University.

**F. Identify any established or planned educational sites at which the program is expected to be offered and indicate whether it will be offered only at sites other than the main campus.**

The program is intended to be offered onsite at the J.D. Alexander Campus at 4700 Research Way, Lakeland, Florida 33805.

# Institutional and State Level Accountability

## II. Need and Demand

- A. Need: Describe national, state, and/or local data that support the need for more people to be prepared in this program at this level. Reference national, state, and/or local plans or reports that support the need for this program and requests for the proposed program which have emanated from a perceived need by agencies or industries in your service area. Cite any specific need for research and service that the program would fulfill.**

Cybersecurity is a national security issue and an economic concern for Florida and the United States. As more industrial equipment and processes rely on computer-based, remotely controlled systems such as autonomous vehicles and smart-grids, their secure operation is important. Nationwide, demand is growing for engineering jobs especially in cyber physical security and ABET has responded by developing accreditation standards that articulate industry expectations and requirements associated with the broad field of cyber-security, both software and hardware systems. According to the Occupational Outlook Handbook of US Department of labor, the demand for jobs in security is growing 28% faster ("much faster") than average.

This program should create a hub for a highly skilled workforce in cyber physical security to meet the local, state, national and international demands making a center of excellence around Florida Poly. There are a number of companies whose businesses are entirely centered around cybersecurity.

Seven Florida companies are on the Cybersecurity 500, Cybersecurity Ventures' list of the world's best companies in the industry: Easy Solutions, Veriato, KnowBe4, Appraver, INFOSIGHT, Harris and Citrix. On the other hand, two Florida cities - Miami (6th) and Tampa (8th) - ranked in the top 10 for cybersecurity job growth from 2010 to 2014.

Within the Departments of Electrical and Computer Engineering and Computer Science, there are at least four (4) faculty members who are actively engaged in research in cybersecurity with two additional projects funded by Florida agencies. The development of the proposed curriculum would enhance research activities at Florida Poly to reach its research goals. The department of electrical and computer engineering is searching for two new faculty in the field: one in cyber physical security; and, another in autonomous vehicles. Once the proposed curriculum is in place and the program is accredited by ABET Inc, the program plans (a) to seek for designation as a National Center of Academic Excellence in Cyber Defense Education by the National Security Agency and the Department of Homeland Security, and (b) to offer an online certificate on cyber physical security.

### Industry Demand

#### **Worldwide**

- 63% of IT professionals surveyed in 2018 noted that their organizations have a shortage of IT staff dedicated to cybersecurity. And nearly 60% say their companies are at moderate or extreme risk of cybersecurity attacks due to this shortage.<sup>[1]</sup>

#### **The United States**

- Nationally, there was a 475% increase in national cybercrime reports in March of 2020, demonstrating a high demand for cybersecurity jobs nationwide.<sup>[2]</sup>
- Employment of information security analysts is projected to grow 32% from 2018 to 2028, a much higher rate than most occupations.<sup>[3]</sup> There were 112,300 jobs in 2018, and it is projected to increase to 147,800 jobs by 2028 by the Bureau of Labor statistics.

#### **Florida**

- More than 27,000 high-tech companies operate in Florida, with more than 5,000 providing IT-specific services, making Florida #4 in the nation for high-tech employment nationally with more than 237,000 IT jobs. Florida's High Tech Corridor alone employs more than 43,000 people, generating a payroll of more than \$3.4 billion annually.<sup>[4]</sup>
- Cybercrime will continue to increase due to Florida's robust economic landscape. At the close of 2017, it was found that there is a national shortage of more than 285,000 skilled workers in this space, with more than 12,600 cybersecurity openings in Florida.<sup>[5]</sup>
- 68% of organizations surveyed in Florida reported cybersecurity staff recruitment challenges.<sup>[6]</sup>
- In 2015, more than 46,000 healthcare establishments employed more than 803,000 Floridians.

the healthcare industry was the hardest hit by cyberattacks in the first half of 2017, accounting for 25% of all breaches. In Florida alone, organizations reported 28 breaches of HIPAA-related information to the U.S. Department of Health and Human Services in 2016, with 2.8 million records extracted from Florida data centers in 2016.

- Florida ranks among the top 10 states for manufacturing, with more than 19,000 manufacturers producing a variety of goods. Manufacturing was the third-most attacked sector in 2016, and the proportion of serious incidents were 40% higher than the average across all industries.<sup>[1]</sup>
- The scarcity of trained cybersecurity professionals and increasing wages have resulted in a negative security-specific unemployment rate in Florida. The Florida Department of Economic Opportunity is estimating additional growth of more than 17% by 2024 across all cybersecurity-related positions.<sup>[8]</sup>
- Cybersecurity data breaches in Florida increased 17.8% between 2015 and 2016. Forty-one percent of Florida entities surveyed by Gartner in 2017 had recently suffered an incident that disrupted normal business. When asked to rank the severity of the disruption, 66% indicated the event was “moderate” in nature, while 16% rated it “high.”

[1] ISC2 Cybersecurity workforce study (2018). Cybersecurity Professionals focus on Developing New Skills as Workforce Gap Widens.

[2] Phillips, J. News Fox 30, April 24, 2020. High demand for cybersecurity professionals in Northeast Florida.

[3] US Bureau of Labor Statistics, Occupational Handbook. Information Security Analysts summary.

[4] The State of Cybersecurity in Florida. 2017. Florida Center for Cybersecurity at USF. Gartner.

[5] ibid

[6] The State of Cybersecurity in Florida. 2017. Florida Center for Cybersecurity at USF. Gartner. Pg 16

[7] Verizon. 2017 Data Breach Investigations Report

[8] The State of Cybersecurity in Florida. 2017. Florida Center for Cybersecurity at USF. Gartner.

**B. Demand: Describe data that support the assumption that students will enroll in the proposed program. Include descriptions of surveys or other communications with prospective students.**

Computer Science and Computer Engineering, our first and third most popular majors respectively, combine to account for nearly 50% of Florida Poly's majors. Twenty-one percent of our total majors are pursuing the concentration in information assurance and cyber-security, currently available only to computer science students. By creating a focused degree program in cyber-security engineering, we create opportunity for computer engineers to explore the security issues involved in physical systems. Therefore, we have strong reason to believe that students interested in Florida Poly would readily populate this program.

On December 9, 2019, the university surveyed current undergraduates at Florida Poly to determine their level of interest in a potential Cybersecurity Engineering program. Of the four direct questions about the proposed degree program, approximately 49% of those responding, or 36 students, stated that they would be interested in or would consider switching majors into Cybersecurity Engineering out of a total of 74 student respondents, with 84% being current computer science or computer engineering majors.

Nationally, over 134,000 graduating high school seniors were interested in engineering and computer science degrees and had academic results that fit the admissions profile for Florida Poly in terms of their math abilities. By extrapolating the national trends would result in approximately 40% moving into technology security related majors (College Board, EPS data May 11, 2020).

**C. If substantially similar programs (generally at the four-digit CIP Code or 60 percent similar in core courses), either private or public exist in the state, identify the institution(s) and geographic location(s). Summarize the outcome(s) of communication with such programs with regard to the potential impact on their enrollment and opportunities for possible collaboration (instruction and research). In Appendix C, provide data that support the need for an additional program.**

There are no programs in the State of Florida in this particular CIP code. Many institutions, including Florida Poly, have concentrations in cyber-security located in Computer Science or a related field;

however, there is a distinct difference between programs in cybersecurity that are grounded in computer science and information technology and those that are grounded in engineering.

A presentation by Allen Parrish and Paul Tortora of the US Naval Academy at the 2017 ABET Symposium (April 20-21) includes an analysis of cybersecurity-related programs nationwide, emphasizing that more are needed nationwide to keep up with demand. Moreover, they analyze types of programs and explain that many are designed around specific approaches such as network security, cyber-crime investigation, data-information security, or some other aspect. In ABET terms, a cyber-security engineering program requires students to “analyze, design, implement and evaluate systems as an underlying principle.” Further, they note that not all cybersecurity is computing, but that it includes policy and human factors as well.

Currently, in the BOG inventory there are two programs at the bachelor’s level under CIP 11.1003 with Cybersecurity in the name, at FIU and UWF. There are also three programs at the master’s level, two at in the 11.1003 CIP—again at FIU and UWF—and one in CIP 43.0303, at USF (CIP is for Critical Infrastructure Protection). There are no programs in the SUS under CIP 29.0207, Cyber/Electronic Operations and Warfare. As such, the program is not duplicative of any existing program in the SUS, but the SUS does have some competition in Florida from similar programs at private institutions.

The University of West Florida shows enrollment in other computer science-related CIP codes at the baccalaureate-level before merging them into the newly developed 11.1003 CIP B.S. in Cybersecurity. This degree remains focused within the Information Technology area, however, and is not an engineering degree. Enrollment, however, is admirably strong and growing from 142 to 274 in just one year.

The following table further illustrates comparable disciplinary activity and illustrates Parrish and Tortora’s claims regarding specific approaches behind different programs.

*Table: SUS Programs by CIP Code Description*

11.1003	Computer Information Systems Security, Information Assurance	UWF-B,M; USF-T—B,M; FIU-M
43.0303	Critical Infrastructure Protection	USF-T—M
43.0406	Cyber/Computer Forensics & Counterterrorism	FSU-B,M;
43.0406	Forensic Science & Technology	FGCU-B; FIU-M; UCF-B,M

- D. Use Table 1 - Appendix A (1-A for undergraduate and 1-B for graduate) to categorize projected student headcount (HC) and Full Time Equivalents (FTE) according to primary sources. Generally undergraduate FTE will be calculated as 30 credit hours per year and graduate FTE will be calculated as 24 credit hours per year. Describe the rationale underlying enrollment projections. If students within the institution are expected to change majors to enroll in the proposed program at its inception, describe the shifts from disciplines that will likely occur.**

Florida Poly anticipates that at the outset some percentage of students will shift from computer science-cyber-security concentration to cybersecurity engineering. This change will be relatively smooth given that the program’s share a common freshman year and many common classes in the sophomore year as well. A small (<15%) percentage of computer science students have indicated interest in a change. Students from within electrical or computer engineering may also consider a change to cyber-security engineering, which may result in a short-term dip in enrollment in one or both of those degrees, but as each program distinguishes itself by research-backed concentrations any drop is not expected to last. Overall, program enrollment in year one and through the first five years is estimated based on the overall University growth plan, not accounting for Covid-19. We do anticipate that the program will be attractive as Admissions analysis has positive indicators, and we believe its synergy with our other programs will enable it to grow. Furthermore, as this program, and therefore the ECE Department grows, and launches its newer, better defined concentrations, we feel that any initial pull of graduates will even out and all three ECE programs will, over time, demonstrate growth.

- E. Indicate what steps will be taken to achieve a diverse student body in this program. If the proposed program substantially duplicates a program at FAMU or FIU, provide, (in consultation with the affected university), an analysis of how the program might have an impact upon that university’s ability to attract students of races different from that which is predominant on their campus in the subject program. The university’s Equal Opportunity Officer shall review this section of the proposal and then sign and date**

**Appendix B to indicate that the analysis required by this subsection has been completed.**

As noted in I.B., there were no concerns from the CAVP-ACG in April 2019; furthermore, as identified in Section II.C, the proposed program has no similar CIP codes in the system and the only related fields are at FIU at the master's level. Thus, graduates of the B.S. in Cybersecurity Engineering from Florida Poly may be good candidates for graduate work in Forensic Science and Technology at FIU or further study at the master's level in Information Assurance.

### **III. Budget**

- A. Use Table 3 - Appendix A to display projected costs and associated funding sources for Year 1 and Year 5 of program operation. Use Table 4 - Appendix A to show how existing Education & General funds will be shifted to support the new program in Year 1. In narrative form, summarize the contents of both tables, identifying the source of both current and new resources to be devoted to the proposed program. (Data for Year 1 and Year 5 reflect snapshots in time rather than cumulative costs.)**

In 2018, the University received a recurring appropriation of \$4.8 million for faculty salaries. This amount has been included in the new programs proposed and implemented in 2019 (Environmental Engineering, Engineering Physics, and Engineering Mathematics), which combined total up to \$1,290,685 in year (1) one expenses and \$2,194,265 in year (5) five. This leaves a balance of \$2,606,735.00 for Cybersecurity Engineering and other programs in year (5) five.

Appendix A – Table 3 reflects total expenditures from the new source as \$729,787 in year (1) one, and \$1,288,425 in year (5) five. These funds cover all program costs, including the two new faculty lines shown in Appendix A, Table 2.

The program is housed in the Department of Electrical and Computer Engineering (ECE) and will be delivered by existing faculty in that department, faculty who have joint appointments in ECE and Computer Science, and CS faculty who are specialist in cybersecurity and teach in that concentration in the B.S. in Computer Science. Courses in that concentration also make up part of the curriculum for the B.S. in Cybersecurity Engineering so, in effect, there is no resource allocation to another department but a student credit hour benefit to CS for additional students in the new program in ECE. Thus, Appendix A – Table – 4 shows no reallocation of resources.

As noted elsewhere in this document, programs in ECE presently operate with lower enrollments relative to other departments and programs and increases in enrollment would be sustainable even at the levels projected for this program with the current faculty. The addition of only seven new courses that this program adds to the curriculum means that the relative load across the department and collaborating faculty in Computer Science whose expertise lies in cybersecurity is less a burden than a boon to both departments in terms of research, program, and university prestige.

- B. Please explain whether the university intends to operate the program through continuing education, seek approval for market tuition rate, or establish a differentiated graduate-level tuition. Provide a rationale for doing so and a timeline for seeking Board of Governors' approval, if appropriate. Please include the expected rate of tuition that the university plans to charge for this program and use this amount when calculating cost entries in Table 3.**

Not Applicable.

- C. If other programs will be impacted by a reallocation of resources for the proposed program, identify the impacted programs and provide a justification for reallocating resources. Specifically address the potential negative impacts that implementation of the proposed program will have on related undergraduate programs (i.e., shift in faculty effort, reallocation of instructional resources, reduced enrollment rates, greater use of adjunct faculty and teaching assistants). Explain what steps will be taken to mitigate any such impacts. Also, discuss the potential positive impacts that the proposed program might have on related undergraduate programs (i.e., increased undergraduate research opportunities, improved quality of instruction associated with cutting-edge research, improved labs and**

**library resources).**

The addition of a B.S. in Cybersecurity Engineering in the Department of Electrical and Computer Engineering *may* have one potential, short-term negative impact in terms of drawing some enrollment away from both electrical and computer engineering and the cybersecurity concentration in the B.S. in Computer Science degree. This will likely settle out over time.

Any other impacts are mitigated by the addition of new resources due to a 2018 recurring appropriation of funds for faculty hiring and an ongoing effort to refocus budgetary priorities toward academic programming institutionally. Thus, we will simply be adding faculty to the department to cover the department's needs in its broad and specialized areas. As all programs share much of the same core, any addition to faculty results in correspondent benefit to other faculty who now have additional relief at the lower and core-level to teach and research in their specialty. The addition of the program further creates interdisciplinary collaborations with research areas in computer and data science programs, mathematics, mechanical engineering's growing emphasis on agile manufacturing, and our unique, year-long industry-sponsored and interdisciplinary senior capstone design sequence that all majors must take as part of their degree program. The inclusion of a full-system design view of cybersecurity from an engineering perspective into these industry-based projects will enhance other students' experiences as well as grow our reputation among our industry partners.

**D. Describe other potential impacts on related programs or departments (e.g., increased need for general education or common prerequisite courses, or increased need for required or elective courses outside of the proposed major).**

The university currently operates with an aggressive enrollment growth plan. Florida Poly's target goals exceed projections associated with the addition of this program. In fact, the University's growth plan is, in part, built upon the assumption that we will be adding new degree programs over the next 1 to 5 years at both bachelor's and master's levels in core engineering areas and other STEM disciplines. Overall, increased enrollment would increase demand on general education courses that support the program and increase demand on courses within the department that share a core with the program. This is fully expected and desirable as the university already plans for this growth and the department, due to recent drops in enrollment in its other programs, has capacity to grow its student body. These considerations are accounted for in Appendix A in enrollment, cost, and faculty tables.

**E. Describe what steps have been taken to obtain information regarding resources (financial and in-kind) available outside the institution (businesses, industrial organizations, governmental entities, etc.). Describe the external resources that appear to be available to support the proposed program.**

The state provided Florida Poly with an additional appropriation in 2018 to support faculty hiring and that recurring money continues to be available to grow our programs. As yet unallocated portions of those funds (up to \$2,194,265.00) will go toward any new costs associated with the program. The University works regularly with its Industry Partners in funding for senior capstone projects and regularly builds these relationships to facilitate student internships and create pathways for job placement. In 2019 and again in 2020, the University received donations specific to the Department of Electrical and Computer Engineering to support majors in its degree programs and student projects. Such funds, while not specifically supporting the implementation of the program, support its students and student projects.

## IV. Projected Benefit of the Program to the University, Local Community, and State

Use information from Tables 1 and 3 - Appendix A, and the supporting narrative for “Need and Demand” to prepare a concise statement that describes the projected benefit to the university, local community, and the state if the program is implemented. The projected benefits can be both quantitative and qualitative in nature, but there needs to be a clear distinction made between the two in the narrative.

The 2017 report out of the Florida Center for Cybersecurity at the University of South Florida makes ample case for the need for a growing workforce in cybersecurity for the state. The “State of Cybersecurity Report” is important to this proposal for several reasons. While it demonstrates the cost of cyber-attacks and the threat they pose to Florida’s economy as well as specific sectors within the economy, the most notable aspect of this report with respect to the proposed program is the range of types of threats that the document identifies: among these threats are environment, human threats, and social threats such as unrest. The report details other specific actions and causes of breaches, but the key factor is that the report implicitly identifies the complexity of the cybersecurity problem and show it as one to be challenged from an engineering perspective. The report further examines Florida-based organizations and shows that “the average number of full-time, dedicated security personnel ranges from two to five FTE.” Most security teams are backfilled by support positions and 98% of respondents indicated that at least some staff hold security certification. Clearly, the space is wide open for cybersecurity engineers to step in to a wide range of positions throughout Florida and begin making an enormous difference.



## V. Access and Articulation – Bachelor’s Degrees Only

- A. If the total number of credit hours to earn a degree exceeds 120, provide a justification for an exception to the policy of a 120 maximum and submit a separate request to the Board of Governors for an exception along with notification of the program’s approval. (See criteria in Board of Governors Regulation 6C-8.014)

Not Applicable.

- B. List program prerequisites and provide assurance that they are the same as the approved common prerequisites for other such degree programs within the SUS (see link to the Common Prerequisite Manual on [the resource page for new program proposal](#)). The courses in the Common Prerequisite Counseling Manual are intended to be those that are required of both native and transfer students prior to entrance to the major program, not simply lower-level courses that are required prior to graduation. The common prerequisites and substitute courses are mandatory for all institution programs listed, and must be approved by the Articulation Coordinating Committee (ACC). This requirement includes those programs designated as “limited access.

If the proposed prerequisites are not listed in the Manual, provide a rationale for a request for exception to the policy of common prerequisites. NOTE: Typically, all lower-division courses required for admission into the major will be considered prerequisites. The curriculum can require lower-division courses that are not prerequisites for admission into the major, as long as those courses are built into the curriculum for the upper-level 60 credit hours. If there are already common prerequisites for other degree programs with the same proposed CIP, every effort must be made to utilize the previously approved prerequisites instead of recommending an additional “track” of prerequisites for that CIP. Additional tracks may not be approved by the ACC, thereby holding up the full approval of the degree program. Programs will not be entered into the State University System Inventory until any exceptions to the approved common prerequisites are approved by the ACC.

The University received notice on November 19, 2020 that the following program pre-requisites were approved by the Articulation Coordinating Committee:

Current Approved Common Prerequisites		
Course Prefix	Course Name	Cr. Hrs.
COP 2271C	Introduction to Computation and Programming	3
CHM 2045/BSC 1010	Chemistry 1 / Biology 1	3
CHM 2045L/BSC 1010L	Chemistry 1 Laboratory / Biology 1 Laboratory	1
MAC 2311	Analytic Geometry and Calculus 1	4
MAC 2312	Analytic Geometry and Calculus 2	4
MAC 2313	Analytic Geometry and Calculus 3	4
MAP 2302	Differential Equations	3
PHY 2048	Physics 1	3
PHY 2048L	Physic 1 Laboratory	1
PHY 2049	Physics 2	3
PHY 2049L	Physics 2 Laboratory	1
Current Approved Common Prerequisite Credit Hours		30

**From:** [Page, Lynda](#)  
**To:** [Tom Dvorske](#)  
**Cc:** [Page, Lynda](#)  
**Subject:** Common Prerequisites  
**Date:** Thursday, November 19, 2020 4:28:57 PM

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The ACC approved the common prerequisites for the Florida Polytechnic University requests in CIP 11.0701, 29.0207, 30.7001, and 30.7109. The changes will be added to the Common Prerequisite Manual once the programs are listed on the SUS Academic Program Degree Inventory.

Lynda

Lynda A. Page  
Director of Articulation  
Board of Governors  
State University System  
325 W. Gaines St. Suite 1601  
Tallahassee, FL 32399

- C. If the university intends to seek formal Limited Access status for the proposed program, provide a rationale that includes an analysis of diversity issues with respect to such a designation. Explain how the university will ensure that Florida College System transfer students are not disadvantaged by the Limited Access status. NOTE: The policy and criteria for Limited Access are identified in Board of Governors Regulation 6C-8.013. Submit the Limited Access Program Request form along with this document.**

Not Applicable.

- D. If the proposed program is an AS-to-BS capstone, ensure that it adheres to the guidelines approved by the Articulation Coordinating Committee for such programs, as set forth in Rule 6A-10.024 (see link to the Statewide Articulation Manual on [the resource page for new program proposal](#)). List the prerequisites, if any, including the specific AS degrees which may transfer into the program.**

Not Applicable.

# Institutional Readiness

## VI. Related Institutional Mission and Strength

- A. Describe how the goals of the proposed program relate to the institutional mission statement as contained in the SUS Strategic Plan and the University Strategic Plan (see link to the SUS Strategic Plan on [the resource page for new program proposal](#)).**

The Program's Educational Objectives (PEOs) at this initial phase are as follows:

- Graduates demonstrate growth in professional development through graduate study or professional training.
- Graduates demonstrate effective teamwork as members and leaders in professional environments.
- Graduates demonstrate employability in industry, government, and entrepreneurial endeavors.

Florida Polytechnic University's mission is to "serve students and industry through excellence in education, discovery, and application of engineering and applied sciences." The B.S. in Cybersecurity Engineering directly supports these goals through program content in engineering designed to educate students to be successful professionals that serve a range of public, private, and government industries and enhance the research reputation and economy of the state of Florida in keeping with the University System's strategic plan.

- B. Describe how the proposed program specifically relates to existing institutional strengths, such as programs of emphasis, other academic programs, and/or institutes and centers.**

The B.S. in Cybersecurity Engineering program follows our rationale for institutional program growth by drawing on existing faculty expertise and curricular constructs already in place. Thus, with relatively minimal investment and effort, we can launch a new degree program that expands our portfolio in a cutting-edge and innovative way, that has strong promise for both career and academic discipline longevity as well as meets immediate and fast-growing local, state, and national (as well as national security) demand.

The program further draws on our existing research base through the Advanced Mobility Institute (AMI) and our partnership with FDOT Suntrax along with potential partnership with the Florida Industrial Phosphate Research Institute (FIPRI) as well as with other institutions in the state that has established cybersecurity programs.

The program also adds a stronger dimension to our programs and ultimately to our senior capstone experience, which is a year-long, industry-sponsored interdisciplinary project that students collaborate on to demonstrate the full breadth of their content and professional knowledge and skills. As cybersecurity engineering is a comprehensive view of the entire system rather than just a component, including this perspective into capstone design project teams provides us with a new selling point to industry and conversely a new opportunity for industry to test out unique projects with our student body. The program's fit into portfolio of offerings strengthens and Florida Poly's total program mix and positions us in yet another way to grow our student body and reputation.

- C. Provide a narrative of the planning process leading up to submission of this proposal. Include a chronology in table format of the activities, listing both university personnel directly involved and external individuals who participated in planning. Provide a timetable of events necessary for the implementation of the proposed program.**

The program has undergone an extensive departmental and institutional review process in its development.

### Planning Process

Date	Participants	Planning Activity
11/28/2018	Dr. Youssif Al-Nashif, Dr. Muhammad Rashid, Dr. Tom Dvorske	Exploring the steps involved initiating a new program
3/12/2019	Dr. Youssif Al-Nashif, Dr. Muhammad Rashid, Dr. Tom Dvorske	Identifying program limitations and university-wide requirements. Prepare draft of New Academic Degree Program Authorization Pre-Proposal Form

Date	Participants	Planning Activity
4/24/2019	Dr. Tom Dvorske	Council of Academic Vice Presidents' Academic Coordinating Group
8/12/2019	Board of Trustees	Preliminary program approval – inclusion in Accountability plan approval in 8/12/2019 re-submission to BOG.
8/19/2019	Dr. Arman Sargolzaei, Dr. Muhammad Rashid, Dr. Ashiq Sakib, Dr. Mohammad Reza Khalghani, Dr. Navid Khoshavi Najafabadi and Dr. Tom Dvorske	Identify the steps and timeline to complete the program curriculum
9/5/2019	Dr. Arman Sargolzaei, Dr. Muhammad Rashid, Dr. Harish Chintakunta, Dr. Onur Toker, Dr. Rawa Adla, Dr. Mohammad Reza Khalghani, and Dr. Navid Khoshavi Najafabadi. Dr. Ashiq Sakib.	Identify the structure and curricular courses of the program, concentration areas and specialized courses
10/8/2019	ECE faculty meeting to all ECE (13) members	Presented to ECE faculty members for their comments and input
10/14/2019	Departmental Curriculum Committee Dr. Onur Toker, Dr. Ashiq Saqib, Dr. Suleiman Alswiss, Dr. Muhammad Rashid	Committee Approval to forward to the University Curriculum Committee (UCC)
11/21/2019	Dr. Arman Sargolzaei, Dr. Muhammad Rashid, Dr. Onur Toker, Dr. Rawa Adla, Dr. Mohammad Reza Khalghani, Dr. Navid Khoshavi Najafabadi and Mahmoud Saleh, Dr. Ashiq Sakib, Dr. Hisham Mahmoud	Assigning tasks and responsibilities to prepare equipment list
11/26/2019	Dr. Arman Sargolzaei, Dr. Muhammad Rashid, Dr. Onur Toker, Dr. Rawa Adla, Dr. Mohammad Reza Khalghani, Dr. Navid Khoshavi Najafabadi and Mahmoud Saleh, Dr. Ashiq Sakib, Dr. Hisham Mahmoud	Review of the draft of equipment list
12/3/2019	Dr. Arman Sargolzaei, Dr. Muhammad Rashid, Dr. Onur Toker, Dr. Rawa Adla, Dr. Mohammad Reza Khalghani, Dr. Navid Khoshavi Najafabadi and Mahmoud Saleh	Final list of the equipment list
12/5/2019	Dr. Arman Sargolzaei, Dr. Muhammad Rashid, Dr. Onur Toker, Dr. Rawa Adla, Dr. Mohammad Reza Khalghani, Dr. Navid Khoshavi Najafabadi and Mahmoud Saleh, Dr. Hisham Mahmoud, Dr. Ashiq Sakib.	Review the BOG proposal form
4/29/2020	Dr. Muhammad Rashid	Final Course and Program Approval Recommendation and Concentrations to University Curriculum Committee
5/11/2020	Dr. Terry Parker	Provost Approval of Program
5/20/2020	Florida Polytechnic University Board of Trustees	Approval

### Events Leading to Implementation

Date	Implementation Activity
5/21/2020	Submit all forms to Board of Governors Staff
Summer 2020	Begin planning integrated course offerings, multi-year schedule in ECE department; validate staffing and enrollment projections.
Upon BOG inclusion in Inventory	Begin recruiting for program and working with State College partners to add to articulation agreements.

## VII. Program Quality Indicators - Reviews and Accreditation

Identify program reviews, accreditation visits, or internal reviews for any university degree programs related to the proposed program, especially any within the same academic unit. List all recommendations and summarize the institution's progress in implementing the recommendations. Please include evidence that teacher preparation programs meet the requirements outlined in Section. 1004.04, Florida Statutes, if applicable.

Both programs in the Department of Electrical and Computer Engineering (electrical engineering and computer engineering) were accredited by ABET-EAC in August 2019, back-dated to October 2017, for a period of 6-years. These programs are the "sister-programs" for Cybersecurity Engineering and from the same accrediting agency and commission with the same program learning outcomes. The programs received full-accreditation with no recommendations for the full 6-year period available. This was their first attempt at accreditation by ABET and a strong endorsement of the quality and integrity of the programs and the strong effort put forth by the faculty and the quality processes they have established and continue to nurture and develop.

## VIII. Curriculum

- A. Describe the specific expected student learning outcomes associated with the proposed program. If a bachelor's degree program, include a web link to the Academic Learning Compact or include the document itself as an appendix.**

The Program Learning Outcomes for the B.S. in Cybersecurity Engineering conform to the expectation for learning outcomes for ABET-EAC and are easily aligned to the broad skill areas required for the academic learning compact. In the following table, the learning outcomes are defined in the left column, while their alignment with the ALC skills are noted on the right.

Program (Student) Learning Outcomes	The Outcomes Involve These Skills:		
	Content	Critical Thinking	Communication
Upon Completion of the Cybersecurity Engineering Degree, students will possess:			
an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	X		
an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors		X	
an ability to communicate effectively with a range of audiences			X
an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts		X	
an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives			X
an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusion	X		
an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.		X	

- B. Describe the admission standards and graduation requirements for the program.**

Admissions standards and graduation requirements for the program are the same as for all undergraduate programs at Florida Poly. Details for admissions to Florida Poly may be found at <https://floridapoly.edu/admissions/>.

Requirements for graduation are found in the [University's Academic Catalog](#) and in Academic Policy [FPU-5.0094AP Baccalaureate Degree Graduation Requirements](#).

- C. Describe the curricular framework for the proposed program, including number of credit hours and composition of required core courses, restricted electives, unrestricted electives, thesis requirements, and dissertation requirements. Identify the total numbers of semester credit hours for the degree.**

The program in Cybersecurity engineering is 120 credits and includes a 0-credit required internship. Students also take a nearly common freshman year of courses consistent with other programs at Florida Poly to facilitate program exploration and foundational skill-building. The program shares a number of credits with both its cousins in the same department in electrical and computer engineering and shares a number of elective courses with computer science. The program only differs from other departmental programs by seven credits, meaning that it does not constitute a significant departure by SACSCOC standards for substantive change. In fact, most of the courses for the program, with only a few exceptions are already in the Florida Poly catalog.

<b>B.S. Cybersecurity Engineering</b>				
<b>05.20.2020</b>				
The following program curriculum template was approved by the UCC and the Provost in spring 2017. This template exists to ensure a certain level of consistency across new and existing programs in terms of general education, foundations, program core, and capstone requirements.				
Category	Section	Course	Credits	Notes
<b>I. Professional Foundations Core</b>			<b>8</b>	<b>8</b>
		SLS 1106 - Academic & Professional Skills	1	1
		IDS 4941 - Professional Experience Internship	0	0
		IDS 1380 - Introduction to STEM	3	3
		EGN 1007C - Concepts and Methods for Engineering and Computer Science (req of Engineering and CS programs only).	1	1
		COP 2271C - Introduction to Computation and Programming (required for all programs)	3	3
		<i>All but Professional Foundations may be distributed in categories below to allow for appropriate credit hour allocations.</i>		
<b>II. General Education</b>			<b>36</b>	<b>36</b>
	<b>Rules</b>	1. Students must complete at least one ♦ course in each category to satisfy state of Florida regulation. 2. Students must take 9 hours of Humanities and Social Sciences, to be divided 6/3 between the areas. 3. Courses not taught by Florida Poly but listed in the State of Florida "common core" menu of courses can be accepted as transfer credit. 4. Transfer students who have fulfilled the general education requirements at another institution are understood to have fulfilled the requirements at Florida Poly.		
	<b>Section A</b>	<b>Communication</b>	<b>6</b>	<b>6</b>
		ENC 1101 - English Composition 1: Exp and Arg Writing (W) ♦	3	3
		ENC 2210 - Technical Writing (W)	3	3
	<b>Section B</b>	<b>Humanities</b>	<b>3 to 6</b>	<b>6</b>
		ARH 2000 - Art Appreciation ♦	3	
		PHI 2010 - Introduction to Philosophy ♦	3	
		HUM 2022 Explorations in the Humanities (Special Topics)	3	
		IDS 2144 Legal, Ethical, and Management Issues in Technology	3	3R
	<b>Section C</b>	<b>Social Science</b>	<b>3 to 6</b>	<b>6</b>
		AMH 2010 - American History to 1877	3	
		AMH 2020 - American History Since 1877 (W) ♦ Satisfies Florida State Civics Requirement	3	
		AMH 2930 - History: Special Topics	3	
		ECO 2013 - Principles of Macroeconomics (W) ♦	3	3R
		ECO 2023 - Principles of Microeconomics (W)	3	
		PSY 2012 - General Psychology (W) ♦	3	3R

	<b>Section D</b>	<b>Mathematics</b>	<b>7</b>	<b>7</b>
		MAC 2311 - Analytic Geometry and Calculus 1 ♦	4	4
		MAC 2312 - Analytic Geometry and Calculus 2	4	
		MAC 2313 - Analytic Geometry and Calculus 3	4	
		STA 2023 - Statistics 1 ♦	3	
		MAD 2104 - Discrete Mathematics	3	3
		MAP 2302 - Differential Equations	3	
		MAC 1147 - Pre-calculus Algebra and Trigonometry	4	
	<b>Section E</b>	<b>Natural Sciences</b>	<b>8</b>	<b>8</b>
		BSC 1010 - Biology 1 ♦	3	
		BSC 1010L - Biology 1 Laboratory	1	
		CHM 2045 - Chemistry 1 ♦	3	3
		CHM 2045L - Chemistry 1 Laboratory	1	1
		PHY 2048 - Physics 1 ♦	3	3
		PHY 2048L - Physics 1 Laboratory	1	1
		PHY 2049 - Physics 2	3	
		PHY 2049L - Physics 2 Laboratory	1	
	<b>Section F</b>	<b>Open Inquiry: 3 Additional GE credits taken here</b>	<b>3</b>	<b>3</b>
		MAP 2302 - Differential Equations	3	3
<b>II. Program Foundations / Advanced Math &amp; Science</b>			<b>12</b>	<b>15</b>
		1. This area may consist of additional general education courses or other foundational courses in a related field.		
		2. General education courses must be used first to fulfill General Education requirements before being applied here.		
		3. 15 credits here, plus 15 in Sections D and E (above) meet the 30 hour Basic Math/Science requirement for ABET.		
		4. Should count the following in this category: COP 2271C - Introduction to Computation and Programming (required for all programs) Credits: 3. Doing so ensures the 30 hour ABET requirement for "Basic Math/Science."		
		PHY 2049 - Physics 2		3
		PHY 2049L - Physics 2 Laboratory		1
		MAC 2312 - Analytic Geometry and Calculus 2		4
		MAC 2313 - Analytic Geometry and Calculus 3		4
		STA 3032 Probability and Statistics		3
<b>III. Program Core</b>			<b>40</b>	
		40 credits represents a minimum, depending on how many credits are included in Category II, above.		
		Pre-Capstone design sequences should be included in this category - may be listed as a subset in catalog to stand out.		
Add Rows as needed		<b><i>The following may be counted in this category instead:</i></b>		<b>7</b>
		* IDS 1380 - Introduction to STEM: Credits: 3	Counted above	3
		* EGN 1007C - Concepts and Methods for Engineering and Computer Science: Credits: 3 (req of Engineering and CS programs only).		1
		* COP 2271C Introduction to Computation and Programming		3
				<b>43</b>
		MAS 3105 Linear Algebra		3
		COP 3337C Object Oriented Programming		3
		EEL 3311C Circuits 1		4



D. Provide a sequenced course of study for all majors, concentrations, or areas of emphasis within the proposed program.

B.S. Cybersecurity Engineering Plan of Study	
<u>Freshman Year</u>	
<b>Semester 1</b>	
SLS 1106 Academic & Professional Skills	Credits: 1
BSC 1010 Biology 1	Credits: 3
or CHM 2045 - Chemistry 1	Credits: 3
BSC 1010L Biology 1 Laboratory	Credits: 1
or CHM 2045L - Chemistry 1 Laboratory	Credits: 1
ENC 1101 English Composition 1	Credits: 3
IDS 1380 Introduction to STEM	Credits: 3
MAC 2311 Analytic Geometry and Calculus 1	Credits: 4
<b>Total Semester Credit Hours: 15</b>	
<b>Semester 2</b>	
COP 2271C Introduction to Computation and Programming	Credits: 3
EGN 1007C Concepts & Methods	Credits: 1
ENC 2210 Technical Writing	Credits: 3
MAC 2312 Analytic Geometry and Calculus 2	Credits: 4
PHY 2048 Physics 1	Credits: 3
PHY 2048L Physics 1 Laboratory	Credits: 1
<b>Total Semester Credit Hours: 15</b>	
<u>Sophomore Year</u>	
<b>Semester 1</b>	
COP 3337C Object Oriented Programming	Credits: 3
MAC 2313 Analytic Geometry and Calculus 3	Credits: 4
PHY 2049 Physics 2	Credits: 3
PHY 2049L Physics 2 Laboratory	Credits: 1
Social Science General Education: History	Credits: 3
<b>Total Semester Credit Hours: 14</b>	
<b>Semester 2</b>	
EEL 3311C Circuits 1	Credits: 4
EEL 3702C Digital Logic Design	Credits: 3
MAD 2104 Discrete Mathematics	Credits: 3
MAP 2302 Differential Equations	Credits: 3
Arts and Humanities General Education	Credits: 3
<b>Total Semester Credit Hours: 16</b>	
<u>Junior Year</u>	
<b>Semester 1</b>	
EEL 3135 Systems and Signals	Credits: 3
EEL 3312C Circuits 2	Credits: 3
EEL 4746C Microcomputers	Credits: 3
EEL 4768C Computer Architecture and Organization	Credits: 3
STA 3032 Probability and Statistics	Credits: 3
<b>Total Semester Credit Hours: 15</b>	
<b>Semester 2</b>	

CNT 3004C Introduction to Computer Networks	Credits: 3
COP 3530 Data Structures & Algorithms	Credits: 3
COP 4600 Operating Systems Concepts	Credits: 3
IDS 4941 Professional Experience Internship	Credits: 0
MAS 3105 Linear Algebra	Credits: 3
Arts, Humanities, or Social Science General Education	Credits: 3
<b>Total Semester Credit Hours: 15</b>	
<b><u>Senior Year</u></b>	
<b>Semester 1</b>	
Cybersecurity Engineering Concentration Course	Credits: 3
Cybersecurity Engineering Concentration Course	Credits: 3
CAP 4612 Machine Learning	Credits: 3
EEL 4914C Senior Design 1	Credits: 3
EEL 4523 Information Theory and Cryptography	Credits: 3
<b>Total Semester Credit Hours: 15</b>	
<b>Semester 2</b>	
Cybersecurity Engineering Concentration Course	Credits: 3
Cybersecurity Engineering Concentration Course	Credits: 3
EEL 4915C Senior Design 2	Credits: 3
EEL 4721 Protective Technologies and Forensic Technologies for Cybersecurity	Credits: 3
IDS 2144 Legal, Ethical, and Management Issues in Technology	Credits: 3
<b>Total Semester Credit Hours: 15</b>	
<b><u>Concentrations</u></b>	
<b>Industrial Control Systems Security</b>	
EEE 4531 Techniques for High Fidelity Acquisition	Credits: 3
EEL 4652 Control Theory	Credits: 3
EEL 4743 Cyber Physical Security of Industrial Control Systems	Credits: 3
Cybersecurity Engineering Concentration or Program Elective	Credits: 3
<b>Smart-Grid Security</b>	
EEL 4345 Renewable Energy Systems and Power Electronics	Credits: 3
EEL 4251 Power System Analysis	Credits: 3
EEL 4543 Smart-Grid and Cyber Physical Security	Credits: 3
Cybersecurity Engineering Concentration or Program Elective	Credits: 3
<b>Hardware Security</b>	
EEE 3310 Digital Electronics	Credits: 3
EEL 4724 Hardware Design with FPGAs and Reconfigurable Computing	Credits: 3
EEL 4772 Hardware Security	Credits: 3
Cybersecurity Engineering Concentration or Program Elective	Credits: 3
<b>Advanced Topics</b>	
Choose 12 credits from this list of courses	
EEL 4652 Control Theory	Credits: 3
EEL 4251 Power System Analysis	Credits: 3
EEE 3310 Digital Electronics	Credits: 3
EEL 4543 Smart-Grid and Cyber Physical Security	Credits: 3
EEL 4743 Cyber Physical Security of Industrial Control Systems	Credits: 3
EEL 4772 Hardware Security	Credits: 3

<b>Cybersecurity Engineering Electives</b>	
CDA 3631C Embedded Operating Systems	Credits: 3
CIS 4367 Computer Security	Credits: 3
EEL 4242 Power Electronics Circuits	Credits: 3
EEL 4515 Digital Communication Systems	Credits: 3
EEL 4664C Kinematics and Control of Robotic System	Credits: 3

**E. Provide a one- or two-sentence description of each required or elective course.**

The descriptions below include *core*, *concentration*, and *elective* courses for the program.

**COP 3337C - Object Oriented Programming**

This is an intermediate programming course designed for students with prior programming experience. This course focuses on object-oriented programming concepts and techniques using C++. The covered topics will include: streams, classes, recursion, template classes, file handling, and exception handling.

**EEL 3111C - Circuits 1**

This lecture-lab combined course covers the basic analysis of linear circuits. Topics include electrical quantities, network laws and theorems, steady state and transient analysis for circuits. Computer-aided analysis is also covered.

**EEL 3702C - Digital Logic Design**

The analysis and design of sequential logic circuits, combinational logic circuits, and feedback circuits are covered in this course. Additional topics include Boolean algebra, Boolean functions, number systems, minimizations, binary arithmetic, k-maps, combinational circuit synthesis, combinational medium scale integrated (MSI) logic circuits, sequential logic, sequential MSI logic circuits and synchronous state machine design.

**COP 3530 - Data Structures & Algorithms**

The course introduces program run-time analysis and algorithm design and analysis. Topics include: data abstraction principals, serial and parallel data structures, linked lists, graphs, trees, divide and conquer algorithms, greedy algorithms, and linear programming.

**EEL 3112C - Circuits 2**

This lecture-lab combined course introduces the fundamentals of transient state analysis; linear circuit analysis in frequency domain, sinusoidal steady-state analysis and power calculations, Laplace transform techniques, frequency response analysis, balanced three-phase circuits and two-port circuit analysis.

**EEL 3135 - Systems and Signals**

Continuous-time and discrete-time systems analysis, focusing on linear time-invariant (LTI) systems and the classification of these systems is presented in this course. Convolution and its application to LTI systems, the Laplace, Fourier, and z transforms, the Fourier series and their application to the analysis of LTI systems will also be presented. Industry applications will be a specific focus.

**CNT 3004C - Introduction to Computer Networks**

This course provides an introduction to fundamental concepts in computer networks, including their design and implementation. Topics covered include all seven layers of OSI Reference Model, network protocols (providing reliability and congestion control), routing, and link access. Special attention is also paid to wireless networks and security.

**EEL 4768C - Computer Architecture and Organization**

This course covers a top-down approach to computer design. Topics include Computer architecture, introduction to assembly language programming and machine language set design. Computer organization, logical modules, CPU, memory and I/O units, instruction cycles, the data path and control unit, hardwiring and microprogramming are also covered.

**EEL 4746C – Microcomputers**

The course will discuss microcomputers and microcontrollers and explore the subjects of memory

addressing modes, instruction sets, central processing units / microprocessors, C and assembly language programming in the context of the course, debugging software and hardware, computer buses, interrupts, real-time events, memory, I/O, counters, timers and interfacing techniques.

#### COP 4610 - Operating Systems Concepts

This course covers the concepts of the design and implementation of operating systems. Topics included: memory and storage management, virtual memory, processes/threads, system calls, interfaces, I/O, file system, and introduction to virtualization.

#### EEL4523 – Information Theory and Cryptography

This course covers introduction to information theory, fundamentals of error control coding, error detection and applications; information Theoretic Metrics; basic cryptography and security.

#### CAP 4612 - Machine Learning

An overview of machine learning algorithms and their applications. Topics covered include: supervised and unsupervised learning, clustering and classification, linear and logistic regression, dimensionality reduction, support vector machines, anomaly detection.

#### EEL 4721 - Protective Technologies and Forensic Techniques for Cybersecurity

This course is an introductory course on the selection and design of attack prevention techniques and countermeasures. In addition, it introduces the students to the concepts of digital forensics science and the techniques of preparing the high-tech investigation reports.

### **Industrial Control Systems Security**

#### EEL 4652 - Control Theory

The analysis of feedback control systems in both continuous- & discrete time domains, methods for improving system response for transient and steady state behavior, system stability concept, methods for examining system stability in both time & frequency domains and determining the system stability margins are discussed.

#### EEE 4531 - Techniques for High Fidelity Acquisition

The course covers the concepts, planning, design, tools, and skills related to acquiring high quality signals. Methods include extracting signals from noise, designing measurement systems to minimize noise and disturbance effects, and identifying and ameliorating sources of noise. The course also investigates measurement error using statistical analysis and sensors dynamic models.

#### EEL 4743 - Cyber Physical Security of Industrial Control Systems

This course is an introduction to the security of industrial control systems and networked control systems. It covers communication protocols and network security issues related to industrial control systems. The stability of networked control systems will be investigated to examine the robustness of the control systems. It also covers simple model-based detection and compensation techniques for designing secure control system based on linear control theory.

### **Smartgrid Security**

#### EEL 4251 - Power System Analysis

Development of models for power system components: power transformers, transmission lines, transmission lines steady state operation, power flows, symmetrical components, and fault analyses.

#### EEL 4543 - Smart-Grid and Cyber Physical Security

This course covers an overview of smart grid infrastructure, and management policy, including the integration of renewable resources, electricity market, and demand-side management, etc. The smart grid challenges and requirements will be extensively discussed, especially privacy, and cybersecurity. Digital communications, communication standards and Internet-of-Things in smart grids will be presented. Smart grid operation and management will be analyzed and demonstrated by simulation software, e.g. MATLAB-SIMULINK.

#### EEL 4345 - Renewable Energy Systems and Power Electronics

This course covers an overview of renewable energy systems with emphasis of the applications in photovoltaic sources and wind power. Also includes the design considerations of power electronics and control for grid-connected systems. The use of Matlab-Simulink software tool for evaluating renewable

energy and power electronics converters for grid-connected systems.

### Hardware Security

#### EEE 3310 - Digital Electronics

This course focuses on the implementation of logic devices, MOSFET's, and BJT's. Students will analyze logic families including NMOS, CMOS, and TTL. The fundamentals of digital memory circuits are also covered.

#### EEL 4772 - Hardware Security

This course covers the basic algebra of finite fields, the mathematical theory of selective cryptographic primitives, the different security threats across both circuit and microarchitecture levels in the modern electronic hardware designs, the test and verification of cryptographic hardware, and hardware Trojans. Students will gain in-depth knowledge by applying the theoretical concepts on the practical case studies through completing multiple projects.

#### EEL 4724—Hardware Design with FPGAs and Reconfigurable Computing

Introduction to rapid hardware prototyping and reconfigurable computation. Fundamentals of RTL design, FSM and FSM based designs, and System on Chip based approaches. Design constraints, timing closure, and power analysis. Realization of various hardware systems on an actual FPGA board.

### Cybersecurity Engineering Electives

#### CIS 4367 - Computer Security

This course covers security issues in different aspect of computing. Topics covered are: access control mechanisms, authentication models, and vulnerability detection. Attacks and mitigation methods at the OS level. Database and operating system security issues, mobile code, security kernels. Malicious code, Trojan horses and computer viruses. Security policy formation and enforcement.

#### CDA 3631C - Embedded Operating Systems

Embedded Operating Systems or Real time operating systems are operating systems are designed to be compact, efficient, and reliable. Topics discussed include embedded architectures, interaction with devices, concurrency, real-time principles, implementation trade-offs, profiling and code optimization, and embedded software.

#### EEL 4664C-Kinematics and Control of Robotic Systems

This course provides a general introduction to spatial descriptions and transformations. The fundamental concepts and methods to analyze, model and control robotic mechanisms will be covered. Main topics include the fundamentals of kinematics, dynamics and control of robotic systems. Additional topics include state estimation and dynamic parameter identification. Also, the course covers the design and implementation of a motion trajectory planning algorithm.

#### EEL 4242 - Power Electronics Circuits

Circuit topologies, analysis, design and simulation of power electronic circuits such as power supplies and motor drives.

#### EEL 4515 - Digital Communication Systems

This course covers various aspects of the physical layer of the communication system. These aspects include information theory (source coding, channel coding, and channel capacity), channel models, and modulation techniques.

- F. For degree programs in the science and technology disciplines, discuss how industry-driven competencies were identified and incorporated into the curriculum and indicate whether any industry advisory council exists to provide input for curriculum development and student assessment.**

The genesis of this degree program idea came from interaction with the Program Area Chair for the ABET-EAC committee that reviewed our programs in Electrical, Computer, and Mechanical Engineering in October 2018. The program further received input from the curriculum advisory board for the ECE Department at its 2019 meeting in May. This advisory Board provides regular input on the programs as part of the Department's active monitoring of its ABET compliance processes and Cybersecurity

Engineering would fall under this umbrella. The specific program objectives at this stage are the same at those reviewed and supported by the industry/curriculum advisory board for electrical and computer engineering and the program's learning outcomes are consistent with outcomes for ABET-EAC accredited programs.

- G. For all programs, list the specialized accreditation agencies and learned societies that would be concerned with the proposed program. Will the university seek accreditation for the program if it is available? If not, why? Provide a brief timeline for seeking accreditation, if appropriate. For degree programs in medicine, nursing, and/or allied health, please identify the courses that meet the requirements in Section 1004.08, Florida Statutes for required patient safety instruction.**

The program will seek ABET-EAC accreditation upon completion of its first graduate. This should coincide with the reapproval period of its programs in electrical and computer engineering in 2023, so the final decision would likely come in August of 2024, and would be accredited back to the graduation of that first student. The program would also consider certification approvals by NSA and other agencies as appropriate.

- H. For doctoral programs, list the accreditation agencies and learned societies that would be concerned with corresponding bachelor's or master's programs associated with the proposed program. Are the programs accredited? If not, why?**

Not Applicable.

- I. Briefly describe the anticipated delivery system for the proposed program (e.g., traditional delivery on main campus; traditional delivery at branch campuses or centers; or nontraditional delivery such as distance or distributed learning, self-paced instruction, or external degree programs). If the proposed delivery system will require specialized services or greater than normal financial support, include projected costs in Table 3 in Appendix A. Provide a narrative describing the feasibility of delivering the proposed program through collaboration with other universities, both public and private. Cite specific queries made of other institutions with respect to shared courses, distance/distributed learning technologies, and joint-use facilities for research or internships.**

The program is intended to be delivered on-site, face-to-face. As the University continues to grow and especially in response to the Covid-19 pandemic, it has increasingly grown in its ability to deliver courses in distance and hybrid delivery methods. We will continue to explore the most effective learning environments and methodologies for our students to be successful professionals in the area of cybersecurity engineering.

## IX. Faculty Participation

- A. Use Table 2 in Appendix A to identify existing and anticipated full-time (not visiting or adjunct) faculty who will participate in the proposed program through Year 5. Include (a) faculty code associated with the source of funding for the position; (b) name; (c) highest degree held; (d) academic discipline or specialization; (e) contract status (tenure, tenure-earning, or multi-year annual [MYA]); (f) contract length in months; and (g) percent of annual effort that will be directed toward the proposed program (instruction, advising, supervising internships and practica, and supervising thesis or dissertation hours).**

Existing faculty in the Department of Electrical and Computer Engineering and faculty in the Department of Computer Science collaborated on the development of the program and will continue to collaborate on the delivery of the degree. This is reflected in Appendix A.

- B. Use Table 3-Appendix A to display the costs and associated funding resources for existing and anticipated full-time faculty (as identified in Table 2-Appendix A). Costs for visiting and adjunct faculty should be included in the category of Other Personnel Services (OPS). Provide a narrative summarizing projected costs and funding sources.**

Current faculty positions, as Appendix A, Table 4 shows, are sufficient to deliver the program and maintain delivery in existing programs as well. Funds will come from unallocated E&G provisioned by the legislature in 2018 to support faculty hiring to offset any reallocation of time that may be incurred by increased enrollment and section growth due to student demand.

- C. Provide in the appendices the abbreviated curriculum vitae (CV) for each existing faculty member (do not include information for visiting or adjunct faculty).**

Curriculum Vitae for faculty are located in Appendix C of this document.

- D. Provide evidence that the academic unit(s) associated with this new degree have been productive in teaching, research, and service. Such evidence may include trends over time for average course load, FTE productivity, student HC in major or service courses, degrees granted, external funding attracted, as well as qualitative indicators of excellence.**

See Appendix D., Faculty Workload Summary, of this document.

## X. Non-Faculty Resources

- A. Describe library resources currently available to implement and/or sustain the proposed program through Year 5. Provide the total number of volumes and serials available in this discipline and related fields. List major journals that are available to the university's students. Include a signed statement from the Library Director that this subsection and subsection B have been reviewed and approved.**

The Florida Polytechnic University Library is comprised of two distinct collections: the main library collection is a digital library, and the Florida Industrial Phosphate Research (FIPR) Institute collection is primarily a print comprehensive collection of phosphate-related resources and archival materials. There was a conscious effort at the inception of the institution to establish the main library as a virtual library. The Florida Polytechnic University Library provides specialized, STEM-focused resources and learning opportunities for students, faculty, and staff to work successfully with, interpret, and utilize information. Students at Florida Polytechnic University have 24/7/365 access to library resources via the internet.

The Florida Polytechnic University's main library is located on the second floor of the University's Innovation, Science and Technology Building, in an open-space area called the Commons. The main, digital collection contains over 150,000 full text ebook volumes that are a mixture of owned and licensed materials. There is no physical stack area.

The University Library provides support for all the degrees offered at the institution, and currently supports master's and bachelor's programs in Computer, Electrical and Mechanical Engineering. Resources that directly support Florida Poly's current engineering programs will also directly support the proposed Cybersecurity Engineering program. Current library resources include Elsevier's Science Direct, IEEE Electronic Library, and ProQuest's SciTech Premium Collection and ProQuest Ebook Central.

Major journals currently available through the Florida Poly Library that will directly support Cybersecurity Engineering include:

- IEEE Security and Privacy (2003-present)
- IEEE Transactions on Information Forensics and Security (2006-present)
- IEEE Transactions on Signal and Information Processing Over Networks (2015-present)
- Elsevier Computers & Security (2012-present)
- International Journal of Information Security Science (2012-present)

- B. Describe additional library resources that are needed to implement and/or sustain the program through Year 5. Include projected costs of additional library resources in Table 3-Appendix A. Please include the signature of the Library Director in Appendix B.**

To further support the Cybersecurity Engineering program, the Library will seek to acquire access to IOS Press journals that focus on information, intelligence and computer security, specifically: Integrated Computer-Aided Engineering, International Journal of Knowledge-Based Intelligent Engineering Systems and Journal of Computer Security. Approximate cost of IOS Press journal access is \$6,000.00. Also, additional cybersecurity engineering books will need to be identified and added to the Florida Poly collection, with an approximate initial cost of \$5,000.00.

- C. Describe classroom, teaching laboratory, research laboratory, office, and other types of space that are necessary and currently available to implement the proposed program through Year 5.**

The following facilities are currently available for electrical and computer engineering programs.

### Offices, Classrooms and Laboratories

Florida Poly's primary instructional and laboratory building is the Innovation, Science, and Technology (IST) building. It has an estimated gross square feet of 186,736 and houses all academic departments and programs. Currently all instruction and research activities conducted by faculty and staff take place at this building. Square footage is separated between classrooms, research labs, teaching labs, library, office space for faculty and staff, study areas, and terrace space.

The second floor, center of the IST houses the University's fully online Library, areas for students to study, and the commons. This space has a total of 22,172 net assignable square footage. Collaborations rooms are used by students, faculty and staff. These seat a maximum of five people and are equipped with television monitors where personal laptops can be projected.

### **Offices**

All faculty offices are located on the second floor of the IST, which is divided into four quadrants. The Electrical and Computer Engineering Department shares a quadrant with the Mechanical Engineering Department, and both are adjacent to the Department of Computer Science.

Administrative and faculty offices include a total net assignable space of 10,545. An office has an average of 68 square feet, glass-board, desk and auxiliary table, built-in space for storage and small lock-in key storage cabinet. Each office seats one person.

Across the hall from the ECE faculty offices sits an administrative assistant dedicated to the department and a workroom, complete with copier (scanner, fax, etc.), refrigerator, and other essential office equipment. Each quadrant has a collaboration room for departmental meetings, committee work, student collaborations, and student-faculty conferences.

### **Classrooms and Associated Equipment**

Classrooms and associated equipment that are typically available where the program courses are taught.

Classrooms and teaching labs are primarily located on the 1st floor of the IST building. A typical classroom or teaching lab contains a desk with a computer for the instructor to access teaching materials and seats from 20 to 46 students.

All classrooms include dual projectors and monitors, Claris-boards, and sound-technology so classes can be simulcast and recorded facilitating any instructional modality needed. These educational spaces contain different seating options can be easily rearranged depending on the instructional needs. There is 29,620 net assignable square footage in the IST building considered as educational space.

Additionally, there are 16,697 net assignable square footage allocated for research activities conducted by faculty and students. Research labs are located on the 1st floor of the building and depending on the type of research conducted in the lab, they contain specialized equipment, computers, projectors, appropriate safety equipment and security.

### **ECE Laboratories**

The Department of Electrical and Computer Engineering presently works in four laboratories in the IST, sharing at least one of those labs with Computer Science and other programs for interdisciplinary work in robotics.

*IST, Room 1013 Research Laboratory:* This is an approximately 1747 sq. ft. lab that is typically used as a research project lab for graduate programs and graduate students although during Covid-19 has served to support social distancing in the classrooms and manage undergraduate populations as well. This lab has 10 benches with 20 stations. Each station is equipped with 20 Tektronix MD031004-type oscilloscopes, 20 Tektronix AFG 3052C-type Function Generators, 20 Keithley 22300G-3-1-type DC supplies, 20 Keithley 2110-type multimeters and 20 Lenovo computers with access to all of the university software tools. There are additional 4 benches with computers for control system lab and other course based-projects.

The lab also contains bins of resistors, capacitors, parts bins, lab kits, and analog ICs used for the laboratory courses held in the room. Students enrolled in a course utilizing this lab can request access to the lab for hours that the lab is not used. The lab is managed by a lab technician who is available all the time during the lab sessions. There are about 20 labs scheduled in this room during a week. This typically amounts to approximately 60 hours between Monday and Friday.

Available ECE Software Tools:

- MARSMIP simulation
- VHDL/Verilog – Model Sim
- Multisim 14.0 circuit simulator
- Python Language

- Mathlab 2016
- Quarc –software
- Rockwell PLC studio 5000
- Labview
- Cadence 22nm technology
- NeMOS5 Device simulatipons

*IST, Room 1056 Circuits Laboratory:* This is an approximately 927 sq. ft. lab that is utilized by both electrical and computer engineering students enrolled in circuits, electronics, digital logic and control systems laboratory courses (EEL 3111C, EEL 3112C, EEL 3702C, EEL 3304C, EEL 4351C and 4321C). Each student works individually in each lab station in all labs. It is furnished to accommodate 24 stations for 24 students.

*IST, Room 1058 Digital and Cyber Physical Lab:* This is an approximately 930 sq. ft. lab is completely equipped and finished appropriately to accommodate 24 stations for 24 students. It is used for labs in computer architecture and organization, microcomputer, cybersecurity, embedded control, and embedded operating systems, and computer science courses.

*IST, Room 1025 Robotics Lab:* This is an approximately 772 sq. ft. lab that is utilized by both electrical and computer engineering and computer science students for graduate and undergraduate labs and projects.

The University nears completion of the exterior structure of the Applied (Engineering) Research Center, a second academic building on campus dedicated to instructional space, research facilities, and faculty offices. This facilities is approximately 85,000-square feet with an additional 10,000 square feet annex for “dirty-lab” work to support, among other things, student capstone projects. The annex is expected to be completed and operational by Fall 2021, while the ARC as a whole awaits further funding to complete the interior spaces. For the foreseeable future, the implementation and initial three-years, at minimum of the program in cyber-security engineering, is not dependent on the ARC to function; however, the building is expected to be completed within the next 2 years and will greatly benefit the University’s ability to advance its mission.

- D. Describe additional classroom, teaching laboratory, research laboratory, office, and other space needed to implement and/or maintain the proposed program through Year 5. Include any projected Instruction and Research (I&R) costs of additional space in Table 3-Appendix A. Do not include costs for new construction because that information should be provided in response to X (E) below.**

The department of electrical and computer engineering plans for implementation of the proposed Cybersecurity Engineering program in collaboration with the department of computer science. The existing faculties will be utilized for most of the courses, except specialized concentration areas. Florida Polytechnic University plans to move to a new building Applied Research Center (ARC) of 95,000 sq. ft (total) in fall 2021, and that facility would prove additional classrooms, laboratories, and two dedicated cybersecurity labs to be shared with computer science department.

- E. If a new capital expenditure for instructional or research space is required, indicate where this item appears on the university's fixed capital outlay priority list. Table 3-Appendix A includes only Instruction and Research (I&R) costs. If non-I&R costs, such as indirect costs affecting libraries and student services, are expected to increase as a result of the program, describe and estimate those expenses in narrative form below. It is expected that high enrollment programs in particular would necessitate increased costs in non-I&R activities.**

Not Applicable.

- F. Describe specialized equipment that is currently available to implement the proposed program through Year 5. Focus primarily on instructional and research requirements.**

With carefully class schedules, the exiting labs IST, Room 1056 Circuits Laboratory, IST, Room 1058 Digital and Cyber Physical Lab, Computer labs and computing facilities should be able to accommodate

up to three (3) lab sections of 24 students in each section, totaling  $3 \times 24 = 72$  students per semester. There would be need to project-based lab facility and dedicated equipment for Industrial Control Systems Security, Smart-grid Security, and Hardware Security. A further focus and on-going study on lab and lecture delivery methods across all programs in the Department reveals potential for maximizing space utilization of laboratories and classroom facilities that better manages curriculum and faculty resources.

**G. Describe additional specialized equipment that will be needed to implement and/or sustain the proposed program through Year 5. Include projected costs of additional equipment in Table 3-Appendix A.**

1 <sup>st</sup> year: No need for equipment	2021-2022	0
2 <sup>nd</sup> year: software needed \$45k	2022-2023	\$45,000
3 <sup>rd</sup> year: all equipment: \$ 375k	2023-2024	\$375,000
4 <sup>th</sup> year: all equipment: \$200k	2024-2025	\$200,000

The program expenses outlined here and in section H. below are represented in Appendix A.-Table 3 in lines for Expenses and Operating Capital Outlay, years 1 and year 5, which are in the recurring column. The program anticipates no cost in year one, relatively minimal software cost in year 2, and higher equipment costs in years 3 and 4 (as the ARC opens) for more specialized equipment for the upper-division courses. The budget lines in Table 3 are inclusive of these figures by being recurring and beginning prior to the program's assumptions. This is done to maximize our flexibility from a planning and execution standpoint given the uncertainty of state budgets, enrollment fluctuations due to the pandemic, and other institutional changes.

**H. Describe any additional special categories of resources needed to implement the program through Year 5 (access to proprietary research facilities, specialized services, extended travel, etc.). Include projected costs of special resources in Table 3-Appendix A.**

As noted above in section G., the detailed list below is assumed in Appendix A.- Table 3 in both Expenses, and Operating Capital Outlay from years 1 through 5 in the recurring column, which includes expenses inclusive of these. This facilitates maximum flexibility from a budgetary standpoint particularly in these uncertain times.

	Lab Equipment	Specialized Equipment
RTDS: \$150K	\$ -	\$ 150,000.00
Opal RT (Real time HIL): \$130k	\$ -	\$ 130,000.00
DSPACE: \$25K	\$ -	\$ 25,000.00
5 PC: \$15K	\$ 15,000.00	\$ -
Power supply: \$10K	\$ 10,000.00	\$ -
Hi-Fi Probs: \$10K	\$ 10,000.00	\$ -
Hardware security:	\$ -	\$ -
12 PCs: \$25K	\$ 25,000.00	\$ -
PLC: \$40K	\$ -	\$ 40,000.00
Smart meters: \$30K	\$ 30,000.00	\$ -
Server: \$30K	\$ -	\$ 30,000.00
Routers: \$10K	\$ -	\$ 10,000.00
Software: \$40K	\$ -	\$ 40,000.00
Firewalls: \$15K	\$ -	\$ 15,000.00
FPGA: \$30K	\$ -	\$ 30,000.00
Microcontrollers: \$5K	\$ -	\$ 5,000.00
Oscilloscope: \$20K	\$ 20,000.00	\$ -
Chip whisperer: \$10K	\$ -	\$ 10,000.00
PSSE license: \$5K	\$ -	\$ 5,000.00
Hi Com PCs: \$20k	\$ 20,000.00	\$ -
	\$ 130,000.00	\$ 490,000.00
<b>TOTAL</b>		<b>\$ 620,000.00</b>

**I. Describe fellowships, scholarships, and graduate assistantships to be allocated to the proposed program through Year 5. Include the projected costs in Table 3-Appendix A.**

Undergraduate students are provided scholarships based on their merit. Recent [donations](#) specific to the Department of Electrical and Computer Engineering support scholarships specific to students in the department's programs. These donations are not reflected in the program budget because they support the student and not the program directly; however, it is anticipated that they will benefit the program by providing financial pathways for students to progress in ECE programs.

**J. Describe currently available sites for internship and practicum experiences, if appropriate to the program. Describe plans to seek additional sites in Years 1 through 5.**

All Florida Poly degrees require students to take an internship as part of their graduation requirement. The emphasis is on external, professional internships, but may also include internal, research-based internships where students work on funded projects with a faculty member or with a team of collaborators on a faculty-driven or industry-sponsored project.

Florida Poly holds both an annual internship fair and an annual career fair and currently sends interns to over 200 companies in throughout Florida and beyond. Some nearby companies include Accusoft, Publix Supermarkets, the Florida Department of Transportation, and Motorola Solutions. Our Director of Industry Engagement and our Office of Career Services continue to reach out and grow relationships with Florida companies to create pathways for interns, careers, sponsored projects, and a range of other opportunities of mutual benefit.

# APPENDIX A. Table 1-A

**APPENDIX A**  
**TABLE 1-A**  
**PROJECTED HEADCOUNT FROM POTENTIAL SOURCES**  
**(Baccalaureate Degree Program)**

Source of Students (Non-duplicated headcount in any given year)*	Year 1 HC	Year 1 FTE	Year 2 HC	Year 2 FTE	Year 3 HC	Year 3 FTE	Year 4 HC	Year 4 FTE	Year 5 HC	Year 5 FTE
Upper-level students who are transferring from other majors within the university**	7	7	5	5	3	3	2	2	1	1
Students who initially entered the university as FTIC students and who are progressing from the lower to the upper level***	11	10	34	32	60	57	85	80	90	87
Florida College System transfers to the upper level***	2	2	4	4	6	5	6	5	12	10
Transfers to the upper level from other Florida colleges and universities***	0	0	2	2	6	4	6	4	9	7
Transfers from out of state colleges and universities***	0	0	0	0	8	7	8	7	8	6
Other (Explain)***	0	0	0	0	0	0	0	0	0	0
<b>Totals</b>	<b>20</b>	<b>19</b>	<b>45</b>	<b>43</b>	<b>83</b>	<b>76</b>	<b>107</b>	<b>98</b>	<b>120</b>	<b>111</b>

\* List projected annual headcount of students enrolled in the degree program. List projected yearly cumulative ENROLLMENTS instead of admissions.  
 \*\* If numbers appear in this category, they should go DOWN in later years.  
 \*\*\* Do not include individuals counted in any PRIOR CATEGORY in a given COLUMN.

Appendix A. Table 2

**APPENDIX A**  
**Table 2**  
**Anticipated Faculty Participation**

Faculty Code	Faculty Name or "New Hire" Highest Degree Held Academic Discipline or Specialty	Rank	Contract Status	Initial Date for Participation in Program	Mos. Contract Year 1	FTE Year 1	% Effort for Prg. Year 1	PY Year 1	Mos. Contract Year 5	FTE Year 5	% Effort for Prg. Year 5	PY Year 5
A	Adla, Rawa, Ph.D Electronic and Electrical Engineering	Asst. Prof	MYA	Fall 2021	9	0.75	0.15	0.11	9	0.75	0.25	0.19
A	Al-Nashif, Youssif, Ph.D. Electrical and Computer Engineering	Assoc. Prof	MYA	Fall 2021	9	0.75	0.35	0.26	9	0.75	0.75	0.56
A	Chandrasekaran, Bala, Ph.D. Electrical Engineering	Asst. Prof	MYA	Fall 2021	9	0.75	0.20	0.15	9	0.75	0.50	0.38
A	Chintakunta, Harish, Ph.D. Electrical Engineering	Asst. Prof	MYA	Fall 2021	9	0.75	0.20	0.15	9	0.75	0.25	0.19
A	Demirel, Doga, Ph.D. Computer Science	Asst. Prof	MYA	Fall 2021	9	0.75	0.35	0.26	9	0.75	0.50	0.38
A	Habib, Md Selim, Ph.D. Photonics Engineering	Asst. Prof	MYA	Fall 2021	9	0.75	0.15	0.11	9	0.75	0.25	0.19
A	Hamam, Abdelwahab, Ph.D. Electrical and Computer Engineering	Asst. Prof	MYA	Fall 2021	9	0.75	0.20	0.15	9	0.75	0.35	0.26
A	Karaman, Bayazit, Ph.D. Computer Science	Asst. Prof	MYA	Fall 2021	9	0.75	0.15	0.11	9	0.75	0.25	0.19
A	Khalgani, Mohammad Reza, Ph.D. Electrical Engineering	Asst. Prof	MYA	Fall 2021	9	0.75	0.20	0.15	9	0.75	0.25	0.19
A	Mahmood, Hisham, Ph.D. Electrical Engineering	Asst. Prof	MYA	Fall 2021	9	0.75	0.15	0.11	9	0.75	0.35	0.26
A	Patel, Ashok, Ph.D. Computer Science	Asst. Prof	MYA	Fall 2021	9	0.75	0.25	0.19	9	0.75	0.65	0.49
A	Rashid, Muhammad, Ph.D. Electronic and Electrical Engineering	Prof.	MYA	Fall 2021	9	0.75	0.15	0.11	9	0.75	0.10	0.08
A	Sakib, Ashiq, Ph.D. Electrical and Computer Engineering	Asst. Prof	MYA	Fall 2021	9	0.75	0.15	0.11	9	0.75	0.25	0.19
A	Toker, Onur, Ph.D. Electrical Engineering	Assoc. Prof	MYA	Fall 2021	9	0.75	0.15	0.11	9	0.75	0.25	0.19
A	Ullah, Muhammad, Ph.D. Electrical and Computer Engineering	Asst. Prof	MYA	Fall 2021	9	0.75	0.10	0.08	9	0.75	0.25	0.19
C	Cyber-Security Engineering Cyber-Physical Systems	Assoc. Prof or Prof.	MYA	Fall 2021	9	0.75	0.60	0.45	9	0.75	1.00	0.75
C	Cyber-Security Engineering AI/Deep Machine	Assoc. Prof or Prof.	MYA	Fall 2021	9	0.75	0.60	0.45	9	0.75	1.00	0.75
	<b>Total Person-Years (PY)</b>							<b>3.08</b>				<b>5.40</b>

Worksheet Table 2 Faculty Participation

**APPENDIX A**  
**Table 2**  
**Anticipated Faculty Participation**

Faculty Code	Code Description	Source of Funding	PY Workload by Budget Classification			
			Year 1			Year 5
A	Existing faculty on a regular line	Current Education & General Revenue	2.18			3.90
B	New faculty to be hired on a vacant line	Current Education & General Revenue	0.00			0.00
C	New faculty to be hired on a new line	New Education & General Revenue	0.90			1.50
D	Existing faculty hired on contracts/grants	Contracts/Grants	0.00			0.00
E	New faculty to be hired on contracts/grants	Contracts/Grants	0.00			0.00
F	Existing faculty on endowed lines	Philanthropy & Endowments	0.00			0.00
G	New faculty on endowed lines	Philanthropy & Endowments	0.00			0.00
H	Existing or New Faculty teaching outside of regular/tenure-track line course load	Enterprise Auxiliary Funds	0.00			0.00
<b>Overall Totals for</b>			<b>3.08</b>			<b>5.40</b>

# Appendix A. Table 3

**APPENDIX A  
TABLE 3  
PROJECTED COSTS AND FUNDING SOURCES**

Budget Line Item	Reallocated Base* (E&G) Year 1	Enrollment Growth (E&G) Year 1	New Recurring (E&G) Year 1	New Non-Recurring (E&G) Year 1	Contracts & Grants (C&G) Year 1	Philanthropy/Endowments Year 1	Enterprise Auxiliary Funds Year 1	Subtotal Year 1	Continuing Base** (E&G) Year 5	New Enrollment Growth (E&G) Year 5	Other*** (E&G) Year 5	Contracts & Grants (C&G) Year 5	Philanthropy/Endowments Year 5	Enterprise Auxiliary Funds Year 5	Subtotal Year 5
Faculty Salaries and Benefits	0	0	350,970	0	0	0	0	\$350,970	609,670	0	0	0	0	0	\$609,670
A & P Salaries and Benefits	0	0	114,096	0	0	0	0	\$114,096	120,942	0	0	0	0	0	\$120,942
USPS Salaries and Benefits	0	0	0	0	0	0	0	\$0	0	0	0	0	0	0	\$0
Other Personal Services	0	0	10,200	0	0	0	0	\$10,200	13,600	0	0	0	0	0	\$13,600
Assistantships & Fellowships	0	0	0	0	0	0	0	\$0	0	0	0	0	0	0	\$0
Library	0	0	46,787	0	0	0	0	\$46,787	49,594	0	0	0	0	0	\$49,594
Expenses	0	0	38,984	0	0	0	0	\$38,984	43,369	0	0	0	0	0	\$43,369
Operating Capital Outlay	0	0	168,750	0	0	0	0	\$168,750	451,250	0	0	0	0	0	\$451,250
Special Categories	0	0	0	0	0	0	0	\$0	0	0	0	0	0	0	\$0
<b>Total Costs</b>	<b>\$0</b>	<b>\$0</b>	<b>\$729,787</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$729,787</b>	<b>\$1,288,425</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$1,288,425</b>

\*Identify reallocation sources in Table 4.

\*\*Includes recurring E&G funded costs ("reallocated base," "enrollment growth," and "new recurring") from Years 1-4 that continue into Year 5.

\*\*\*Identify if non-recurring.

**Faculty and Staff Summary**

Total Positions	Year 1	Year 5
Faculty (person-years)	3.08	5.40
A & P (FTE)	2.25	2.25
USPS (FTE)	4.25	4.5

**Calculated Cost per Student FTE**

	Year 1	Year 5
Total E&G Funding	\$729,787	\$1,288,425
Annual Student FTE	19	111
E&G Cost per FTE	\$38,410	\$11,607

Worksheet Table 3 Budget

**APPENDIX A**  
**TABLE 3**  
**PROJECTED COSTS AND FUNDING SOURCES**

Table 3 Column Explanations		
Reallocated Base* (E&G)	1	E&G funds that are already available in the university's budget and will be reallocated to support the new program. Please include these funds in the Table 4 – Anticipated reallocation of E&G funds and indicate their source.
Enrollment Growth (E&G)	2	Additional E&G funds allocated from the tuition and fees trust fund contingent on enrollment increases.
New Recurring (E&G)	3	Recurring funds appropriated by the Legislature to support implementation of the program.
New Non-Recurring (E&G)	4	Non-recurring funds appropriated by the Legislature to support implementation of the program. Please provide an explanation of the source of these funds in the budget section (section III. A.) of the proposal. These funds can include initial investments, such as infrastructure.
Contracts & Grants (C&G)	5	Contracts and grants funding available for the program.
Philanthropy Endowments	6	Funds provided through the foundation or other Direct Support Organizations (DSO) to support the program.
Enterprise Auxiliary Funds	7	Use this column for continuing education or market rate programs and provide a rationale in section III.B. in support of the selected tuition model.
Continuing Base** (E&G)	9	Includes the sum of columns 1, 2, and 3 over time.
New Enrollment Growth (E&G)	10	See explanation provided for column 2.
Other*** (E&G)	11	These are specific funds provided by the Legislature to support implementation of the program.
Contracts & Grants (C&G)	12	See explanation provided for column 5.
Philanthropy Endowments	13	See explanation provided for column 6.
Enterprise Auxiliary Funds	14	Use this column for continuing education or market rate programs and provide a rationale in section III.B. in support of the selected tuition model.

Appendix A. Table 4

**APPENDIX A**  
**TABLE 4**  
**ANTICIPATED REALLOCATION OF EDUCATION GENERAL FUNDS\***

Program and/or E&G account from which current funds will be reallocated during Year 1	Base before reallocation	Amount to be reallocated	Base after reallocation
Example: 555-555 World exploration fund (example)	0	0	\$0
	0	0	\$0
	0	0	\$0
	0	0	\$0
	0	0	\$0
	0	0	\$0
	0	0	\$0
	0	0	\$0
<b>Totals</b>	\$0	\$0	\$0

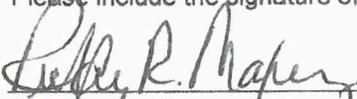
\* If not reallocating E&G funds, please submit a zeroed Table 4

Florida Poly received a recurring \$4.8 million state appropriation for faculty salaries. This amount has been included in the new programs proposed and implemented in 2019 (Environmental Engineering, Engineering Physics, and Engineering Mathematics), which, combined, totaled up to \$1,290,685 in Year 1 expenses and \$2,194,265 in Year 5. This leaves a balance of at least \$3million for year one of Cybersecurity Engineering and \$2,606,735.00 for Cybersecurity Engineering and other programs in year five.

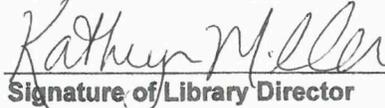
Worksheet Table 4 Reallocation

## APPENDIX B

Please include the signature of the Equal Opportunity Officer and the Library Director.

  
\_\_\_\_\_  
Signature of Equal Opportunity Officer

12-16-20  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
Signature of Library Director

1-15-2021  
\_\_\_\_\_  
Date

This appendix was created to facilitate the collection of signatures in support of the proposal. Signatures in this section illustrate that the Equal Opportunity Officer has reviewed section II.E of the proposal and the Library Director has reviewed sections X.A and X.B.

## Appendix C. Curriculum Vitae

1. **Name:** Rawa Adla

2. **Degrees**

Degree	Discipline	Institution	Year
B.Sc.(Eng.)	Electrical and Computer Engineering	University of Aleppo, Syria	1999
Diploma	Computer Science	University of Aleppo, Syria	2001
M.Sc.	Computer Science	University of Michigan, MI	2008
Ph.D.	Electronic and Electrical Engineering	University of Detroit Mercy, MI	2015

3. **Academic Experience**

Institution	Rank & Title	Period	FT/PT
Florida Polytechnic University	Assistant Professor	Sep, 2019-	FT
University of Arizona	Assistant Professor of Electrical and Computer Engineering	2018 - 2019	FT
University of Detroit Mercy	Visiting Assistant Professor	2015 – 2016	FT
St. Clair County College	Adjunct Professor	2013-2015	PT
University of Detroit Mercy	Teaching Assistant	2010-2014	PT
University of Michigan	Teaching Assistant	2008-2009	PT
University of Aleppo	Instructor	2000-2005	FT

4. **Non-Academic Experience**

Company	Job Title & Position Description	Period	FT/PT
Ford Motor Company, Crash Avoidance Metrics Partnership (CAMP), Farmington Hills, MI	Senior Research Engineer and Consultant	2016-2018	FT
University of Detroit Mercy	Graduate Research Assistant	2012-2015	PT

5. **Certifications or Professional Registrations**

6. **Current Membership in Professional Organizations**

- Member, The Institute of Electrical and Electronics Engineers (New York)
- Eta Kapa Nu (HKN) - Electrical Engineering Honor Society
- ACM - Association for Computing Machinery

7. **Honors and Awards**

- Best Poster Session Winner Award and to the Success of The IEEE Southeastern Michigan Section Activities, IEEE/SEM Winter 2016 meeting, April 19, 2016.
- Best Poster Presentation Award: "Collision Avoidance Systems in Autonomous Driving," IEEE/SEM Fall 2014 meeting, Best Poster Award, November 2014.
- Research Quality Second Place Award: "Bayesian Network Based Vehicle Collision Avoidance System," University of Detroit Mercy, UDM E&S Annual Research Symposium, October 2014.
- Best Poster Presentation Award: "Advanced Sensor Fusion Algorithm for Vehicle Safety System" IEEE/SEM Fall 2013 meeting, Best Poster Award, November 2013.
- Silver Paper Award: "Vehicle Collision Avoidance System Using Multi-Sensor Data Fusion with Dependency Information," The Silver Paper Award, Intelligent Transportation Society-Michigan (ITS-MI) Annual Meeting, 2012.

8. **Service Activities** (within and outside of the institution)

- Reviewers for many conferences papers and journals such as IEEE, IASTED, and IJCITE

- Member of the Steering/Advisory Committees for EMERGING series. ISSN: 2326-9383, ISBN: 978-1-61208-602-6
- Editorial board member of the International Journal of Computer Science and information technology for education IJCSITE
- Committee member, The 6th international conference on model drive engineering software development (Modelsward 2018), January 22 -24, 2018 – Funchal, Madeira, Portugal
- Technical Program Committee member, The 9th IEEE International Conference on Computer Science & Information Technology CSIT 2018, Amman – Jordan, 11-12 July
- Technical Program Committee member, The Ninth International Conference on Emerging Networks and Systems Intelligence (EMERGING 2017), November 12 - 16, 2017 - Barcelona, Spain
- Technical Program Committee member, The 8th IEEE International Conference on Computer Science & Information Technology CSIT 2017, Amman – Jordan, 12-13 July
- Technical Program Committee member, The Eighth International Conference on Emerging Networks and Systems Intelligence (EMERGING 2016), October 9 - 13, 2016 - Venice, Italy
- Technical Program Committee (TPC) member in the 7th IEEE International Conference on Computer Science and Information Technology CSIT 2016
- Member of the College of Engineering and Science’s Computer and Technology Committee, University of Detroit Mercy, 2016
- Member of the Department of Mathematics, Computer Science and Software Engineering’s Curriculum Committee, University of Detroit Mercy, 2016

**9. List the Most Important Publications and Presentations from the Past Five (5) years**

- Mikael Paulik, Sam Youness, Nizar Al-Holou, Syed Misbahuddin, Rawa Adla, “Internet of Things based Undergraduate Curriculum,” 5th Annual Conf. on Computational Science & Computational Intelligence (CSCI’18) | Dec 13-15, 2018 | Las Vegas, Nevada, USA
- Meier, J.-N., Kailas, A., Adla., Rawa, et. Al, “On Augmenting Adaptive Cruise Control Systems with Vehicular Communication for Smoother Automated Following,” Proc. TRB Annual Meeting, Washington DC, Jan. 2018.
- HRUŠECKÁ, Denisa, Rawa ADLA, Said KRAYEM a Michal PIVNIČKA, “Event-B model for increasing the efficiency of warehouse management,” Polish Journal of Management Studies [online]. 2018, vol. 17, iss. 2, s. 63-74. [cit. 2018-08-18]. ISSN 2081-7452.
- Meier, J.-N., Kailas, A., Adla., Rawa, et. Al, “On Augmenting Adaptive Cruise Control Systems with Vehicular Communication for Smoother Automated Following,” Journal of the Transportation Research Board, 2018
- Parikh. J, Kailas. A, Rawa Adla, et. Al, “Development of Wireless Message for Vehicle-to-Infrastructure Safety Applications,” SAE World Congress, 2018.
- Parikh. J, Kailas. A, Rawa Adla, et. Al, “Validating Prototype Connected Vehicle-to-Infrastructure Safety Application in Real-World Settings,” SAE World Congress, 2018.
- Jan-Niklas Meier, Aravind Kailas, Rawa Adla, et. Al, “Implementation and Evaluation of Cooperative Adaptive Cruise Control Functionalities”, 25th ITS World Congress, Copenhagen, Denmark, 17-21 September 2018
- Meier, J.-N., Abuchaar, O., Adla, Rawa., et. Al, “Cooperative Adaptive Cruise Control Small-Scale Test- Phase 1,” submitted to the United States Department of Transportation, FHWA-JPO, 2017
- Parikh, J., Abubakr, M., Adla, Rawa., et. Al, “Vehicle-to-Infrastructure Program Safety Application Project,” submitted to the United States Department of Transportation, FHWA-JPO, June, 30, 2017
- Stowe, L., Abubakr, M., Adla, Rawa., et. Al, “Advanced Messaging Concept Development (AMCD) Project Vehicle-to-Infrastructure Program,” submitted to the United States Department of Transportation, FHWA-JPO, 2017

- Rawa Adla; Youssef Bazzi; Nizar Al-Holou, "Bayesian network based collision avoidance system," IEEE/ Electro-Information Technology Conference on , pp.605,610, 19-21 May. 2015
- Rawa Adla, Nizar Al-Holou, Youssef Bazzi, "Kalman Filter Based Safety Application," CSC'14, The 2014 World Congress in Computer Science, Computer Engineering, and Applied Computing, The 2014 World Congress Computer Engineering, and Applied Computing, pp. 67-72; 22-25 July 2014.
- Rawa Adla, Youssef Bazzi, Nizar Al-Holou, "Multi Sensor Data Fusion, Methods and Problems," PDPTA'13, The 2013 International Conference on Parallel and Distributed Processing Techniques and Applications, The 2013 World Congress in Computer Science, Computer Engineering, and Applied Computing, pp.1-6, July 2013, <http://world-comp.org/p2013/PDP.html>
- Adla, Rawa; Al-Holou, Nizar; Murad, Mohannad; Bazzi, Youssef A., "Automotive collision avoidance methodologies Sensor-based and ITS-based," Computer Systems and applications (AICCSA), 2013 ACS International Conference on , vol., no., pp.1,8, 27-30 May 2013, doi: 10.1109/AICCSA.2013.6616458, <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6616458&isnumber=6616408>
- Rawa Adla, Youssef Bazzi, Nizar Al-Holou, "Vehicle Collision Avoidance System Using MultiSensor Data Fusion with Dependency Information", ITS Michigan-Annual Meeting, The Silver Award, 2012.

# Youssif Al-Nashif

Florida Polytechnic University, 4700 Research Way, Lakeland, FL 33805  
yalnashif@floridapoly.edu • +1 (863) 874-8566

## Education

### The University of Arizona, Tucson, AZ, USA

- Ph.D. in Electrical and Computer Engineering *Jan. 2004 - Dec. 2008*
  - Dissertation: *Design, Analysis, and Automation of a Multi-Level Network Behavior Analysis Defense System*
  - Advisor: *Prof. Salim Hariri*

### Jordan University of Science and Technology, Irbid, Jordan

- M.Sc. in Electronic and Communication Engineering *Feb. 1999 - Sep. 2000*
  - Thesis: *Topology Transparent Transmission Method in Multi-Hop Packet Radio Network Using Combinatorial Theory*
  - Supervisor: *Prof. Ibrahim Ghareeb*

### Jordan University of Science and Technology, Irbid, Jordan

- B.Sc. in Electrical Engineering, Computer Eng. Major *Sep. 1993 - Feb. 1999*

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## Academic experience

### Florida Polytechnic University, Lakeland, FL

- Department Chair, Dept. of Computer Science *Jan. 2018 - present*
- Associate Professor, Dept. of Computer Science *Aug. 2015 - present*
- Associate Professor, Dept. of Computer Engineering *Aug. 2015 - present*
- Academic Program Coordinator, Dept. of Computer Science *Sep. 2015 - Jan. 2018*

### Old Dominion University, Norfolk, VA

- Founding Director for the ODU Center for Cybersecurity Education and Research *Feb. 2015 - Jul. 2015*
- Assistant Professor, Dept. of Electrical and Computer Engineering *Jul. 2014 - Jul. 2015*

### The University of Arizona, Tucson, AZ

- Assistant Research Professor, Dept. of Electrical and Computer Engineering *Feb. 2009 - Jun. 2014*
- Project Manager, Dept. of Electrical and Computer Eng. *Apr. 2008 - Feb. 2009*
- Research Assistant, Dept. of Electrical and Computer Eng. *Jan. 2004 - Apr. 2008*
- Teaching Assistant, Dept. of Electrical and Computer Eng. *Jan. 2007 - Jun. 2007*

### Jordan University of Science and Technology, Irbid, Jordan

- Lecturer, Dept. of Computer Engineering *Sep. 2000 - Dec. 2003*
- Teaching Assistant, Dept. of Electrical Engineering *Feb. 1999 - Aug. 2000*

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## Non-academic experience

### AVIRTEK Inc., Tucson, AZ

- Part-time, Computer Research Scientist *Oct. 2009 - Jun. 2014*

### Computer World Establishment, Irbid, Jordan

- Part-time, Computer hardware/software troubleshooter and maintenance man *Sep. 1994 - Sep. 1999*

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## Current membership in professional organizations

- ACM Professional Member
- A member of the IEEE Society
- A member of the Engineering Society in Amman/Jordan

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## Honors & awards

- The best poster award from The International Conference on Cloud and Autonomic Computing (CAC 2014), September, 2014
- The solo designer and implementer of Avirteks Inc. Security Solutions. Based on those solutions, Avirtek was chosen with 19 other companies to present Innovative Security Solutions in Washington, D.C. at SINET Showcase 2010. The solutions were labeled as the most innovative Cybersecurity solutions 2010 (<http://www.security-innovation.org/showcase2010.htm>).

## Service Activities

### Internal

- Academic Program Coordinator for the Department of Computer Science and Information Technology. (Sept. 2015 - present)
- Faculty co-advisor for ACM Florida Polytechnic University ACM Student Chapter. (2017)
- Faculty mentor and judge for Biology Expo 2016.
- Faculty judge for History Expo 2016.
- Search committee chair (Summer 2016).
- Computer Engineering Search Committee member (2017).
- CSIT program review (2016).
- CSIT department representative in the SACS-COC candidacy visit (2017).
- Member in FIPoly Website Steering Committee. (2017).
- Member of Faculty Assembly Constitution Review Committee. (2016).

### External

- Associate Editor, Cluster Computing: The Journal of Networks, Software Tools and Applications.
- IEEE Cloud and Autonomic Computing Conf. (ICCAC) 2017, Publication Chair
- IEEE Cloud and Autonomic Computing Conf. (ICCAC) 2017, Web Chair
- IEEE AICCSA 2017, Publication Chair
- IEEE Cloud and Autonomic Computing Conf. (ICCAC) 2016, Publicity Chair
- IEEE AICCSA 2016, Publication Chair
- ICICS 2016, Track Co-Chair for Security and Privacy track.
- ANT-2016 (The 7th International Conference on Ambient Systems, Networks and Technologies), Program Committee member
- IEEE Cloud and Autonomic Computing Conf. (ICCAC) 2015, Publicity Chair
- IEEE AICCSA 2015, Program Chair
- The 24th International Conf. on Computer Communication and Networks (ICCCN 2015), Program Committee member
- ICICS 2014, Program Committee member
- ICCS 2014 (14th International Conference on Computational Science), Program
- ICICS 2013, Program Committee member
- PC member (Autonomic Cybersecurity), ACM Cloud and Autonomic Computing Conference, CAC2013
- PC member (Autonomic Cloud Computing), ACM Cloud and Autonomic Computing Conference, CAC2013
- AICCSA 2013, Publication Chair
- Judge for the 2016 Congressional App Challenge

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## Sample of Recent Publications

- C. Tunc, F. Fargo, **Y. B. Al-Nashif**, S. Hariri, “Autonomic Cross-Layer Management of Cloud Systems”, In Foundations and Applications of Self\* Systems (FAS\* W), 2017 IEEE 2nd International Workshops on, pp. 160-165. IEEE, 2017.
- E. Blasch, Y. Badr, S. Hariri, **Y. Al-Nashif**, “Fusion Trust Service Assessment for Crisis Management Environments”, in Fusion Methodologies in Crisis Management - Higher Level Fusion and Decision Making, Galina Rogova and Peter Scott, Eds., pp. 389-420, Springer, 2016.
- B. AlBaalbaki, J. Pacheco, C. Tunc, Salim Hariri, **Y. Al-Nashif**, “Anomaly Behavior Analysis System for ZigBee in Smart Buildings”, in IEEE ACS International Conference on Computer Systems and Applications (AICCSA 2015).
- C. Tunc, S. Hariri, F. D. L. P. Montero, F. Fargo, P. Satam, **Y. Al-Nashif**, “Teaching and Training Cybersecurity as a Cloud Service”, Proceedings of the International Conference on Cloud and Autonomic Computing (ICCAC15), 2015
- P. Satam, H. Alipour, **Y. Al-Nashif**, and S. Hariri, “DNS-IDS: Securing DNS in the Cloud Era”, Proceedings of the International Conference on Cloud and Autonomic Computing (ICCAC15), 2015
- C. Tunc, S. Hariri, **Y. Al-Nashif**, F. De La Pea Monter, F. Fargo, and P. Satam, “CLaaS: Cybersecurity Lab as a Service Design, Analysis, and Evaluation”, Proceedings of the 2nd workshop on Autonomic Cloud Cybersecurity, 2015
- Y. Badr, S. Hariri, **Y. B. Al-Nashif**, E. Blasch, “Resilient and Trustworthy Dynamic Data-driven Application Systems (DDDAS) Services for Crisis Management Environments,” ICCS 2015, pp. 2623-2637
- H. Alipour, **Y. B. Al-Nashif**, P. Satam and S. Hariri, “Wireless Anomaly Detection Based on IEEE 802.11 Behavior Analysis,” in IEEE Transactions on Information Forensics and Security, vol. 10, no. 10, pp. 2158-2170, Oct. 2015.

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## Samples of Professional Development

- Ongoing research on Trustworthy and Autonomic Computing.
- Ongoing research on Power Management in Cloud Computing.

1. **Name:** Balasubramaniyan Chandrasekaran

2. **Degrees**

Degree	Discipline	Institution	Year
B.E.	Electronics and Communications Engineering	Visveswaraiah Technological University, India	2007
M.S.	Electrical Engineering	University of North Carolina at Charlotte	2010
Ph.D.	Electrical Engineering	University of North Carolina at Charlotte	2017

3. **Academic Experience**

Institution	Rank & Title	Period	FT/PT
Florida Polytechnic University	Assistant Professor, Computer Engineering	Aug 2018-	FT
Teaching Fellow	Fellowship	Aug 2016 – Dec 2016	PT
Teaching Assistant	Student Work	Aug 2014 – May 2017	FT

4. **Non-Academic Experience**

Company	Job Title & Position Description	Period	FT/PT
Lara Technologies, India	Software Engineer	2010-2014	FT
Tech Mahindra, India	Technical Associate	2007-2008	FT

5. **Current Membership in Professional Organizations**

- Member, Institute of Electrical and Electronics Engineers (IEEE)

6. **Honors and Awards**

- 2016 - Provost's Doctoral Teaching Fellowship

7. **Service Activities** (within and outside of the institution)

- Paper Reviewer: IEEE during 2015 - 2017

8. **List the Most Important Publications and Presentations from the Past Five (5) years**

1. Chandrasekaran, B., & Conrad, J. M. (2017, February). Complete Coverage Planning: Achieving Human Interaction and Maximum Coverage During an Autonomous Robotic Vehicle Navigation of an Unknown Terrain. In Workshops at the Thirty First AAAI Conference on Artificial Intelligence.
2. Chandrasekaran, B., Gangadhar, S., & Conrad, J. M. (2017, April). A Survey of Multisensor Fusion Techniques, Architectures and Methodologies. In SoutheastCon, 2017 (pp. 1-8). IEEE.
3. Chandrasekaran, B., & Conrad, J. M. (2016, March). Sensor fusion using a selective sensor framework to achieve decision and task execution. In SoutheastCon, 2016 (pp. 1-7). IEEE.
4. Chandrasekaran, B., & Conrad, J. M. (2015, April). Human-robot collaboration: A survey. In SoutheastCon 2015 (pp. 1-8). IEEE.

5. **List the most recent professional development activities**

- ABET program evaluation committee member for electrical and computer engineering.
- Faculty Development series organized by Florida Polytechnic University (Fall 2017):
  - Course Assessment
  - Research development/Sponsored Research

# Dr. Harish Chintakunta | Curriculum Vitae

## Education

- Doctor of Philosophy in Electrical Engineering, North Carolina State University, 2013
- Master of Science in Electrical Engineering, North Carolina State University, 2008
- Bachelor of Technology in Electronics and Communications Engineering, Indian Institute of Technology, 2006

## Academic Experience

- Florida Polytechnic University, Assistant Professor of Electrical Engineering, 2016-present, full time
- Coordinated Science Laboratory at University of Illinois, Urbana Champaign, Post-doctoral researcher, 2014-2015, full time.
- Department of Electrical and Computer Engineering at North Carolina State University, Post-doctoral researcher, 2013-2014.

## Current membership in professional organizations

- Institute of Electrical and Electronics Engineers (IEEE)

## Service activities

- Serving on the board for collaboration between Florida Polytechnic University and Lakeland regional hospital.
- Department representative to the faculty assembly.
- Summer student workshops on networking, data acquisition and programming.
- Served in hiring committees for advanced technology and computer engineering departments.
- Served as a reviewer for several peer reviewed journals.

## Research Grants

- Real time monitoring and prediction of reduced visibility events on Florida's highways. Granted by Florida Department of Transportation (FDOT). Grant amount: \$1,500,000.

## Selected publications

- Jennifer Gamble, Harish Chintakunta, and Hamid Krim. Node Dominance: Revealing Community and Core-Periphery Structure in Social Networks. IEEE Transactions on Signal and Information Processing over Networks (TSiPN). 2016.
- Hamid Krim, Thanos Gentimis, and Harish Chintakunta. Discovering the Whole by the Coarse: A topological paradigm for data analysis. IEEE Signal Processing Magazine. 2016.
- Harish Chintakunta, and Athanasios Gentimis. Influence of topology in information flow in social networks. Annual Asilomar Conference on Signals, Systems, and Computers (ASILOMAR). 2016.s
- Yang Chen, Harish Chintakunta, Yuliy Baryshnikov and P.R. Kumar. Persistent-Homology-based Detection of Power System Low-frequency Oscillations using PMUs. IEEE Global Conference on Signal and Information Processing (GlobalSIP). 2016.
- Jennifer Gamble, Harish Chintakunta, and Hamid Krim. Coordinate-Free Quantification of Coverage in Dynamic Sensor Networks. Signal Processing. 2015.
- Harish Chintakunta and Hamid Krim. Distributed localization of coverage holes using Topological Persistence. IEEE Transactions on Signal Processing (TSP). 2014.
- Harish Chintakunta, Thanos Gentimis, Rocio Gonzalez Diaz, Dr., Maria-Jose Jimenez, and Hamid Krim. An entropy based persistent barcode. Special issue on Graph based representation (Gbr2013), Pattern Recognition. 2014.

# Doga Demirel

4048 Shearwater Street, Lakeland, FL 33811 • ddemirel@floridapoly.edu • dogademirel.com

## EDUCATION

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**University of Arkansas at Little Rock**

January 2016-December 2018

Doctor of Philosophy in Integrated Computing

**University of Central Arkansas**

August 2013-December 2015

Master of Science in Applied Computing

**University of Arkansas at Little Rock**

August 2009-May 2013

Bachelor of Science

**Major:** Computer Sciences

**Minor:** Mathematics

## RESEARCH INTERESTS

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Virtual Surgical Design and Development

Virtual Reality

Mixed Reality

Computer Graphics

Medical Simulations

Non-linear Optimization

Haptics

Data Analysis

Visualization

## ACADEMIC EXPERIENCE

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**Assistant Professor, Florida Polytechnic University**

*August 2019-Present*

- Coordination of Game Development and Simulation Concentration
- Co-Director Virtual Reality, Interactive Simulation, and Biomedical Lab
- Courses Taught: Computer Graphics, Advanced Graphics, Software Design and Architecture, Software Requirements Engineering, Software Verification and Quality Assurance, Senior Capstone.
- Ongoing research support:
  - **Role:** Co-Investigator, NIH- R01 EB025241, Design development and validation of Virtual Colorectal Surgical Trainer (VCoST) which aims to develop highly realistic simulation of Endoscopic Sleeve Gastroplasty within an immersive 3D environment.
  - **Role:** Co-Investigator, NIH- R44 AR075481, Design development and validation of Virtual Rotator Cuff Arthroscopic Skill Trainer (ViRCASST) to virtually simulate arthroscopic rotator cuff repair surgery and perform extensive validation studies to demonstrate its effectiveness as a training platform.
  - **Role:** Co-Investigator, NIH- R56 EB026490, Design development and validation of Virtual Bariatric Endoscopic (ViBE) which aims to develop highly realistic simulation of the five open Colorectal Objective Structured Assessment of Technical Skills tasks; Handsewn anastomosis, coloanal anastomosis, ileal pouch anal anastomosis, pelvic bleed, and rectal prolapse within an immersive 3D environment using a head mounted display system.
  - **Role:** Co-Investigator, NIH- 2R01EB005807, Design, develop and evaluate a Virtual Operating Room Team Experience (VORTEX) simulation system.

## **Virtual Reality, Simulation, Imaging and Modeling (ViRaSIM) Lab at University of Central Arkansas**

*August 2013- August 2019*

- Head of the Lab.
- Working with graduate and undergraduate students on research problems regarding real-time rendering, physics simulation, Human Computer Interaction, Virtual Multimodal Interactive Simulation environment design and development that includes haptic interaction, visualization, parallel computing for real-time and time critical applications, performance and resource optimization of Multimodal Interactive Simulations for both medical and non-medical related application domains.

### **Graduate Teaching Assistant at University of Arkansas at Little Rock**

*August 2018-December 2018*

- Instructor for Computer Systems and Assembly Language (Fall 2018)- 2 sections.

### **Research Assistant at University of Arkansas at Little Rock**

*January 2016-December 2018*

- Virtual Arthroscopic Tear Diagnosis and Evaluation Platform (VATDEP)
  - Design and development of a virtual simulator for rotator cuff surgery using C/C++, OpenGL, GLSL and haptic device technology.
- Generative Anatomy Modeling Language (GAML)
  - Developed a platform for 3D model modification using commands in real-time and by satisfying any geometric constraints imposed by the human anatomy via a non-linear optimization model (WebGL, JavaScript and HTML/CSS).
- Partition-based Optimization Model for GAML(POM-GAML)
  - Effectively computes solution for non-linear optimization model and reduces computation time from exponential to linear time by using geometric partitions.
- Virtual Endoluminal Surgical Simulator (VESS)
  - Design and development of Virtual Endoluminal Surgical Simulator for Endoscopic Submucosal Dissection surgery in Unity and haptic device technology.
- Virtual Fundamentals of Arthroscopic Surgery Training (VFAST)
  - Involved in writing of the grant.
  - Design and development of a virtual environment for orthopedic surgeons in-training to develop necessary skills for arthroscopic surgery in Unity and haptic device technology.
- Development and Validation of a Virtual Colorectal Surgical Trainer (VCOST)
  - Involved in writing of the grant.

### **Graduate Seminar Volunteer at University of Arkansas at Little Rock**

*January 2017—May 2017*

- Helped set up invited speakers to discuss and exchange ideas on research topics of general interest to the graduate programs in Engineering and Information Technology.

### **Research Assistant at University of Central Arkansas**

*August 2013—December 2015*

- Virtual Pancreatic Cancer Surgery: Whipple Surgery Simulator (VPanSS)
  - Design and development of a preliminary navigation task in abdominal anatomy with real time collision detection using WebGL, JavaScript and HTML/CSS.
- Mobile Mixed Reality system for Physical & Occupational Therapies for Hand and Wrist Ailments (MoMiReS)
  - Development of a pressure sensor pen using Arduino.
- Natural Orifice Transluminal Endoscopic Surgery (NOTES)
  - Worked on visualization and realism of the overall simulator.
- Virtual Airway Skills Trainer (VAST)
  - Design and development of Cricothyroidotomy and Endotracheal intubation simulators for Oculus Rift using C/C++, OpenGL, GLSL and haptic device technology.
  - Data collection from surgeons for validation.

### **Graduate Assistant at University of Central Arkansas**

*August 2013—December 2015*

- Lab instructor and teaching assistant for Computer Science Programming 1(Fall 2013).
- Teaching assistant for Assembly Language and Computer Organization (Fall 2014 and Fall 2015).

- Teaching assistant for Computer Architecture (Spring 2015 and Spring 2015).

## INDUSTRIAL EXPERIENCE

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### System Support Specialist Intern

June 2012—August 2012

### ASELSAN

Ankara, Turkey

- Created a social network for employees of the company to communicate with each other.

## PUBLICATIONS

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### Journal Publications:

- **D. Demirel**, B. Cetinsaya, T. Halic, S. Kockara, D. Reiners, S. Ahmadi, S. Arikatla, “A partition-based optimization model and its performance benchmark for Generative Anatomy Modeling Language,” *Computers in Biology and Medicine*, 2020.
- J. Farmer, **D. Demirel**, R. Erol, D. Ahmadi, T. Halic, S. Kockara, S. Arikatla, K. Sexton, S. Ahmadi, “Systematic approach for content and construct validation: Case studies for arthroscopy and laparoscopy,” *International Journal of Medical Robotics and Computer Assisted Surgery*, 2020.
- **D. Demirel**, B. Cetinsaya, T. Halic, S. Kockara, S. Ahmadi, “Partition-based Optimization Model for Generative Anatomy Modeling Language (POM-GAML)”. *BMC Bioinformatics* 20, 105 (2019).
- O. Topsakal, M.I Akbaş, **D. Demirel et al.** Digitizing rhinoplasty: a web application with three-dimensional preoperative evaluation to assist rhinoplasty surgeons with surgical planning. *Int J CARS* 15, 1941–1950 (2020).
- D. Qi, E. Petrusa, U. Kruger, N. Milef, M. Rassoul Abu-Nuwar, M. Haque, R. Lim, D.B. Jones, M. Turkseven, **D. Demirel**, T.Halic, S.De, N.Saillant, “Surgeons With Five or More Actual Cricothyrotomies Perform Significantly Better on a Virtual Reality Simulator”, *Journal of Surgical Research*, Volume 252, 2020, Pages 247-254.
- **D. Demirel**, A. Yu, S. Baer-Cooper, T. Halic, and C. Bayrak, “Generative Anatomy Modeling Language (GAML),” *International Journal of Medical Robotics and Computer Assisted Surgery*, vol.13, no. 4, 2017.
- **D. Demirel**, A. Yu, S. Baer-Cooper, A. Dendukuri, T. Halic, S. Kockara, N. Kockara, and S. Ahmadi, “A hierarchical task analysis of shoulder arthroscopy for a virtual arthroscopic tear diagnosis and evaluation platform (VATDEP),” *International Journal of Medical Robotics and Computer Assisted Surgery*, vol. 13, no. 3, 2017.
- **D. Demirel**, K. L. Butler, T. Halic, G. Sankaranarayanan, D. Spindler, C. Cao, E. Petrusa, M. Molina, D. Jones, S. De, and M. DeMoya, “A Hierarchical Task Analysis of Cricothyroidotomy Procedure for a Virtual Airway Skills Trainer (VAST) Simulator,” *American Journal of Surgery*, vol. 212, pp. 475-484, 2016.
- B. Cetinsaya, M. A. Gromski, S. Lee, Z. Xia, **D. Demirel**, T. Halic, C. Bayrak, C. Jackson, S. De, S. Hegde, J. Cohen, M. Sawhney, S. N. Stavropoulos, D. Jones, “A Task and Performance Analysis of Endoscopic Submucosal Dissection (ESD) Surgery,” *Surgical Endoscopy*, pp. 1-15, 2018, 10.1007/s00464-018-6379-6.
- **D. Demirel**, S. Baer-Cooper, M. Tunc, T. Halic, S. Kockara, N. Kockara, M. E. Rogers, S. Ahmadi, “Scoring Metrics for Assessing Skills in Arthroscopic Rotator Cuff Repair: Performance Comparison Study of Novice and Expert Surgeons”. (Submitted)

### Conference Publications:

- L. Pena, **D. Demirel**, A. Hamam, C. Scott, B. Karaman, O. Toker, “Towards a new chemistry learning platform with virtual reality and haptics,” 23<sup>rd</sup> International Conference on Human-Computer Interaction, (Accepted, Presentation, Proceedings)
- J. Farmer, M. Tunc, D. Ahmadi, **D. Demirel**, T. Halic, S. Arikatla, S. Kockara S. Ahmadi, “Arthroscopic Tool Classification using Deep Learning,” In Proceedings of the 2020 the 4<sup>th</sup> International Conference on Information System and Data Mining (ICISDM 2020). Association for Computing Machinery, 139-143. (Presentation, Proceedings)
- B. Cetinsaya, J. Dials, **D. Demirel**, T. Halic, S. De, M. Gromski, D. Rex, “Arthroscopic Tool Classification using Deep Learning,” In Proceedings of the 2020 the 4<sup>th</sup> International Conference on Information System and Data Mining (ICISDM 2020). Association for Computing Machinery, 84-88. (Presentation, Proceedings)
- B. Palmer, G. Sundberg, J. Dials, B. Karaman, **D. Demirel**, M. Abid, T. Halic, S. Ahmadi, “Arthroscopic Tool Classification using Deep Learning,” In Proceedings of the 2020 the 4<sup>th</sup> International Conference on Information System and Data Mining (ICISDM 2020). Association for Computing Machinery, 96-99. (Presentation, Proceedings)

- T. Halic, S. De, J. Dials, M.A. Gromski, **D. Demirel**, A. Ryason, A. Gilmore, M.A. Al-Haddad, S. Kundumadam, "S1191 Task Analysis and Performance Metrics of Endoscopic Sleeve Gastropasty: Preparation for Virtual Simulation Development," The American Journal of Gastroenterology: October 2020 - Volume 115 - Issue - p S595. ([Abstract](#))
- **D. Demirel**, S. Baer-Cooper, J. Farmer, T. Halic, S. Kockara, and S. Ahmadi, "Optimization for Arthroscopic Rotator Cuff using Generative Anatomy Modeling Language," 2018 Midsouth Computational Biology & Bioinformatics Society (MCBIOS XV), 2018. ([Abstract](#))
- D. Qi, U. Kruger, N. Milef, E. Petrusa, M. Turkseven, **D. Demirel**, T. Halic, D. Jones, S. Dem N. Saillant, "Establishing Novice and Expert Groups to Assess a Virtual Reality Simulator for Rare and Emergent Sugical Procedures", 38<sup>th</sup> Annual Meeting of the Association for Surgical Eucation (ASE), 2018. ([Abstract](#))
- **D. Demirel**, A. Yu, S. Baer-Cooper, T. Halic, S. Kockara, N. Kockara, and S. Ahmadi, "Difficulty Scenario Modeling for Virtual Arthroscopic Rotator Cuff With GAML," Computational & Mathematical Biomedical Engineering Conference, vol. 2, pp. 814-817, 2017. ([Podium Presentation, Proceedings](#))
- **D. Demirel**, A. Yu, S. Baer-Cooper, T. Halic, S. Kockara, N. Kockara, and S. Ahmadi, "Difficulty Scenario Modeling for Virtual Arthroscopic Rotator Cuff With GAML," 101<sup>st</sup> Arkansas Academy of Science, 2017. ([Podium Presentation, Abstract](#))
- B. Cetinsaya, M. A. Gromski, S. Lee, Z. Xia, M. Turkseven, **D. Demirel**, T. Halic, C. Bayrak, C. Jackson, S. De, J. Cohen, M. Sawhney, D. Jones, "Design of Virtual Endolumenal Surgery Simulator (VESS): Colorectal Endoscopic Submucosal Dissection (ESD) Training Module," World Congress of Gastroenterology at ACG, 2017 ([Abstract, Proceedings](#))
- C. Jackson, S. Hegde, J. Cohen, M. Sawhney, D. B. Jones, B. Cetinsaya, M. A. Gromski, S. Lee, Z. Xia, **D. Demirel**, T. Halic, C. Bayrak, S. De, "A Cognitive Task Analysis Approach Toward the Design of a Virtual Reality Simulator for Endoscopic Submucosal Dissection," Surgical Endoscopy, 2018, 32: Supplement 1 ([Abstract](#)).
- B. Cetinsaya, M. A. Gromski, S. Lee, Z. Xia, **D. Demirel**, T. Halic, C. Bayrak, C. Jackson, S. De, S. Hegde, J. Cohen, M. Sawhney, S. N. Stavropoulos, D. Jones, "A Task and Performance Analysis of Endoscopic Submucosal Dissection (ESD) Surgery," Surgical Endoscopy, 2018, 32: Supplement 1 ([Abstract](#))
- Z. Xia, T. Halic, S. Lee, B. Cetinsaya, M. Gromski, **D. Demirel**, C. Bayrak, C. Jackson, S. Hegde, J. Cohen, M. Sawhney, D. Jones, S. De, "The Development of a Virtual Simulator for Colorectal Endoscopic Submucosal Dissection (ESD)," Surgical Endoscopy, 2018, 32: Supplement 1([Abstract](#))
- **D. Demirel**, S. Baer-Cooper, J. Farmer, T. Halic, S. Kockara, and S. Ahmadi, "Virtual Arthroscopic Tear Diagnosis and Evaluation Platform (VATDEP)," Arkansas INBRE, 2017. ([Abstract](#))
- **D. Demirel**, S. Baer-Cooper, J. Farmer, T. Halic, S. Kockara, and S. Ahmadi, "Optimization for Arthroscopic Rotator Cuff using Generative Anatomy Modeling Language," Arkansas INBRE, 2017. ([Abstract](#))
- M. Tunc, **D. Demirel**, T. Halic, S. Kockara, and S. Ahmadi, "Dynamic Voxelization for Virtual Rotator Cuff Surgery," Arkansas INBRE, 2017. ([Abstract](#))
- B. Cetinsaya, M. A. Gromski, S. Lee, Z. Xia, **D. Demirel**, T. Halic, C. Bayrak, C. Jackson, S. De, S. Hegde, J. Cohen, M. Sawhney, S. N. Stavropoulos, D. Jones, "Virtual Endoluminal Surgery Simulator," Arkansas INBRE, 2017. ([Abstract](#))
- **D. Demirel**, A. Yu, T. Halic, G. Sankaranarayanan, A. Ryason, D. Spindler, K. L. Butler, C. Caroline, E. Petrusa, M. Molina, D. Jones, S. De, M. Demoya, S. Jones, "Virtual Airway Skills Trainer (VAST) Simulator," Med. Meets Virtual Real. 22 NextMedMMVR22, vol. 220, p. 91, 2016. ([Podium Presentation, Proceedings](#))
- **D. Demirel**, A. Yu, S. Baer-Cooper, T. Halic, S. Kockara, and S. Ahmadi, "Time and video analysis of Virtual Arthroscopic Tear Diagnosis and Evaluation Platform," 2016 Midsouth Computational Biology & Bioinformatics Society (MCBIOS XIII), 2016. ([Abstract](#))
- A. Yu, **D. Demirel**, T. Halic, S. Kockara, and S. Ahmadi, "Dynamic Voxelization for Virtual Rotator Cuff Surgery," 2016 Midsouth Computational Biology & Bioinformatics Society (MCBIOS XIII), 2016. ([Abstract](#))
- A. Yu, **D. Demirel**, T. Halic, and S. Kockara, "Virtual Intraoperative Cholangiogram Using WebCL.," Med. Meets Virtual Real. 22 NextMedMMVR22, vol. 220, p. 459, 2016. ([Abstract, Proceedings](#))
- **D. Demirel**, A. Yu, T. Halic, S. Kockara, "Parallel Continuous Collision Detection for Surgery Simulations with WebCL," 13<sup>th</sup> US National Congress on Computational Mechanics. ([Podium Presentation, Abstract](#))

- A. Yu, **D. Demirel**, T. Halic, S. Kockara, “Virtual Cholangiogram,” 13<sup>th</sup> US National Congress on Computational Mechanics. ([Podium Presentation](#), [Abstract](#))
- **D. Demirel**, A. Yu, T. Halic, and S. Kockara, “Parallel Continuous Collision Detection with WebCL,” 2015 Midsouth Computational Biology & Bioinformatics Society (MCBIOS XII), 2015. ([Podium Presentation](#), [Abstract](#))
- **D. Demirel**, A. Yu, S. Baer-Cooper, A. Dendukuri, T. Halic, S. Kockara, and S. Ahmadi, “A hierarchical task analysis of a Virtual Arthroscopic Tear Diagnosis and Evaluation Platform (VATDEP),” Arkansas INBRE, 2015. ([Abstract](#))
- **D. Demirel**, A. Yu, T. Halic, and S. Kockara, “Web based camera navigation for virtual pancreatic cancer surgery: Whipple surgery simulator (VPanSS),” in 2014 IEEE Innovations in Technology Conference (InnoTek), 2014, pp. 1–8. ([Podium Presentation](#), [Proceedings](#))
- T. Halic, S. Kockara, **D. Demirel**, M. Willey, “MoMiReS: Mobile mixed reality system for physical & occupational therapies for hand and wrist ailments,” in 2014 IEEE Innovations in Technology Conference (InnoTek), 2014, pp. 1–6. ([Podium Presentation](#), [Proceedings](#))

## **PARTICIPATION IN GRANTS**

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- **Development and Validation of a Virtual Airway Skill Trainer (VAST)**

Funded by: National Institutes of Health (NIH) / National Heart, Lung, and Blood Institute (NHLBI)

Project Number: 5R01HL119248

Award Amount: \$2,860,421 until Fiscal Year 2017

Project Period: 01/04/2014 - 31/03/2019

Collaborators: Rensselaer Polytechnic Institute, Harvard School of Medicine (Beth Israel Deaconess Medical Center (BIDMC) and Massachusetts General Hospital (MGH)), Wright State University

My Role:

- Design and development of Cricothyroidotomy and Endotracheal intubation simulators using a head mounted display (Oculus Rift) to represent clinical environment.
- Realistic force feedback using haptics.
- Development of different simulation scenarios.
- Initial validation of the simulator by data collection from surgeons.

- **Development and Validation of a Virtual Colorectal Surgical Trainer (VCOST)**

Funded by: National Institutes of Health (NIH) / National Institute of Biomedical Imaging and Bioengineering (NIBIB)

Project Number: 1R01EB025241-01

Award Amount: \$693,484 for Fiscal Year 2018

Collaborators: Rensselaer Polytechnic Institute, Harvard School of Medicine (Beth Israel Deaconess Medical Center (BIDMC) and Massachusetts General Hospital (MGH))

Project Period: 07/25/2018 - 30/04/2022

My Role:

- Involved in writing of the grant.

- **Development and Validation of a Virtual Endoluminal Surgical Simulator (VESS) for Treatment of Colorectal Cancer**

Funded by: National Institutes of Health (NIH) / National Cancer Institute (NCI)

Project Number: 1R01CA197491

Award Amount: \$953,143 until Fiscal Year 2018

Project Period: 25/08/2016 - 31/08/2020

Collaborators: Rensselaer Polytechnic Institute, Harvard School of Medicine (Beth Israel Deaconess Medical Center (BIDMC) and Massachusetts General Hospital (MGH))

My Role:

- Design and development of Virtual Endoluminal Surgical Simulator for Endoscopic Submucosal surgery.
- Realistic force feedback using haptics.

- Development of different simulation scenarios.
  - Initial validation of the simulator by data collection from surgeons.
- **Developing Physics-based Virtual Simulation Technology for Natural Orifice Transluminal Endoscopic Surgery (NOTES)**  
Funded by: National Institutes of Health (NIH) / National Institute of Biomedical Imaging and Bioengineering (NIBIB)  
Project Number: 5R01EB009362  
Award Amount: \$2,613,478  
Project Period: 06/05/2011 - 30/04/2016  
Collaborators: Rensselaer Polytechnic Institute, Harvard School of Medicine (Beth Israel Deaconess Medical Center (BIDMC))  
My Role:
    - Worked on visualization and realism of the simulator.
  - **Virtual Arthroscopic Tear Diagnosis and Evaluation Platform (VATDEP)**  
Funded by: Arkansas INBRE program, National Institutes of Health (NIH) / National Institute of General Medical Sciences (NIGMS)  
Project Number: P20 GM103429  
Collaborators: University of Arkansas for Medical Sciences  
My Role:
    - Design and development of a virtual simulator for rotator cuff surgery.
    - Realistic force feedback using haptics.
    - Development of different simulation scenarios.
    - Initial validation of the simulator by data collection from surgeons.
  - **Virtual Fundamentals of Arthroscopic Surgery Training (VFAST)**  
Funded by: Arkansas INBRE program, National Institutes of Health (NIH) / National Institute of General Medical Sciences (NIGMS)  
Project Number: P20 GM103429  
Collaborators: University of Arkansas for Medical Sciences  
My Role:
    - Involved in writing of the grant.
    - Design and development of a virtual environment for orthopedic surgeons in-training to develop necessary skills.
    - Realistic force feedback using haptics.
    - Development of different tasks (field of view, triangulation, maze, picking) and simulation scenarios.

## SERVICES AND AWARDS

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### Reviewer:

- International Conference on Information System and Data Mining (ICISDM) ACM - Technical Committee Chair
- Frontiers in Neuroinformatic
- IEEE VR
- The International Journal of Medical Robotics and Computer Assisted Surgery.
- American Medical Informatics Association (AMIA).

### Awards:

- 2016 Outstanding Publication Award - University of Arkansas at Little Rock.
- 2016 Student Research and Creative Works Expo 3<sup>rd</sup> place - University of Arkansas at Little Rock.
- 2016 Midsouth Computational Biology & Bioinformatics Society (MCBIOS XIII) 2<sup>nd</sup> place in best poster presentation.

- 2016 Midsouth Computational Biology & Bioinformatics Society (MCBIOS XIII) Travel Award
- 2015 Graduate School Travel Award – University of Arkansas at Little Rock
- 2015 Engineering and Information Technology Travel Award – University of Arkansas at Little Rock
- 2013 Who's Who Among Students in American Universities and Colleges.
- 2013 Dean's List – University of Arkansas at Little Rock
- 2012 Greek Man of the Year – University of Arkansas at Little Rock

## SKILLS

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### **Programming Languages:**

- C, C++, C#, GLSL, HLSL, JavaScript, HTML, CSS, Python, PHP, SQL, Swift, Java, MATLAB, MIPS, x86.

### **Technologies:**

- OpenGL, WebGL, OpenCL, WebCL, Unity, Arduino, Raspberry Pi, Haptics, Oculus Rift, HTC Vive, IBM SPSS, Photoshop, 3D Studio Max, ZBrush, Blender.

## REFERENCES

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- **Name:** Dr. Tansel Halic  
**Title:** Acxiom Associate Professor at University of Central Arkansas and Director of Virtual Reality, Simulation, Imaging and Modeling (ViRaSIM) at University of Central Arkansas.  
**E-mail:** tanselh@uca.edu
- **Name:** Dr. Suvranu De  
**Title:** J. Erik Jonsson '22 Distinguished Professor of Engineering, Head of Department of Mechanical, Aerospace and Nuclear Engineering at Rensselaer Polytechnic Institute and Director of Center for Modeling, Simulation and Imaging in Medicine (CeMSIM), at Rensselaer Polytechnic Institute  
**E-mail:** des@rpi.edu
- **Name:** Dr. Sreekanth Arikatla  
**Title:** Senior R&D Engineer, Kitware Inc.  
**E-mail:** sreekanth.arikatla@kitware.com
- **Name:** Dr. Sinan Kockara  
**Title:** Professor at University of Central Arkansas  
**E-mail:** SKockara@uca.edu
- **Name:** Dr. Steven Minsker  
**Title:** Professor at University of Arkansas at Little Rock  
**E-mail:** sxminsker@ualr.edu

1. **Name:** Md Selim Habib

2. **Degrees**

Degree	Discipline	Institution	Year
B.Sc.(Eng.)	Electrical and Electronic Engineering	Rajshahi University of Engineering and Technology, Bangladesh	2008
M.Sc.	Electrical and Electronic Engineering	Rajshahi University of Engineering and Technology, Bangladesh	2012
Ph.D.	Photonics Engineering	Technical University of Denmark, Denmark	2017

3. **Academic Experience**

Institution	Rank & Title	Period	FT/PT
Florida Polytechnic University	Assistant Professor of Electrical and Computer Engineering	Aug. 12, 2019-	FT
University of Central Florida	Postdoctoral Research Associate	Sep. 2017 – Aug. 2019	FT
Technical University of Denmark	Postdoctoral Researcher	Apr. 2017 – July 2017	FT
Rajshahi University of Engineering and Technology	Assistant Professor of Electrical and Electronic Engineering	2013 – 2014	FT
Rajshahi University of Engineering and Technology	Assistant Professor of Electrical and Electronic Engineering	2010 – 2013	FT

4. **Non-Academic Experience**

5. **Certifications or Professional Registrations**

6. **Current Membership in Professional Organizations**

- Senior Member, The Institute of Electrical and Electronics Engineers (IEEE), USA
- Early Career Professional Member, Optical Society of America (OSA), USA
- Executive officer: Fiber modeling and fabrication group, OSA, USA

7. **Honors and Awards**

- 2016: Otto Mønstedts Fond, Oticon Fond, and IDA Fond for External research stay in USA
- 2014: University Gold Medal, Rajshahi University of Engineering and Technology, Bangladesh
- 2006-2009: EEE Association Award, Rajshahi University of Engineering and Technology, Bangladesh

8. **Service Activities** (within and outside of the institution)

- Review papers: Optics Letters, Optics Express, IEEE PTL, IEEE JLT, IEEE Sensors Letters, IEEE Photonics Journal, IEEE J Select Top in Quantum Electronics, IEEE Access, Applied Optics, Optics Communication, Optical Fiber Technology, Chinese Optics Letters, Sensing and Bio-Sensing Research, J Electromagnetic waves & Applications, Optical and Quantum Electronics, Sensors, Applied Sciences.

9. **List the Most Important Publications and Presentations from the Past Five (5) years**

- [1] **M. Selim Habib**, J. E. A. Lopez, C. Markos, A. Schulzgen, R. Amezcua Correa Single-mode, “Low loss hollow-core anti-resonant fiber designs,” *Optics Express*, vol. 27, pp. 3824-3836, 2019.

- [2] D. Jayasuriya, C. R. Petersen, D. Furniss, C. Markos, Z. Tang, **M. Selim Habib et al.**, “Mid-IR supercontinuum generation in birefringent, low loss, ultra-high numerical aperture Ge-As-Se-Te chalcogenide step-index fiber,” *Optical Materials Express*, vol. 9, pp. 2617-2629, 2019.
- [3] Abubakar I. Adamu, **M. Selim Habib et al.**, “Deep-UV to Mid-IR Supercontinuum Generation driven by Mid-IR Ultrashort Pulses in a Gas-filled Hollow-core Fiber,” *Nature Scientific Reports*, vol. 9, pp. 4446, 2019.
- [4] **M. Selim Habib**, C. Markos, J. E. A. Lopez, R. Amezcua Correa, “Multi-octave supercontinuum from visible to midIR and Bend Effects on Ultrafast Nonlinear Dynamics in Gas-filled Hollow-core Fiber,” *Applied Optics* vol. 58, pp. D7-D11, 2019 [**Editor’s peak**].
- [5] X. Ding, **M. Selim Habib**, R. Amezcua Correa, J. Moses, “Near-octave intense mid-infrared by adiabatic down-conversion in hollow anti-resonant hollow fiber,” *Optics Letters*, vol. 44, pp. 1084-1087, 2019.
- [6] M. Saiful Islam, J. Sultana, R. A. Aoni, **M. Selim Habib**, A. Dinovitser, B. W. H. Ng, D. Abbott, “Localized Surface Plasmon Resonance Biosensor: An Improved Technique for SERS Response Intensification,” *Optics Letters*, vol. 44, pp. 1134-1137, 2019.
- [7] **M. Selim Habib**, C. Markos, J. E. A. Lopez, R. Amezcua Correa, “Extreme UV Light Generation Through Dispersive Wave Trapping in a Tapered Gas-Filled Hollow Fiber,” *IEEE Photonics Technology Letters*, vol. 31, pp. 795-798, 2019.
- [8] M. Bache, **M. Selim Habib**, C. Markos, J Lægsgaard, “Poor-man’s model of hollow-core anti-resonant fibers,” *JOSA B*, vol. 36, pp. 69-80, 2019.
- [9] **M. Selim Habib**, C. Markos, J.E. Antonio-Lopez, R. Amezcua Correa, O. Bang, M. Bache, “Multi-stage generation of extreme ultraviolet dispersive waves by tapering gas-filled hollow-core anti-resonant fibers,” *Optics Express*, vol. 26, pp. 24357-24371, 2018.
- [10] **M. Selim Habib**, O. Bang, M. Bache, “Low-loss single-mode hollow-core fiber with anisotropic anti-resonant elements,” *Optics Express*, vol. 24, pp. 8429-8436, 2016.
- [11] **M. Selim Habib**, O. Bang, M. Bache, “Low-loss hollow-core anti-resonant fibers with semi-circular nested tubes,” *IEEE J Selected Top in Quantum Electronics*, vol. 22, pp. 4402106, 2016.
- [12] **M. Selim Habib**, O. Bang, M. Bache, “Low-loss hollow-core silica fibers with adjacent nested anti-resonant tubes,” *Optics Express*, vol. 23, pp. 17394-17406, 2015.
- [13] G. K. M. Hasanuzzaman, **M. Selim Habib**, S. M. Abdur Razzak, M. Anwar Hossain, Y. Namihira, “Low loss single mode porous-core kagome photonic crystal fiber for THz wave guidance,” *IEEE Journal of Lightwave Technology*, vol. 33, pp. 4027-4031, 2015.
- [14] Abubakar I. Adamu, **M. Selim Habib et al.**, “Multioctave supercontinuum generation from deep-UV to mid-IR in a noble gas-filled fibers,” SPIE Photonics West, 2-5 February, 2019, San Francisco, USA [**Invited talk**].
- [15] Abubakar I. Adamu, **M. Selim Habib et al.**, “Deep-UV dispersive wave generation in a gas-filled fiber pumped with mid-IR pulses,” SPIE Photonics West, 2-5 February, 2019, San Francisco, USA.
- [16] Abubakar I. Adamu, **M. Selim Habib et al.**, “Supercontinuum generation from deep-UV to mid-IR in a noble gas-filled fiber pumped with ultrashort mid IR pulses,” Advances in Photonics Congress, 2-5 July, 2018, Zurich, Switzerland [**Post-deadline paper**].
- [17] **M. Selim Habib**, O. Bang, M. Bache, “Anisotropic Anti-resonant Elements gives Broadband Single-mode Low-loss Hollow-core Fibers,” CLEO/USA Conference, 05-10 June, 2016, San Jose, USA.

## 10. List the most recent professional development activities

- Associate Editor: *IEEE Access*
- Feature Editor: *Applied Optics*
- Topic Editor: *Fibers*

# Abdelwahab Hamam

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2921 Dunhill Circle, Lakeland, Florida, 33810, USA

## EDUCATION

**University of Ottawa** **2013**

Ph.D. – Electrical and Computer Engineering

*Dissertation: Quality of experience evaluation for haptic multimedia applications*

**University of Ottawa** **2007**

M.A.Sc – Electrical Engineering

*Dissertation: Haptic-based virtual reality medical simulations*

**University of Ottawa** **2004**

B.A.Sc – Computer Engineering, Co-operative Education

## PROFESSIONAL DEVELOPMENT COURSES

**McGill University** **2015**

Comprehensive Project Management Course

**Workshops at Immersion Cooperation** **2013 - 2015**

- + Emotional Intelligence
- + Becoming High Performing Team Member
- + Innovator DNA -Employee Development Plan

**University of Ottawa** **2010**

Theory and Practice of Undergraduate Teaching

## EXPERIENCE

**Florida Polytechnic University** **2017 – Present**

Assistant Professor of Computer Science

- + Conduct research in the latest Human Computer Interaction, Virtual Reality, and Haptic Technology Fields
- + Teach undergraduate courses: Software Engineering, Computer Animation, Introduction to Computation and Programming, Computer Programming 2, and Virtual Reality.
- + Set the curriculum for software engineering concentration as part of the CS curriculum committee
- + Select and interview prospective faculty members as part of the CS search committee

**CENX, Ottawa, Canada**

**2016 – 2017**

Software Developer

- + Developed Lifecycle Service Orchestration solutions for telecommunication service providers
- + Communicated with network engineers to establish network requirements and exceptions
- + Used up-to-date platforms including Docker, Solr, Cassandra, PostgreSQL
- + Applied agile software development principles

**Immersion, Montreal, Canada**

**2013 – 2015**

Postdoctoral Research Scientist

- + Led technical projects for researching and developing haptic applications and technology
- + Prototyped haptic solutions on the Android platform using external sensors and hardware connected to an Android device
- + Performed user experience testing for haptic solutions
- + Conducted ideation sessions for brainstorming and listing solutions as well as future projects
- + Presented the research results to the company
- + Captured Intellectual Property for the research projects and other external ideas
- + Participated in defining the innovation and research roadmap for the company

**University of Ottawa, Ottawa, Canada**

**2005 – 2013**

Ph.D. Candidate, Masters Candidate, and Research Assistant

- + Evaluated the quality of experience of various haptic-based and virtual reality applications
- + Implemented a virtual haptic cataract eye surgery simulation using C++ and haptic libraries
- + Interfaced special hardware devices to 3D applications to provide tactile and force feedback to the user
- + Performed demonstrations and presentations to external visitors

**University of Ottawa, Ottawa, Canada**

**2005 – 2013**

Teaching Assistant (Multiple Sessions)

- + Virtual Environments
- + Analysis and Design of User Interfaces
- + Computer Architecture I and III
- + Fundamentals of Engineering Computation

**University of Ottawa, Ottawa, Canada**

**2011-2013**

Substitute Instructor for Multimedia and Virtual Environment courses

**Mitel, Ottawa, Canada****Summer 2003**

Quality Assurance Engineer (Co-operative education)

- + Wrote and executed detailed test plans for a telephony switch software

**Activcard, Ottawa, Canada****Fall 2002**

Quality Assurance Engineer (Co-operative education)

- + Provided quality assurance through testing different biometric software features

**Multimedia Communications Research Laboratory, Ottawa, Canada****Winter 2002**

Software Developer (Co-operative education)

- + Involved in the development of a Collaborative Virtual Environment Application used for training purposes

**RESEARCH ACTIVITIES AND AWARDS**

- + 2015 ACM Transactions on Multimedia Computing, Communications and Applications (TOMM) Nicolas D. Georganas Best Paper Award
- + YouTube - Google best paper award at QoMEX 2015 international workshop
- + NSERC Industrial R&D Fellowship (IRDF) Award
- + Admission graduate studies scholarship
- + Technical Program Co-Chair for the 2015 International Symposium on Haptic Audio-Visual Environments and Games (HAVE'2015)
- + Co-organizer of the Haptics Quality of Experience special session at QoMEX 2015
- + Reviewer for multimedia conferences and journals including the IEEE Transaction on Haptics
- + Local organizer for the Haptic Audio-Visual Environments (HAVE) conferences held at the University of Ottawa
- + Coordinator in the First International Conference on Ambient Media and Systems, Quebec City, Canada 2008
- + Member of IEEE and ACM professional societies

**TECHNICAL SKILLS****Programming Languages and API**

- + Java, C++, C, Clojure, Objective-C, Swift, Python, SQL, C#, Android SDK, R, MATLAB, OpenHaptics

**Computer Software**

- + IntelliJ IDEA, Eclipse, Android Studio, Xcode, Unity, NetBeans, Visual Studio, Blender, 3DS Max, Borland C++

## PUBLICATIONS AND PATENTS

(Google profile URL: <https://scholar.google.com/citations?user=Dqj6G0sAAAAJ&hl=en>)

### Refereed Journal Papers

- + **A. Hamam**, A. El Saddik, and J. Alja'am, "A Quality of Experience Model for Haptic Virtual Environments", ACM Transactions on Multimedia Computing Communications and Applications, vol. 10, no. 3, April 2014. (**Nicolas D. Georganas best paper award**)
- + **A. Hamam** and A. El Saddik, "Toward a Mathematical Model for Quality of Experience Evaluation of Haptic Applications", IEEE Transactions on Instrumentation and Measurement, vol. 62, no. 12, pp.3315-3322, Dec. 2013.
- + **A. Hamam**, M. Eid, and A. El Saddik, "Effect of Kinesthetic and Tactile Haptic Feedback on the Quality of Experience of Edutainment Applications", Journal of Multimedia Tools and Applications, vol. 67, no. 2, pp. 455-472, Nov. 2013.
- + X. Shen, J. Zhou, **A. Hamam**, S. Nourian, N.R. El-Far, F. Malric, and N.D. Georganas, "Haptic-enabled Tele-mentoring Surgery Simulation: Design, Implementation and Evaluation", IEEE Multimedia, vol. 15, no. 1, 2008.

### Refereed Conference Papers

- + M. Al Jaafreh, **A. Hamam**, A. El Saddik, "A framework to analyze fatigue for haptic-based tactile internet applications", 2017 IEEE International Symposium on Haptic, Audio and Visual Environments and Games (HAVE), Abu Dhabi, 2017, pp. 1-6, doi: 10.1109/HAVE.2017.8240347
- + **A. Hamam** and A. El Saddik, "User Force Profile of Repetitive Haptic Tasks Inducing Fatigue", International Workshop on Quality of Multimedia Experience (QoMEx), 2015. (**Best Paper Award**)
- + A. Albraikan, H. Badawi, **A. Hamam**, and A. El Saddik, "Haptibasic: Learning Basic Concepts of Haptic Technology through Edutainment Games", IEEE International Conference on Multimedia and Expo (ICME), 2013.
- + **A. Hamam** and A. El Saddik, "Evaluating the Quality of Experience of Haptic-based Applications through Mathematical Modeling", Haptic Audio-Visual Environments and Games (HAVE), 2012.
- + **A. Hamam**, F. Alsulaiman, A. El Saddik, and N.D. Georganas, "Deducing User's Fatigue from Haptic Data", ACM Proc. of the International Conference on Multimedia (ACM MM), 2010.
- + **A. Hamam**, N. D. Georganas and A. El Saddik, "Effect of Haptics on the Quality of Experience", Haptic Audio-Visual Environments and Games (HAVE), 2010.
- + **A. Hamam** and N.D. Georganas, "A Comparison of Mamdani and Sugeno Fuzzy Inference Systems for Evaluating the Quality of Experience of Hapto-Audio-Visual Applications", Haptic Audio Visual Environments (HAVE), 2008.
- + **A. Hamam**, M. Eid, A. El Saddik, and N.D. Georganas, "A Fuzzy Logic System for Evaluating Quality of Experience of Haptic-based Applications", EuroHaptics, 2008.
- + **A. Hamam**, M. Eid, A. El Saddik, and N.D. Georganas, "A Quality of Experience Model for Haptic User Interfaces", Haptic User Interfaces in Ambient Media System, 2008.
- + X. Shen, **A. Hamam**, F. Malric, S. Nourian, N.R. El-Far, and N.D. Georganas, "Immersive Haptic Eye Tele-Surgery Training Simulation", Proc. of the 3DTV Conference, 2007.

- + **A. Hamam**, S. Nourian, N.R. El-Far, F. Malric, X. Shen, and N.D. Georganas, “A Distributed, Collaborative, and Haptic-Enabled Eye Cataract Surgery Application with a User Interface on Desktop, Stereo Desktop and Immersive Displays”, Haptic Audio Visual Environments (HAVE), 2006.
- + N.R. El-Far, S. Nourian, J. Zhou, **A. Hamam**, X. Shen, and N.D. Georganas, “A Cataract Tele-Surgery Training Application in a Hapto-Visual Collaborative Environment Running over the CANARIE Photonic Network”, Haptic Audio Visual Environments (HAVE), 2005.

## Patents

- + United States Patent 10,509,474 - Systems and Methods for Shape Input and Output for a Haptically-enabled Deformable Surface, granted on December 17, 2019
- + United States Patent 10,466,793 - Systems and methods for providing haptic effects in response to deformation of a cover for an electronic device, granted on November 5, 2019
- + United States Patent 10,416,768 - Unitary sensor and haptic actuator, granted on September 17, 2019
- + United States Patent 10,394,285 - Systems and methods for deformation and haptic effects, granted on August 27, 2019
- + United States Patent 10,327,974 - Haptic Implants, granted on June 25, 2019
- + United States Patent 10,319,200 - Systems and methods for haptic surface elements, granted on June 11, 2019
- + United States Patent 10,310,614 - Systems and methods for providing haptic effects in response to deformation of a cover for an electronic device, granted on June 4, 2019
- + United States Patent 10,213,166 - Systems and methods for providing enhanced haptic feedback, granted on February 26, 2019
- + United States Patent 10,210,722 - Haptic notification communication system, granted on February 19, 2019
- + United States Patent 10,204,493 - Haptic feedback in a haptically noisy environment, granted on Feb 12, 2019
- + United States Patent 10,203,757 - Systems and methods for shape input and output for a haptically-enabled deformable surface, granted on Feb 12, 2019
- + United States Patent 10,176,680 - Customizing haptic feedback in live events, granted on Jan 8, 2019
- + United States Patent 10,082,872 - Deformable haptic wearables with variable physical properties, granted on Sep 25, 2018
- + United States Patent 10,031,583 - Systems and methods for force-based object manipulation and haptic sensations, granted on July 24, 2018
- + United States Patent 10,013,060 – Systems and methods for providing haptic effects in response to deformation of a cover for an electronic device, granted on July 3 2018
- + United States Patent 9,921,609 - Systems and methods for deformation and haptic effects, granted on March 20, 2018
- + United States Patent 9,898,903 - Systems and methods for haptic surface elements, granted on Feb 20, 2018
- + United States Patent 9,851,805 - Systems and methods for haptically-enabled holders, granted on Dec 26, 2017
- + United States Patent 9,763,628 - Systems and Methods for Providing Enhanced Haptic Feedback, granted Sep 19, 2017

- + United States Patent 9,711,015 - Customizing Haptic Feedback in Live Events, granted on July 18, 2017
- + United States Patent 9,690,381 - Systems and Methods for Shape Input and Output for a Haptically-enabled Deformable Surface, granted on June 27, 2017
- + United States Patent 9,659,468, Haptic Feedback in a Haptically Noisy Environment, granted on May 23, 2017
- + United States Patent 9,466,188 - Systems and Methods for Haptically-enabled Alarms, granted on Oct, 11, 2016
- + US patent application number 20160366450 – Broadcast Haptics Architecture
- + US patent application number 20160342208 – Haptic Effects based on Predicted Contact
- + US patent application number 20160321880 - Systems And Methods For Tactile Guidance
- + US patent application number 20160189427 – Systems and Methods for Generating Haptically Enhanced Objects for Augmented And Virtual Reality Applications

# Bayazit Karaman

Phone: 501.258.3159

E-mail: [bkaraman@floridapoly.edu](mailto:bkaraman@floridapoly.edu)

Lakeland, FL

## EDUCATION

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**University of Arkansas at Little Rock School of EIT, PhD** May 2018

Little Rock, AR

- Doctor of Philosophy in Information and Computer Science (Computer Science) (GPA: 4.0)

**University of Arkansas at Little Rock School of EIT, MS** May 2015

Little Rock, AR

- Master of Computer Science (GPA: 4.0)

**Istanbul Kultur University Faculty of Engineering** June 2012

Istanbul, Turkey

- Bachelor of Computer Engineering (GPA: 3.15)

## RESEARCH INTERESTS

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- Bioinformatics
- Machine Learning
- Signal Processing
- Cognitive Neuroscience
- Brain Research Development Tools
- Autonomous Vehicle Simulators

## EXPERIENCE

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**Assistant Professor** August 2019 – Present

*Florida Polytechnic University*

Lakeland, FL

- 2019 Fall: CDA 2108 - Introduction to Computer Systems
- 2019 Fall: COP 4415 - Data Structures (Section-1 and Section-2)
- 2020 Spring: CDA 2108 - Introduction to Computer Systems
- 2020 Spring: COP 3337C - Object Oriented Programming (Section-1 and Section-2)
- 2020 Summer A: COP 4415 – Data Structures
- 2020 Fall: COP 2271C – Introduction to Computation and Programming
- 2020 Fall: COP 4415 - Data Structures
- 2020 Fall: COP 3337C - Object Oriented Programming

**Visiting Assistant Professor** July 2018 – July 2019

*Hendrix College*

Conway, AR

- 2018 Fall: CSCI 230 - Computing Systems Organization
- 2018 Fall: CSCI 151 - Data Structures with Lab
- 2018 Fall: CSCI 410 - Senior Seminar
- 2019 Spring: CSCI 370 - Interactive Game Development
- 2019 Spring: CSCI 285 - Scientific Computing
- 2019 Spring: CSCI 150 - Foundations of Computer Science Lab

## Instructor

August 2017 – May 2018

*University of Arkansas at Little Rock*

Little Rock, AR

- 2017 Fall: CPSC 1370 - Computer Literacy
- 2018 Spring: CPSC - 1370 Computer Literacy

## Teaching Assistant

January 2014 – December 2017

*University of Arkansas at Little Rock*

Little Rock, AR

- 2014 Fall: CPSC - 2382 Comp Sys & Assembly Language
- 2015 Spring: CPSC - 2382 Comp Sys & Assembly Language
- 2015 Spring: CPSC - 4392 Capstone Project
- 2015 Fall: CPSC - 3482 Computer Organization
- 2016 Spring: CPSC - 3383 Language Structure
- 2016 Fall: CPSC - 3482 Computer Organization
- 2017 Fall: CPSC - 3482 Computer Organization

## Graduate Assistant

August 2014 – May 2017

*University of Arkansas at Little Rock*

Little Rock, AR

- Analyze the sensitive data (HR, Students) for College of Social Sciences and Communication
- Assist Information Technology Specialist in providing IT support for classrooms, computer labs and offices across the College of Social Sciences and Communication
- Software installation and administration
- Database and Website management
- Creating and Maintaining mobile applications of CSSC Department

## Teaching Assistant

September 2012 – August 2013

*Istanbul Kultur University*

Istanbul, Turkey

- CSE 501 - Visual Programming
- CSE 2002 - Programming II
- CSE 4124 - Programming Language Concepts

## SKILLS

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- Data Analysis: Matlab, R Programming, MSSQL, MySQL, Oracle SQL, Microsoft Access
- Programming Languages: C, C++, C#, Java, Linux Programming, Shell Scripting, Perl, HTML, CSS, JavaScript, Python, PHP, ASP .NET
- Weka and EEGLab

## PUBLICATIONS

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### Journals

*Published*

- **B. Karaman**, R. M. Demirer, C. Bayrak, and M. M. Su, "Modeling the Antipodal Connectivity Structure of Neural Communities," *AIMS Neuroscience*, vol. 3, no. 2, pp. 163-180, 2016.
- N. Arica, A. Celik, **B. Karaman**, C. Bayrak, and O. Kececi. "Video Enhanced RFID Tracking System," *International Journal of Applied Mathematics, Electronics and Computers*, vol. 3, no. 4, pp. 226-231, 2015.

*Under Review*

- Classification of Obsessive-Compulsive Disorder by Fractal Dimension Complexity of EEG (**First author**)
- Antipodal Connectivity Structure in Neural Activities based on Riemann Sphere (**First author**)
- The Role of Antipodal Hub Nodes on Cognitive Functions (**First author**)

*In Progress*

- The Role of Antipodal Entropy for a Brain Disorder (OCD)

## Conferences

### *Published*

- M. Ali, C. Scott, **B. Karaman**, “Analysis of protein data bank deposited GPCR conformations,” Arkansas INBRE, 2018. (Poster - Abstract)
- C. Scott, M. Ali, **B. Karaman**, “Principle Component Analysis of G Protein Coupled Receptor Activation,” 2020 AAAS Annual Meeting. (E-Poster - Abstract)
- B. Palmer, G. Sundberg, J. Dials, **B. Karaman**, D. Demirel, M. Abid, T. Halic, and S. Ahmadi, “Arthroscopic Tool Classification using Deep Learning,” 4<sup>th</sup> International Conference on Information System and Data Mining, 2020. (Podium Presentation, Proceedings)

### *Accepted*

- L. Pena, D. Demirel, A. Hamam, C. Scott, **B. Karaman**, O. Toker, “Towards a new chemistry learning platform with virtual reality and haptics,” 23rd International Conference on Human-Computer Interaction, 2020. (Podium Presentation, Proceedings)

### *In Progress*

- Visualization of Myometrium Activities (**First author**)
- NAMS: An Environment for Visualization of Hidden Structures in Neural Activities (**First author**)

## CERTIFICATIONS

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- Central Arkansas Regional Science & Engineering Fair (February 28, 2014)
- UALR Student Research and Creative Works Expo 2015
- UALR Student Research and Creative Works Expo 2016
- Has been elected in recognition of merit and accomplishment as a student at UALR 2016 (Who’s Who Among Students in American Universities and Colleges)
- 4<sup>th</sup> International Symposium on Digital Forensics and Security ISDFS 2016, Little Rock, AR (Service Contribution)

## HONORS

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- First Place Winner at Student Research and Creative Works Expo 2015

1. **Name:** Mohammad Reza Khalghani

2. **Degrees**

Degree	Discipline	Institution	Year
B.Sc.(Eng.)	Electrical Engineering	Sadjad University of Technology, Iran	2010
M.Sc.	Information and Systems Engineering	University of Birjand, Iran	2012
Ph.D.	Electronic and Electrical Engineering	West Virginia University, US	2019

3. **Academic Experience**

Institution	Rank & Title	Period	FT/PT
Florida Polytechnic University	Assistant Professor	August 2019- now	FT
West Virginia University	Research Assistant	2016 - 2019	FT

4. **Non-Academic Experience**

Company	Job Title & Position Description	Period	FT/PT
Khorasan Regional Electric Company, Iran Ministry of Energy	Research Officer: Research and Development	2013-2014	FT

5. **Current Membership in Professional Organizations**

- Member, The Institute of Electrical and Electronics Engineers (IEEE), USA
- Member, IEEE- Power & Energy Society (IEEE-PES), USA

6. **Honors and Awards**

- 2019 – IEEE PES General Meeting Conference: Best Paper Award
- 2012, National Elite Foundation, Iran, (Highest Institute for Elite People).

7. **Service Activities** (within and outside of the institution)

- Technical Program Assistant in North American Power Symposium (NAPS) 2017.
- Technical Reviewer: IEEE Transaction on Vehicular Technology.
- Technical Reviewer: Energies.
- Technical Reviewer: Journal of Applied Energy.
- Technical Reviewer: Journal of Neural Computing and Applications (NCAA).
- Technical Reviewer: Journal Sustainable Cities and Society.
- Technical Reviewer: PES General Meeting Conference 2019.
- Technical Reviewer: Optimal Control, Applications and Methods.
- Technical Reviewer: International Journal of Hydrogen Energy.
- Technical Reviewer: International Journal of Power and Energy Systems.
- Technical Reviewer: Turkish Journal of Electrical Engineering & Computer Sciences.
- Technical Reviewer: Journal of Nonlinear Dynamics, Springer Ltd.
- Technical Reviewer: Journal of Electrical Engineering & Technology.
- Technical Reviewer: IEEE Symposium on Computers & Informatics Conference.
- Technical Reviewer: IEEE International Conference on Computer Applications and Industrial Electronics (ICCAIE).

8. **List the Most Important Publications and Presentations from the Past Five (5) years**

1. **M. R. Khalghani**, M. H. Khooban, E. Mahboubi-Moghaddam, N. Vafamand and M. Goodarzi, "A self-tuning load frequency control strategy for microgrids: Human brain emotional learning," *International Journal of Power and Energy Systems*, Vol. 75, pp. 311–319, February 2016.
2. **M. R. Khalghani**, M. Ramezani, and M. Rajabi-Mashhadi, "Demonstrating The Importance Of Applying A New Probabilistic Power Flow Strategy To Evaluate Power Systems With High Penetration Of Wind Farms," *Journal of Energy Engineering-ASCE*, 10.1061/(ASCE)EY.1943-7897.0000332 , 04016002, 2016.
3. H. Heydari-Doostabad, **M. R. Khalghani**, M. H. Khooban, "A Novel Control System Design to Improve LVRT Capability of Fixed Speed Wind Turbines using STATCOM in Presence of Voltage Fault," *International Journal of Power and Energy Systems*, Vol. 77, pp. 280-286, 2016.
4. M. R. Soltanpour, M. H. Khooban, **M. R. Khalghani**, "An Optimal and Intelligent Control Strategy for a Class of Nonlinear Systems: Adaptive Fuzzy Sliding Mode," *Journal of Vibration and Control*, Vol. 22, Issue 1, pp. 159-175, 2016.
5. **M.R. Khalghani**, and M.H. Khooban, "A Novel Self-Tuning Control Method Based on Regulated Bi-objective Emotional Learning Controller's Structure with TLBO Algorithm to Control DVR Compensator," *Journal of Applied Soft Computing*, Vol. 24, pp. 912–922, November 2014.
6. **M.R. Khalghani**, M.A. Shamsi-nejad and M. H. Khooban, "DVR Control Using Bi-objective Optimization to Improve Power Quality's Indices," *IET Science, Measurement & Technology*, Vol. 8, Issue 4, pp. 203–213, 2014.
7. **M.R. Khalghani**, M.A. Shamsi-nejad, M. Farshad and M.H. Khooban, "Modifying power quality's indices of load by Presenting an Adaptive Method Based on Hebb Learning Algorithm for Controlling DVR," *AUTOMATIKA—Journal for Control, Measurement, Electronics, Computing and Communications*, Vol. 55, No 2, 2014.
8. **M. R. Khalghani**, J. Solanki, S. Khushalani-Solanki and A. Sargolzaei, "Stochastic Load Frequency Control of Microgrids Including Wind Source Based on Identification Method," 2018 IEEE International Conference on Environment and Electrical Engineering and 2018 IEEE Industrial and Commercial Power Systems Europe (EEEIC / I&CPS Europe), Palermo, pp. 1-6, 2018.
9. **M. R. Khalghani**, J. Solanki, S. Khushalani-Solanki and A. Sargolzaei, "Resilient and Stochastic Load Frequency Control of Microgrids," Submitted to IEEE PES General Meeting, Atlanta, pp. 1-5, 2019.
10. **M. R. Khalghani**, S. Solanki, and J. Solanki, "A Load Frequency Control for Microgrid including Stochastic Elements Based on Hebb Learning," 2017 North American Power Symposium (NAPS), Morgantown, WV, 2017, pp. 1-6.
11. **M. R. Khalghani**, S. Solanki, J. Solanki, A. Sargolzaei, "Cyber Disruption Detection in Linear Power Systems," 2017 North American Power Symposium (NAPS), Morgantown, WV, 2017, pp. 1-6.
12. **M. R. Khalghani**, S. Solanki, and J. Solanki, "Optimal Integration and Location of PHEV Aggregators in Power Distribution Systems," 2016 North American Power Symposium (NAPS), Denver, CO, 2016, pp. 1-6.
13. **M. R. Khalghani**, and M.A. Shamsi-nejad, "A novel self-tuning control structure to control DVR compensator using bi-objective human brain Emotional learning," 20th Electric Power Distribution Conference (EPDC), Zahedan, Iran, 2015.
14. **M. R. Khalghani**, S. Khushalani-Solanki and J. Solanki, "Load Frequency Control in a Microgrid Including Electric Vehicle Using Neuroscience Based Controllers", Book Title: *Microgrids: Design, Applications and Control*, Nova Science Inc., 2018.

## 9. List the most recent professional development activities

- Strategic planning Committee, Florida Polytechnic University, 2019.
- Employee Activities Committee, Florida Polytechnic University, 2019.

## Curriculum Vita

Ashok R. Patel, Ph.D

Department of Computer Science, (ABET Accredited) Florida Polytechnic University,  
4700, Research Way, Lakeland, FL 33805-8531. E-mail: [apatel@floridapoly.edu](mailto:apatel@floridapoly.edu),

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### **Employment (Positions):**

- Aug 2017 – Present : Assistant Professor, Florida Polytechnic University.
- Dec 2015 – Jul 2017: Visiting Faculty, Member, Keiser University, Lakeland
- Mar 2010 – Nov 2015: Full Professor, North Gujarat University, India.
- Aug 2010 – Dec 2010: Visiting Professor of Computer Science, GSW University, Americus, GA 31709. (On sabbatical leave).
- Aug 2000 – Mar 2010: Associate Professor, North Gujarat University, India.
- Aug 1990 – Aug 2000: Lecturer, North Gujarat University, India.

### **Education and Training:**

- Nov 2002: Ph.D. (Computer Science), North Gujarat University, India.
- Aug 1990: PG Diploma (Computer Applications), Gujarat Vidhyapeeth University
- Jun 1989: Master of Science (Physics), Gujarat University, India.
- Jun 1986: Bachelor of Science (Physics), Gujarat University, India.
- Dec 2013: M. S. (Computer Science), Georgia Southwestern State University,

### **Awards and Honors:**

- Recipient of the prestigious Young Scientist Award (National) from the Indian Science Congress in the year 2000.
- Awarded University Silver Medal (Merit-based) during the study of a master's degree, from Gujarat University in the year 1989.
- Honored as a Chairman of Advisory Board on "Data Analysis: E-government Projects, Government of Gujarat", from 2006 to 2011.

### **Grants -Sponsored Research:**

- Research Project: "*Privacy and Security concerns and analysis for Infants Identity by fingerprint recognition*".  
Applied to: Cyber Florida Seed Grant. August 2020 – July 2021, \$75,000.  
Role: Principal Investigator. Status: Denied
  - Research Project: "*Robust Effective applicable detection of Fake (spoof) fingerprint: A Complete Integrated Anti-Spoofing system for Fingerprint Recognition*".  
Applied to: NSF, Under Secure and Trustworthy Cyberspace.  
November 2019 – October 2021, \$275,435 No: 1936748.  
Role: Principal Investigator. Status: Denied
  - Awarded by: University Grants Commission, Government of India.  
August 2014 –2017, Indian Rs.500,000  
Research Project: "*Issues and Performance Improvement for Biometric System*", Role: Principal Investigator, Co-Investigator: Meghana Patel (Doctoral Scholar).
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## **Publications: (Recent)**

### **2020:**

#### **Accepted and under publication:**

- IEEE: “A Brief Literature Review and Survey of Adult Perceptions on Biometric Recognition for Infants and Toddlers”. Accepted and will present virtually with Dr. Neal Tempestt, at “2020 International Joint Conference on Biometrics -IJCB 2020”, organized by IEEE Biometrics Council, during Sept28–Oct1, 2020.
- Springer: “A Comprehensive Survey on Fingerprint Liveness Detection Algorithms by Database and Scanner Model”, Accepted and presented virtually with Riley Kiefer at CSCE during July 27-30, 2020 and will publish at “Springer series -Transactions on Computational Science and computational intelligence”, November 2020.

#### **Published:**

- Kiefer R., Stevens J., Patel A., Patel M. (2021) A Survey on Spoofing Detection Systems for Fake Fingerprint Presentation Attacks. In: Senjyu T., Mahalle P.N., Perumal T., Joshi A. (eds) Information and Communication Technology for Intelligent Systems. ICTIS 2020. Smart Innovation, Systems and Technologies, vol 195. Springer, Singapore.  
[https://doi.org/10.1007/978-981-15-7078-0\\_30](https://doi.org/10.1007/978-981-15-7078-0_30)
- Springer: “Global Normalization for Fingerprint Image Enhancement”, Ashok R Patel, Meghna Patel, Satyen Parikh, Published at Conference Proceeding of International Conference on Computational Vision and Bio-Inspired Computing, (January 2020),  
[https://link.springer.com/chapter/10.1007/978-3-030-37218-7\\_111](https://link.springer.com/chapter/10.1007/978-3-030-37218-7_111)
- Springer Chapter: “An Improved Approach in Fingerprint Recognition Algorithm”, Ashok R Patel, Meghna Patel, Satyen Parikh, Book Chapter at Smart Computational Strategies: Theoretical and Practical Aspects, Springer Link, pp135-151, Published (March 2019).  
[https://link.springer.com/chapter/10.1007/978-981-13-6295-8\\_12](https://link.springer.com/chapter/10.1007/978-981-13-6295-8_12)

### **2019:**

- Ashok R Patel, Piyush Arora, “Reliable Broadcast Based Emergency Data Dissemination in VANET by Segmentation of Road Using Contention Window by Hybrid Partitioning Approach” at 6th International Conference on Big Data and Cloud Computing Challenges.  
<https://www.springer.com/gp/book/9789813298880>
- Ashok R Patel, Meghna Patel, Satyam M Parikh, “Performance Improvement in Pre-Processing Phase of Fingerprint Recognition”, Singer Information and Communication Technology for Intelligent Systems pp 521-530, published at  
[https://link.springer.com/chapter/10.1007/978-981-13-1747-7\\_50](https://link.springer.com/chapter/10.1007/978-981-13-1747-7_50).

### **2018**

- Ashok R Patel, Meghna Patel, Satyam M Parikh, “An Improved Approach in Core Point Detection Algorithm for Fingerprint Recognition”, 3rd International Conference on Internet of Things and Connected Technologies, March 26-27, 2018. Proceeding published by Elsevier <http://ssrn.com/abstract=3166188>

## **COURSES Taught:**

1. Semester: Fall 2020 (Teaching in FLEX mode due to COVID-19)  
Taught following Courses at Florida Polytechnic University, Lakeland, Florida.  
COP 5727 – Advanced Database System Design (Graduate course)  
CIS4204 – Ethical Hacking  
CIS4369 – Web Application Security
2. Semester: Spring 2020, Fall & Spring 2019, and Fall 2018  
Taught following Courses at Florida Polytechnic University, Lakeland, Florida.  
CIS4204 – Ethical Hacking  
CIS4369 – Web Application Security  
COP2272 Section3– Computer Programming -I (C++)

3. Semester: Spring 2018

Taught following Courses at Florida Polytechnic University, Lakeland, Florida.

CIS4204 – Ethical Hacking

COP3530 – Data Structures and Algorithms

COP2271 Section8– Intro to Computation & Programming

COP2271 Section9– Intro to Computation & Programming

4. Semester: Fall 2017

Taught following Courses at Florida Polytechnic University, Lakeland, Florida.

CIS4204 – Ethical hacking

CEN4088 – Software Security Testing

CTS4817 – Advanced Web Services

CGS1100 – Applications for Business

5. Semester: Spring 2017

Taught following Courses to students of Keiser University, Lakeland, Florida.

CTS2106C – Multiuser Operating Systems

ISM4300 – Data warehouse

CTS2153C – Advanced Networking

6. Semester: Fall 2016

Taught following Courses to students of Keiser University, Lakeland, Florida.

CIS2350C –Information Security

ISM4212 – Ad Database Management System

CTS3370 – Designing Virtual Infrastructure

7. From January 2016 to July 2016: (multiple workloads, Taught to CS major and non-CS major students of Keiser University, Lakeland Campus and Clearwater Campus, FL)

CGS1000 – Introduction to Computers

\*\*\*\*\*

8. During Aug 2010 – Dec 2010: (Fall 2010) – Visiting Professor ofCS

Following Courses taught to students of the Department of Computer Science at Georgia Southwestern State (GSW) University, Americus, GA, USA.

CIS -1000 Database Management System. (Online)

CSCI -4310 Object Oriented Programming using Java (In class)

CIS -1000 Database Management System. (In-class)

**COURSES Developed:**

**At Florida Poly:** I did develop and teaching a completely new curriculum for courses of 1) CIS4204 - Ethical hacking and 2) CIS – 4369 - Web Application Security, for student Cybersecurity concentration students, with hands-on real scenario experiments.

**At North Gujarat University:** During my tenure at North Gujarat University, I was charged with the responsibilities to develop a new degree program, M.Sc. (Computer Applications and Information Technology), which a 5-year integrated degree program is awarding BS and MS degrees to students and I have developed following courses over the semesters during 2000 to 2014.

□Following Courses developed for Information Technology students.

BSCS-13 Database Management System      BSCS-25      Data & File Structure

MCA-33 Advanced DBMS      MCA-22      Advanced Programming withJAVA

MCA-60 Special Project.      MCA-68 Human Computer Interaction & InterfaceDesign

□The following Course was developed for students of Business.

MBA–201 Database System for Business.

1. **Name:** Hisham Mahmood

2. **Degrees**

Degree	Discipline	Institution	Year
Ph.D.	Electrical Engineering	University of Western Ontario, Canada	2015
M.Sc.	Control Engineering	Lakehead University, Canada	2008
B.Sc.(Eng.)	Electrical Engineering	University of Basrah, Iraq	1998

3. **Academic Experience**

Institution	Rank & Title	Period	FT/PT
Florida Polytechnic University	Assistant Professor of Electrical Engineering	Aug 13, 2018-present	FT
University of Exeter, UK	Research Fellow in the Department of Renewable Energy	Nov 2017 – July 2018	FT
University of Western Ontario, Canada	Postdoctoral Research Fellow and Lecturer of - Department of Electrical and Computer Engineering	Jan 2015 – Oct 2017	FT
University of Western Ontario, Canada	Research Assistant - Department of Electrical and Computer Engineering	2008 – 2014	FT
Lakehead University, Canada	Research Assistant - Department of Electrical and Computer Engineering	2006 – 2008	FT
Higher Institute of Technology, Libya	Lecturer and Department Chair – Department of Electrical Engineering	2001 – 2005	FT
Great March University, Libya	Lecturer of Electrical Engineering	2001 - 2003	PT

4. **Non-Academic Experience**

Company	Job Title & Position Description	Period	FT/PT
HiT Power, UK	Design and Development Engineer	Nov 2017 – July 2018	PT
Cornwall New Energy, UK	Consultant	Nov 2017 – July 2018	PT

5. **Certifications or Professional Registrations**

6. **Current Membership in Professional Organizations**

- Member, The Institute of Electrical and Electronics Engineers (New York)

7. **Honors and Awards**

8. **Service Activities** (within and outside of the institution)

- Review papers for:
  - IEEE Transactions on Power Electronics
  - IEEE Transactions on Industrial Electronics
  - IEEE Journal of Emerging and Selected Topics in Power Electronics
  - IEEE Transactions on Sustainable Energy
  - IEEE Transactions on Smart Grid
  - IEEE Transactions on Power Systems
- Chaired sessions for IEEE conferences

**9. List the Most Important Publications and Presentations from the Past Five (5) years**

1. Hisham Mahmood, D. Michaelson, J. Jiang, "Decentralized power management of a PV/battery hybrid unit in a droop controlled islanded microgrid," *IEEE Transactions on Power Electronics*, vol. 30, no. 12, pp. 7215–7229, Dec. 2015.
2. Hisham Mahmood, D. Michaelson, J. Jiang, "Reactive power sharing in islanded microgrids using adaptive voltage droop control," *IEEE Transactions on Smart Grid*, vol. 6, no. 6, pp. 3052–3060, Nov. 2015.
3. Hisham Mahmood, D. Michaelson, J. Jiang, "Strategies for independent deployment and autonomous control of PV and battery units in islanded microgrids," *IEEE Journal of Emerging and Selected Topics in Power Electronics*, vol. 3, no. 3, pp. 742–755, Sept. 2015.
4. Hisham Mahmood, D. Michaelson, J. Jiang, "Accurate reactive power sharing in an islanded microgrid using adaptive virtual impedances," *IEEE Transactions on Power Electronics*, vol. 30, no. 3, pp. 1605–1617, Mar. 2015.
5. Hisham Mahmood, D. Michaelson, J. Jiang, "A power management strategy for PV/battery hybrid systems in islanded microgrids," *IEEE Journal of Emerging and Selected Topics in Power Electronics*, vol. 2, no. 4, pp. 870–882, Dec. 2014.
6. Hisham Mahmood, J. Jiang, "Modeling and control system design of a grid connected VSC considering the effect of the interface transformer type," *IEEE Transactions on Smart Grid*, vol. 3, no. 1, pp. 122–134, Mar. 2012.
7. Hisham Mahmood, J. Jiang, "Autonomous Coordination of Multiple PV/Battery Hybrid Units in Islanded Microgrids," *IEEE Transactions on Smart Grid*, Accepted, May 2017.
8. D. Michaelson, Hisham Mahmood, J. Jiang, "A Predictive Energy Management System using Pre-emptive Load Shedding for Islanded Photovoltaic Microgrids," *IEEE Transactions on Industrial Electronics*, vol. 64, no. 7, pp. 5440–5448, Jul. 2017.
9. Hisham Mahmood, J. Jiang, "Decentralized Power Management of Multiple PV, Battery, and Droop Units in an Islanded Microgrid," *IEEE Transactions on Smart Grid*, Accepted, Dec. 2017.
10. Hisham Mahmood, J. Jiang, "A control strategy of a distributed generation unit for seamless transfer between grid connected and islanded modes," in *Proc. IEEE International Symp. Ind. Electron. (ISIE)*, June 2014, pp. 2518–2523.
11. D. Michaelson, Hisham Mahmood, J. Jiang, "A predictive energy management strategy with pre-emptive load shedding for an islanded PV-battery microgrid," in *Proc. IEEE Ind. Electron. Conf.*, Nov 2013, pp. 1501–1506.
12. Hisham Mahmood, D. Michaelson, J. Jiang, "Control strategy for a standalone PV/battery hybrid system," in *Proc. IEEE Ind. Electron. Conf.*, Oct 2012, pp. 3412–3418.
13. Hisham Mahmood, K. Natarajan, "Parasitics and voltage collapse of the DC-DC boost converter," in *Proc. of IEEE Canadian Conference on Electrical and Computer Engineering*, May 2008, pp. 273–278.

**10. List the most recent professional development activities**

- Served as a consultant with Cornwall New Energy, UK
- Participate in the design of 100 kW grid connected battery charger with HiT Power, UK
- Planning, design and implementation of a laboratory scale microgrid for the Distributed Generation Laboratory, University of Western Ontario, Canada
- Developed a graduate course on Modeling and Control of Power Electronic Converters at the University of Western Ontario, Canada
- Co-supervised PhD and Master's students at the University of Exeter in UK, and University of Western Ontario in Canada

1. **Name:** Muhammad H. Rashid

2. **Degrees**

Degree	Discipline	Institution	Year
B.Sc.(Eng.)	Electrical Engineering	Bangladesh University of Eng. and Technology, Dhaka	1967
M.Sc.	Information and Systems Engineering	University of Birmingham, UK	1971
Ph.D.	Electronic and Electrical Engineering	University of Birmingham, UK	1976

3. **Academic Experience**

Institution	Rank & Title	Period	FT/PT
Florida Polytechnic University	Professor and Chair of Electrical and Computer Engineering	Jan 8, 2018-	FT
Florida Polytechnic University	Professor of Electrical Engineering	2017 - 2018	FT
University of West Florida	Professor of Electrical and Computer Engineering	2007 – 2016	FT
University of Florida	Professor and Program Director of Electrical and Computer Engineering	1997-2007	FT
Indiana-Purdue University Fort Wayne	Professor and Chair of Engineering Department	1989-2007	FT
Purdue University Calumet	Associate Professor and Professor	1985- 1989	FT
Concordia University, Canada	Associate Professor	1981-1985	FT
University of Connecticut	Visiting Assistant Professor	1980-1981	FT
Higher Institute of Electronics – Malta and Libya	Lecturer and Head of Control Engineering	1977-1980	FT

4. **Non-Academic Experience**

Company	Job Title & Position Description	Period	FT/PT
Lucas Group Research Centre, England, UK	Research Officer: Research and Development	1976-1977	FT
Brush Electrical Machines Ltd., England, UK	Senior Development Engineer: Project Development	1974-1976	FT
Eastern Refinery Ltd., Bangladesh	Engineer - Instruments & Control	1968-1970	FT
Water & Power Development Authority, Bangladesh	Assistant Engineer – Operation	1968-1968	FT

5. **Certifications or Professional Registrations**

- Professional Engineer, Ontario, Canada (from 1977 – 2002)
- Chartered Engineer, United Kingdom (from 1977 – 2005)

6. **Current Membership in Professional Organizations**

- Life Fellow, The Institute of Electrical and Electronics Engineers (New York)
- Fellow, The Institution of Engineering and Technology, (London, UK)
- Member, American Society of Engineering Education (ASEE)

7. **Honors and Awards**

- 2013 – IEEE Industry Applications Society: *Outstanding Achievement Award*
- 2008 IEEE: Undergraduate Teaching Award
- 2002 IEEE: Educational Activities Board Meritorious Achievement Award in Continuing Education

- 2001-2003: Distinguished Lecturer and Speaker of the IEEE-Industry Applications Society.
- 2010 - : Distinguished Lecturer of the IEEE Education Society.
- 1991: IEEE Outstanding Engineer Award

8. **Service Activities** (within and outside of the institution)

- Review papers: Member, IEEE - Education Society, Industry Applications Society, Industrial Electronics Society, Magnetics Society, Circuit & Systems Society, Power Electronics society, and Power Engineering Society.

9. **List the Most Important Publications and Presentations from the Past Five (5) years**

1. M H. Rashid, *Microelectronic Circuits: Analysis and Design*, Cengage Publishing, 2017. ISBN-13: 978-1305635166, ISBN-10: 1305635167
2. M. H Rashid, *Power Electronics – Devices, Circuits and Applications*. Pearson Publishing, 2014, ISBN-10: 0133125904 • ISBN-13: 9780133125900
3. M. H. Rashid, *Introduction to PSpice Using OrCAD/LTspice for Circuits and Electronics*, Cengage Publishing – on production expected to be published in 2017.
4. M. H. Rashid (editor), *Power Electronics Handbook*, Butterworth Heinemann, on production expected to be published in 2017.
5. M H. Rashid (editor), *Electric Renewable Energy Systems*, Elsevier Publishing, 2016, ISBN-13: 978-0128044483, ISBN-10: 0128044489
6. M. H. Rashid (editor), *Alternative Energy in Power Electronics*, Elsevier Publishing, 2015, ISBN-13: 978-0124167148, ISBN-10: 0124167144
7. M H. Rashid, *Electronic Circuits and Applications*, 1/e. ISBN # 9788131522844, 562 Pages, CL Engineering, 2014.
8. M H. Rashid, *Electronic Devices and Circuits*, 1/e. ISBN # 978813152285, 804 Pages, CL Engineering, 2014.
9. M H. Rashid, *Linear Integrated Circuits*, 1/e. ISBN # 9788131522837, 534 Pages, CL Engineering, 2014.
10. M. H Rashid, *SPICE for Power Electronics and Electric Power*, 3/e, CRC Pres, May 2012, 560 pages.
11. M. H Rashid, *The Process of Outcome-Based Education - Implementation, Assessment and Evaluations*, .2012 UiTM Press, Malaysia
12. Jimmy Kocher, and M. H Rashid, “Engineering Our Food: Possible Risks verses Reward”. Original. Research Article Procedia - Social and Behavioral Sciences, Volume 176, 20 February 2015, Pages 927-932.
13. M. H. Rashid, Comparison of ABET Outcome Requirements And Washington Accord Attributes, presentation at the 2015 IEE Colloquium, New York City, November 5-6, 2015.

14. **List the most recent professional development activities**

- ABET program evaluator for electrical, computer and general engineering.
- The Academic Accreditor for the Institution of Engineering and Technology (IET, UK)
- Editor-in-Chief of a *Series in Electric Energy System* with Springer Publishing.
- Editor-in-Chief of a *Series in Power Electronics and Applications* with CRC Press,
- Editor-in-Chief of a *Series in Nanotechnology and Applications* with CRC Press,
- Served as an External Examiner for undergraduate program for the faculty of electrical engineering for undergraduate program at the University of Technology Malaysia (MARA) from 2004-2016.
- Serves as an International Advisory Board Member of numerous international conferences.
- Gave numerous keynote lectures in international conferences in electrical and electronic engineering in China, India, Malaysia, Bangladesh, Pakistan, Palestine, and Iran.
- Reviewed Ph.D. theses as an external examiner for Nanyang Technological University Singapore.
- Reviewed Ph.D. theses as an external examiner for Universiti Putra Malaysia (UPM)

1. **Name:** Ashiq A. Sakib

2. **Degrees**

Degree	Discipline	Institution	Year
B. Tech.	Electronics and Communication Engineering	Institute of Engineering and Management, West Bengal University of Technology, India	2013
Ph.D.	Computer Engineering	North Dakota State University, US	2019

3. **Academic Experience**

Institution	Rank & Title	Period	FT/PT
Florida Polytechnic University	Assistant Professor of Electrical and Computer Engineering	Aug. 12, 2019-	FT
North Dakota State University	Teaching Assistant	Aug. 2014 – May. 2018	FT
North Dakota State University	Research Assistant	Jan. 2018 – July 2019	FT

4. **Non-Academic Experience**

Institution	Rank & Title	Period	FT/PT
Centre for Electronics and Test Engineers (CETE), Ministry of Information Technology, Govt. of West Bengal, India	Industrial Trainee	June 2013- August 2013	PT

5. **Current Membership in Professional Organizations**

- Member, The Institute of Electrical and Electronics Engineers (IEEE), USA
- Member, IEEE- Circuits and Systems Society (IEEE-CAS), USA
- Member, IEEE- Eta Kappa Nu (IEEE-HKN), USA
- Member, Phi-Kappa-Phi (PKP), USA

6. **Honors and Awards**

- Love of Learning award offered by the honor society of Phi Kappa Phi, 2018.
- Selected as one of the 10 early PhD students in the Student Activities program to attend the IEEE-VTS'17 conference held in Las Vegas, 2017.
- National Science Foundation (NSF) Travel Grants.
- Outstanding Teaching Assistant (Nominated from the ECE department at NDSU).
- Outstanding Ambassador of the department, Institute of Engineering and Management, 2013.
- Dhaka Board Scholarship for outstanding result, Govt. of Bangladesh, 2007.

7. **Service Activities** (within and outside of the institution)

- Technical Reviewer: IEEE International Symposium on Circuits and Systems (ISCAS).
- Technical Reviewer: IEEE Mid-West Symposium on Circuits and Systems (MWSCAS).
- Technical Reviewer: IEEE International Symposium on VLSI (ISVLSI).
- Technical Reviewer: IEEE Asia Pacific Conference on Circuits and Systems (APCCAS).
- Vice-President (2018) and Treasurer (2017), IEEE-Eta Kappa Nu Honor Society, Gamma Tau Chapter.

- University Curriculum Committee, North Dakota State University.
- Graduate Studies Senator, Student Government, North Dakota State University.

## 8. List the Most Important Publications and Presentations from the Past Five (5) years

- [1] Book Chapter: **A. A. Sakib**, S. Le, S. C. Smith, and S. K. Srinivasan, “Chapter 15: Asynchronous Circuit Verification,” Asynchronous Circuit Applications, Institution of Engineering and Technology (IET), London, UK (In Press).
- [2] Journal: **A. A. Sakib**, S. C. Smith, S. K. Srinivasan, “Formal Modeling and Verification of PCHB Asynchronous Circuits,” IEEE Transactions on VLSI, pp. 1-14, doi: 10.1109/TVLSI.2019.2937087, 2019.
- [3] Peer-reviewed Conference: **A. A. Sakib**, S. C. Smith, and S. K. Srinivasan, “Formal Modeling and Verification for Pre-Charge Half Buffer Gates and Circuits,” IEEE International Midwest Symposium on Circuits and Systems (MWSCAS), pp. 519-522.
- [4] Peer-reviewed Conference: **A. A. Sakib**, S. C. Smith, and S. K. Srinivasan, “An Equivalence Verification Methodology for Combinational Pre-Charge Half Buffer Asynchronous Circuits.” IEEE International Midwest Symposium on Circuits and Systems (MWSCAS), pp. 767-770.
- [5] Peer-reviewed Conference: M. Hossain, **A. A. Sakib**, S. C. Smith, and S. K. Srinivasan, “An Equivalence Verification Methodology Asynchronous Sleep Convention Logic Circuits.” IEEE International Symposium on Circuits and Systems (ISCAS), 2019, pp. 1-5.
- [6] **A. A. Sakib** and S. C. Smith, “Verification Methodology for QDI Asynchronous Circuits.” – IEEE VLSI Test Symposium (VTS), 2017.
- [7] Presentation: **A. A. Sakib**, “Solving real world problems” – College of Graduate and Interdisciplinary Studies, North Dakota State University (Presentation).
- [8] Presentation: IEEE Red River Valley Graduate Research Competition, 2018(Poster Presentation).
- [9] Presentation: IEEE Red River Valley Graduate Research Competition, 2017(Poster Presentation).

## 9. List the most recent professional development activities

- ECE Curriculum Committee, Florida Polytechnic University, 2019.
- Program Assessment Committee, Florida Polytechnic University, 2019.
- Faculty Adviser, Sub-Club, Florida Polytechnic University, 2019.
- Working on instating the honor society of IEEE-HKN in the Dept. of ECE at Florida Polytechnic University.

1. **Name:** Onur Toker

2. **Degrees**

Degree	Discipline	Institution	Year
B.S.	Electrical Engineering	Bogazici Univ., Istanbul/Turkey	1990
	Mathematics		1990
	Physics		1990
M.S.	Electrical Engineering	Ohio State, Columbus OH	1992
	Mathematics		1994
Ph.D.	Electrical Engineering	Ohio State, Columbus OH	1995

3. **Academic Experience**

Institution	Rank & Title	Period	FT/PT
Florida Polytechnic University Dept. of Electrical and Computer Engineering	Associate Prof. of Computer Engineering	2018 -	FT
TC Fatih Univ., Istanbul/Turkey Dept. of Electrical and Electronics Engineering	Associate Prof., Prof. (2012) of Electrical and Electronics Engineering	2004-2016	FT
K.F.U.P.M., Dhahran/K.S.A. College of Computer Sciences and Engineering	Assistant Prof., Associate Prof. (2004) of Computer Science and Engineering	1997-2004	FT
Univ. of California, Riverside Dept. of Electrical Engineering	Postgraduate Researcher	1996-1997	FT
Eindhoven Univ. of Technology, The Netherlands	Postdoctoral Researcher	1995-1996	FT

4. **Non-Academic Experience**

Company	Job Title & Position Description	Period	FT/PT
Stealth Mode Startup	Embedded Software Engineer	2018-2018	PT
DAQRI Sunnyvale, CA / Pasadena, CA	FPGA Design Engineer	2017-2018	FT
Quanergy Sunnyvale, CA	Embedded Systems Engineer	2017-2018	FT
Teknobil Istanbul/TURKEY	SW Developer, Consultant	1998-2004	PT

5. **Certifications or Professional Registrations**

6. **Current Membership in Professional Organizations**

- Member, Institute of Electrical and Electronics Engineers (IEEE)

7. **Honors and Awards**

- Interdisciplinary Research award, College of Computer Sciences and Engineering, KFUPM, 2004
- Interdisciplinary Research award, College of Computer Sciences and Engineering, KFUPM, 2003
- DISC Fellowship award, 1996.
- Best presentation award, ACC 1995 (WA-16 session).
- Ohio State University Presidential Fellowship award, 1994.

- Bogazici University Dean's High Honor List, 1990.
- Ranked first among the graduating seniors in the double major program, and received an award from the Rector of the University, 1990.

8. **Service Activities** (within and outside of the institution)

- Reviewed several papers for various international journals and conferences.

9. **List the Most Important Publications and Presentations from the Past Five (5) years**

1. O. Toker, H. Gumuskaya, C. Ulas, and B. T. Yılmaz, "Lightweight Wireless Protocol Based on IEEE 802.11 for Delay Sensitive Telerobotic Systems, T. Journal of Electrical Engineering & Computer Sciences, Vol. 21, No. 5 (2013), pp. 1394-1410.
2. H. S. Efendioglu, T. Yıldırım, O. Toker, and K. Fidanboylu, "New statistical features for the design of fiber optic statistical mode sensors", Optical Fiber Technology, vol. 21 (2013), pp. 279-284.
3. F. Camcı, C. Ozkurt, O. Toker, V. Atamuradova, "Sampling based State of Health estimation methodology for Li-ion batteries", Journal of Power Sources, vol. 278 (2015), pp. 668-674.
4. B. Enez, E. Gur, B. Okur, O. Toker, A. Sisman, "A Low-cost Biomarker-based SAW-Biosensor Design for Early Detection of Prostate Cancer," Biosensors 2016 (26th Anniversary World Congress on Biosensors), Gothenburg, Sweden (2016).
5. M. B. Alver, O. Toker, K. Fidanboylu, "Polar Format Statistical Image Processing Based Fiber Optic Pressure Sensors", Proc. SPIE 9217, Applications of Digital Image Processing XXXVII, San Diego, CA (2014), pp. 9217F-1 - 9217F-7.
6. K. Alemdar, S. Likoglu, K. Fidanboylu, O. Toker, "A Novel Periodic Macrobending Hetero-core Fiber Optic Sensor Embedded in Textile for Respiratory Movements Analysis", Proc. SPIE 9062, Smart Sensor Phenomena, Technology, Networks, and Systems Integration, San Diego, CA, (2014), pp. 90620D-1 - 90620D-11.
7. S. Likoglu, K. Alemdar, K. Fidanboylu, O. Toker, "A Novel Microbending Hetero-Core Fiber Optic Sensor for Force and Location Sensing with Applications to Home Security", Proc. SPIE 9062, Smart Sensor Phenomena, Technology, Networks, and Systems Integration, San Diego, CA, (2014), pp. 90620C-1 - 90620C-11.
8. C. Ozkurt, F. Camcı, B. Esat, O. Toker, "Cost Benefit Analysis of Individual Cell Control in Batteries for Electric Vehicles", 23rd IEEE International Symposium on Industrial Electronics (ISIE), Istanbul, Turkey, (2014), pp. 1800-1804.
9. H. Efendioglu, T. Yıldırım, O. Toker, K. Fidanboylu, "Intelligent fiber-optic statistical mode sensors using novel features and artificial neural networks", Proc. SPIE 8693, Smart Sensor Phenomena, Technology, Networks, and Systems Integration, San Diego, CA, (2013).

10. **List the most recent professional development activities**

- Reviewed Ph.D. theses as an external examiner for Istanbul Technical University (ITU)

1. **Name:** Muhammad S. Ullah

2. **Degrees**

Degree	Discipline	Institution	Year
B.Sc.(Eng.)	Electrical and Electronic Engineering	Chittagong University of Engineering and Technology, Bangladesh	2008
M.SE.	Electrical and Computer Engineering	Purdue University Northwest, USA	2013
Ph.D.	Electrical and Computer Engineering	University of Missouri-Kansas City, USA	2016

3. **Academic Experience**

Institution	Rank & Title	Period	FT/PT
Florida Polytechnic University	Assistant Professor	August 15, 2016-	FT
University of Missouri-Kansas City	Instructor and Graduate Research Assistant	August 2013-May 2016	PT
Purdue University Northwest	Graduate Teaching and Research Assistant	August 2011-May 2013	PT
Chittagong University of Engineering and Technology	Lecturer	September 2008-August 2011	FT

4. **Non-Academic Experience**

Company	Job Title & Position	Period	FT/PT
Microwave Packaging Technology, Inc	R&D Engineer	May 2015-August 2015	PT

5. **Certifications or Professional Registrations**

- Training Certificate in Industrial Control with PLC, Institute of Energy Technology at Chittagong University of Engineering and Technology, June 2008
- Training Certificate in Industrial Technology on Electrical and Instrumentation, Training Institute for Chemical Industries, Bangladesh, May 2007

6. **Current Membership in Professional Organizations**

- Professional Member, Association for Computing Machinery (ACM)
- Professional Member, Institute of Electrical and Electronic Engineering (IEEE)

7. **Honors and Awards**

- December 2017 **Teen Driver Education Task Force Choice Award**, Office of the Tax Collector, 5<sup>th</sup> Annual Polytechnic BIO Expo, Florida Polytechnic University.
- April 2017 **Florida Polytechnic University's President Choice Award**, 4<sup>th</sup> BIO EXPO Award Ceremony, Florida Polytechnic University.
- April 2016 **Best Poster Presentation Award**, University of Missouri-Kansas City Community Scholar Symposium
- January 2016 **Interdisciplinary Applied Mathematics Fellowship (IAMP) Award**, Department of Mathematics and Statistics, University of Missouri-Kansas City
- April 2015 **Preparing Future Faculty Scholar Award**, The School of Graduate Studies, University of Missouri-Kansas City
- May 2015 **Outstanding PhD Student Award**, The School of Computing and Engineering, University of Missouri-Kansas City
- August 2013-May 2016 **Graduate Teaching and Research Assistantships**, Department of Computer Science Electrical Engineering, University of Missouri-Kansas City
- May 2013 **Purdue University Calumet Chapter of Sigma Xi Student Research Award**, Sigma Xi-The Scientific Research Society, USA
- April 2013 **Student Research Day Presentation Award**, The Graduate School, Purdue University Calumet

8. **Service Activities** (within and outside of the institution)
  - **Member**, Academic Standard Committee, Florida Polytechnic University (2016~)
  - **Member**, Computer Engineering Search Committee (2017-2018), Computer Science and Information Technology (2016-2017), Computer Engineering Search Committee (2017~2018)
  - **Judge**, Middle School Physical, Florida Junior Academy of Science, Florida Polytechnic University, March 11, 2017.
9. **List the Most Important Publications and Presentations from the Past Five (5) years**
  1. **M. S. Ullah**, Abdullah G. Alharbi and Masud H. Chowdhury, "BPSK Modulation Based Exact BER Computation for Network Intra-Chip RF Interconnect," *The 29<sup>th</sup> IEEE International Conference on Microelectronics*, Beirut, Lebanon, pp. 91-94, 10- 13 December 2017.
  2. **M. S. Ullah** and Masud H. Chowdhury, "Analytical Models of High Speed RLC Interconnect Delay for Complex and Real Poles," *IEEE Transactions on Very Large Scale Integration Systems*, vol. 25, no. 6, pp. 1831-1841, February 2017.
  3. **M. S. Ullah** and Masud H. Chowdhury, "Subthreshold Swing Characteristics of Multilayer MoS<sub>2</sub> Tunnel FET," *IEEE 58th International Midwest Symposium on Circuits and Systems*, Fort Collins, Colorado, pp. 1-4, 2-5 August 2015.
  4. **M. S. Ullah** and Masud H. Chowdhury, "Multilayer Molybdenum disulphide based Tunnel Transistor" *IEEE International Symposium on Circuits and Systems*, Lisbon, Portugal, pp. 1929-1932, 24-27 May 2015.
  5. **M. S. Ullah** and Masud H. Chowdhury, "A new real pole delay model for RLC interconnect using second order approximation," *IEEE 57<sup>th</sup> International Midwest Symposium on Circuits and Systems*, College Station, TX, USA, pp. 238-241, 3-6 August 2014.
  6. **M. S. Ullah** and Masud H. Chowdhury, "Analysis of RLC interconnect delay model using second order approximation," *IEEE International Symposium on Circuits and Systems*, Melbourne, Australia, pp. 2756-2759, 1-5 May 2014.
  7. **M. S. Ullah** and K. Gopalan, "Deception detection in speech using Bark band and perceptually significant energy features," *IEEE 56th International Midwest Symposium on Circuits and Systems*, Columbus, OH, USA, pp.1212-1215, 3-7 August, 2013.
  8. **M. S. Ullah**, "A review of higher order statistics and spectra in communication systems," *The Global Journal of Science Frontier Research*, vol. 13, no. 4, pp. 31-50, May 2013.

#### 10 List the most recent professional development activities

- Journal Paper Review
  - Reviewer, IEEE Transactions on Very Large Scale Integration Systems, Microelectronics Journal, Elsevier, Journal of Circuit, Systems and Signal Processing, Springer
- Seminars Attend
  - "The Future of STEM Education and Research", The 81st Annual Meeting of the Florida Academy of Sciences at Florida Polytechnic University, Lakeland, FL, March 10, 2017.
  - The Division of Diversity and Inclusion's Eighth Annual Martin Luther King Jr. Lecture on "Building Community in an Hour of Chaos: Progress in the Age of Obama", UMKC Pierson Auditorium, January 27, 2016
  - Effective Teaching Practice Session class that organized by Association of College and University Educators (ACUE), UMKC Hospital Hill Campus, September 22, 2015
- Workshops, Technical Presentations and Seminars
  - "TFET-An Energy Efficient Electronic Device for Future Nanoscale Technology," Faculty Research on Renewable Energy and Sustainability Showcase Hour, Lakeland, FL, 9<sup>th</sup> -10<sup>th</sup> October 2017
  - "Accuracy Characterization of High Speed VLSI Interconnect Network," The 81<sup>st</sup> Annual Meeting of the Florida Academy of Sciences, Lakeland, FL, March 10-11, 2017.

## Appendix D. Faculty Workload Data

2019 – 2020

Faculty Name	Dept	Course	Term	Section	Course Name	Credits	Rsch Credit	Service Credit	Other (Noted)
Adla, Rawa	4 Course(s)					12			
	EEL	4746C	FA 2019	01	Microcomputers	3			
	EEL	4746C	FA 2019	02	Microcomputers	3	7	1	0
	EEL	4746C	SP 2020	03	Microcomputers	3	5	1	0
	EEL	4746C	SP 2020	01	Microcomputers	3			
Al-Nashif, Youssif	12 Course(s)					36			
	EGN	5970	FA 2019	01	Thesis 1	3			
	COP	2034	FA 2019	IS	Introduction to Programming Using Python	3			
	EEL	5741	FA 2019	01	Microcomputers	3			
	CAP	5830	FA 2019	01	Modeling and Simulation	3			
	COP	4935C	FA 2019	IS	Senior Design 2	3			
	CIS	4367	FA 2019	IS	Computer Security	3	1	0	3 (Dept. Chair)
	COP	2271C	SP 2020	04	Introduction to Computation and Programming	3	5	3	0
	IDS	5975	SP 2020	02	Thesis 2	3			
	EGN	5975	SP 2020	01	Thesis 2	3			
	EGN	5950	SP 2020	02	Project	3			
	CIS	4367	SU A 2020	01	Computer Security	3			
	CEN	4010	SU A 2020	IS	Software Engineering	3			
	Chandrasekaran, Balasubramanian	12 Course(s)					31		
EEL		4664C	FA 2019	01	Kinematics and Control of Robotic Systems	3			
EGN		5970	FA 2019	01	Thesis 1	3			
EEL		4768C	FA 2019	04	Computer Architecture and Organization	3			
EGS		5930	FA 2019	01	Advanced Kinematics and Control of Robotic Systems	3	4	1	0
EEL		4768C	SP 2020	02	Computer Architecture and Organization	3	1	1	0

Faculty Name	Dept	Course	Term	Section	Course Name	Credits	Rsch Credit	Service Credit	Other (Noted)
	EEL	4768C	SP 2020	03	Computer Architecture and Organization	3			
	EGN	1007C	SP 2020	09	Concepts and Methods	1			
	EEL	4660C	SP 2020	01	Autonomous Robotic Systems	3			
	EEL	5669C	SP 2020	01	Autonomous Robotic Systems	3			
	EGN	5975	SP 2020	03	Thesis 2	3			
	EEL	4768C	SU C 2020	01	Computer Architecture and Organization	3			
Chintakunta, Harish	<b>9 Course(s)</b>					<b>32</b>			
	EEE	3304C	FA 2019	IS	Analog Electronics	3			
	EEL	3111C	FA 2019	03	Circuits 1	4			
	EEL	3111C	FA 2019	04	Circuits 1	4			
	EGN	4930B	FA 2019	03	Software Defined Radio Communications	3			
	EEL	4515	FA 2019	IS	Digital Communication Systems	3	3	1	0
	EEL	3111C	SP 2020	02	Circuits 1	4	3	1	0
	EEL	3111C	SP 2020	01	Circuits 1	4			
	EEL	4515	SP 2020	01	Digital Communication Systems	3			
	EEL	3111C	SU C 2020	01	Circuits 1	4			
Demirel, Doga	<b>11 Course(s)</b>					<b>33</b>			
	COP	4934C	FA 2019	03	Senior Design 1	3			
	COP	4934C	FA 2019	04	Senior Design 1	3			
	CEN	4073	FA 2019	01	Software Requirements Engineering	3	2	2	0
	COP	4935C	SP 2020	01	Senior Design 2	3	1	1	0
	COP	4935C	SP 2020	02	Senior Design 2	3			
	COP	4935C	SP 2020	03	Senior Design 2	3			
	CEN	4065	SP 2020	IS	Software Design and Architecture	3			
	CEN	4072	SP 2020	IS	Software Verification and Quality Assurance	3			
	COP	4935C	SP 2020	IS1	Senior Design 2	3			
	COP	4935C	SP 2020	IS2	Senior Design 2	3			
	COP	4935C	SP 2020	IS3	Senior Design 2	3			

Faculty Name	Dept	Course	Term	Section	Course Name	Credits	Rsch Credit	Service Credit	Other (Noted)
Habib, Md Selim	7 Course(s)					19			
	EEE	3310	FA 2019	01	Digital Electronics	3			
	EEE	4351	FA 2019	01	Electronic Devices	3			
	EEL	4448	FA 2019	01	Optoelectronics	3	2	1	0
	EEE	3304C	SP 2020	01	Analog Electronics	3	3	1	0
	EEE	4376	SP 2020	01	Analog Integrated Circuits	3			
	EGN	1007C	SP 2020	03	Concepts and Methods	1			
	EEE	3310	SP 2020	IS	Digital Electronics	3			
Hamam, Abdelwahab	7 Course(s)					21			
	CAP	4034	FA 2019	01	Computer Animation	3			
	CEN	4010	FA 2019	01	Software Engineering	3			
	CEN	4010	FA 2019	02	Software Engineering	3	2	2	0
	CAP	4122	SP 2020	01	Virtual Reality	3	2	1	0
	CEN	4010	SP 2020	01	Software Engineering	3			
	CEN	4010	SP 2020	02	Software Engineering	3			
	CEN	4010	SU A 2020	01	Software Engineering	3			
Karaman, Bayazit	7 Course(s)					21			
	COP	4415	FA 2019	01	Data Structures	3			
	COP	4415	FA 2019	02	Data Structures	3			
	CDA	2108	FA 2019	02	Introduction to Computer Systems	3	3	1	0
	CDA	2108	SP 2020	01	Introduction to Computer Systems	3	2	1	0
	COP	3337C	SP 2020	01	Object Oriented Programming	3			
	COP	3337C	SP 2020	02	Object Oriented Programming	3			
	COP	4415	SU A 2020	01	Data Structures	3			
Khalghani, Mohammad Reza	6 Course(s)					18			
	EEL	3287	FA 2019	01	Renewable Energy and Sustainability	3			
	IDS	1380	FA 2019	02	Introduction to STEM	3			
	EEL	4251	FA 2019	IS	Power System Analysis	3	5	1	0
	EEL	4283	SP 2020	01	Renewable Energy Systems	3	5.5	1	0
EEL	4290	SP 2020	01	Sustainability Engineering,	3				

Faculty Name	Dept	Course	Term	Section	Course Name	Credits	Rsch Credit	Service Credit	Other (Noted)
					Technology & Entrepreneurship				
	EEL	5286	SP 2020	01	Advanced Renewable Energy Systems	3			
Mahmood, Hisham	7 Course(s)					21			
	EEL	3135	FA 2019	01	Systems and Signals	3			
	EEL	4220	FA 2019	01	Electronic Motor Control	3			
	EEL	5235	FA 2019	01	Electronic Motor Control	3			
	EGN	5970	FA 2019	01	Thesis 1	3	5	1	0
	EEL	3135	SP 2020	01	Systems and Signals	3	4	1	0
	EEL	3211	SP 2020	01	Basic Electric Energy Engineering	3			
	EGN	5975	SP 2020	05	Thesis 2	3			
Patel, Ashokkumar	8 Course(s)					24			
	CIS	4204	FA 2019	01	Ethical Hacking	3			
	CIS	4369	FA 2019	01	Web Application Security	3			
	CIS	4204	FA 2019	02	Ethical Hacking	3	2	2	0
	CIS	4204	SP 2020	01	Ethical Hacking	3	2	1	0
	COP	2271C	SP 2020	05	Introduction to Computation and Programming	3			
	COP	3337C	SP 2020	03	Object Oriented Programming	3			
	CIS	4369	SP 2020	IS	Web Application Security	3			
	COP	3337C	SU A 2020	01	Object Oriented Programming	3			
Rashid, Muhammad	5 Course(s)					15			
	EEL	4242	FA 2019	01	Power Electronics Circuits	3			
	EEL	5245	FA 2019	01	Power Electronics	3	1	0	5 (Dept. Chair)
	EEE	5311	SP 2020	01	Analog IC Design	3	1	1.5	6 (Dept. Chair)
	EEL	4242	SP 2020	IS	Power Electronics Circuits	3			
	EEE	4351	SP 2020	IS	Electronic Devices	3			
Sakib, Ashiq	7 Course(s)					21			
	CDA	3631C	FA 2019	01	Embedded Operating Systems	3			
	EEL	3702C	FA 2019	01	Digital Logic Design	3			
	EEL	3702C	FA 2019	03	Digital Logic Design	3	4	1	0

Faculty Name	Dept	Course	Term	Section	Course Name	Credits	Rsch Credit	Service Credit	Other (Noted)
	EEL	3702C	SP 2020	03	Digital Logic Design	3	5	1	0
	EEL	4685C	SP 2020	01	Embedded Control	3			
	EEL	5685C	SP 2020	01	Embedded Control	3			
	EEL	4685C	SP 2020	IS	Embedded Control	3			
Toker, Onur	<b>6 Course(s)</b>					<b>16</b>			
	EEL	4914C	FA 2019	01	Senior Design 1	3			
	EEL	4915C	FA 2019	01	Senior Design 2	3			
	EEL	4746C	FA 2019	03	Microcomputers	3	2	1	0
	EEL	4914C	SP 2020	01	Senior Design 1	3	3	1	0
	EEL	4915C	SP 2020	01	Senior Design 2	3			
	EGN	1007C	SP 2020	05	Concepts and Methods	1			
Ullah, Muhammad	<b>10 Course(s)</b>					<b>27</b>			
	CDA	4210	FA 2019	01	VLSI Design	3			
	EEE	4510	FA 2019	01	Digital Signal Processing	3			
	EEL	3702C	FA 2019	04	Digital Logic Design	3			
	EGN	5970	FA 2019	01	Thesis 1	3	0	1	0
	EEL	3702C	SP 2020	01	Digital Logic Design	3	3.5	1	0
	EEL	3702C	SP 2020	02	Digital Logic Design	3			
	EEL	4794	SP 2020	01	Power Aware Design	3			
	EGN	5975	SP 2020	02	Thesis 2	3			
	EEL	3112C	SU C 2020	01	Circuits 2	3			
Notes on this table: teaching workload source is SIS; instances of same course at both 4000 and 5000-level <i>indicate cross-list (one) delivery</i> . Research/Service, and Other (noted) credit is taken from Faculty Activity Reports developed each academic term; first line represents fall, second line spring. The total credits for the AY may be as many as 15 = 1 FTE, though closer to 12 is typical. CVs indicate specifics on research and service activity. This table documents assigned workload only. Workload Credits normally correspond with course credits except in C-courses, Thesis, and IS, where the value is lower due to shared load among faculty, student support, or in other cases small, focused enrollment.									

## 2020 – 2021

Faculty Name	Dept	Course	Term	Section	Course Name	Credits	Rsch Credit	Service Credit	Other (Noted)
Adia, Rawwa	<b>8 Course(s)</b>					<b>24</b>			
	EEL	4746C	FA 2020	01	Microcomputers	3			

	EEL	4746C	FA 2020	02	Microcomputers	3			
	EEL	4332	FA 2020	01FX	Intro to Autonomous Vehicles	3			
	EGN	5970	FA 2020	06	Thesis 1	3	4.5	1	0
	EEL	4746C	SP 2021	01FX	Microcomputers	3	4.5	1	0
	EEL	4746C	SP 2021	02FX	Microcomputers	3			
	EGN	5975	SP 2021	01	Thesis 2	3			
	EEL	4333	SP 2021	01	Autonomous Vehicle Design and Applications	3			
Al-Nashif, Youssif	<b>9 Course(s)</b>					<b>27</b>			
	CIS	4367	FA 2020	01FX	Computer Security	3			
	COP	3834C	FA 2020	01OL	Web Application Development	3			
	EEL	5741C	FA 2020	01FX	Microcomputers	3			
	EGN	5970	FA 2020	07	Thesis 1	3	2	2	0
	COP	2271C	SP 2021	04FX	Introduction to Computation and Programming	3	2	1	0
	COP	2271C	SP 2021	06FX	Introduction to Computation and Programming	3			
	EEL	4321C	SP 2021	IS	Hardware in the Loop Simulation	3			
	EGN	5975	SP 2021	05	Thesis 2	3			
	CDA	2108	SP 2021	02FX	Introduction to Computer Systems	3			
	Chandrasekaran, Balasubramanian	<b>12 Course(s)</b>					<b>36</b>		
EEL		4664C	FA 2020	01FX	<i>Kinematics and Control of Robotic Systems</i>	3			
EEL		4768C	FA 2020	01FX	Computer Architecture and Organization	3			
EEL		4768C	FA 2020	02FX	Computer Architecture and Organization	3			
EEL		5930	FA 2020	01FX	<i>Advanced Kinematics and Control of Robotic Systems</i>	3			
EEL		4768C	FA 2020	04OL	Computer Architecture and Organization	3			

	EGN	5970	FA 2020	04	Thesis 1	3	2	1	0
	EEL	4768C	SP 2021	01FX	Computer Architecture and Organization	3	2	1	0
	EEL	4768C	SP 2021	02FX	Computer Architecture and Organization	3			
	EEL	4768C	SP 2021	03FX	Computer Architecture and Organization	3			
	EGN	5975	SP 2021	04	Thesis 2	3			
	EEL	4660C	SP 2021	01	Autonomous Robotic Systems	3			
	EEL	5669C	SP 2021	01	Autonomous Robotic Systems	3			
Chintakunta, Harish	<b>11 Course(s)</b>					<b>35</b>			
	EEE	4510	FA 2020	01OL	Digital Signal Processing	3			
	EEL	3111C	FA 2020	03FX	Circuits 1	4			
	EEL	3111C	FA 2020	04FX	Circuits 1	4	2	1	0
	EEE	4510	SP 2021	01FX	Digital Signal Processing	3	2	1	0
	EEE	5507	SP 2021	01FX	Advanced Digital Signal Processing	3			
	EEL	3111C	SP 2021	01FX	Circuits 1	4			
	EEL	3111C	SP 2021	02FX	Circuits 1	4			
	EEL	3111C	SP 2021	03FX	Circuits 1	4			
	EEL	4515	SP 2021	01FX	Digital Communication Systems	3			
	EEL	5521	SP 2021	01FX	Advanced Digital Communications	3			
	Demirel, Doga	<b>13 Course(s)</b>					<b>39</b>		
CAP		4730	FA 2020	01FX	Computer Graphics	3			
CEN		4073	FA 2020	01FX	Software Requirements Engineering	3			
COP		4934C	FA 2020	03FX	Senior Design 1	3			
COP		4934C	FA 2020	IS	Senior Design 1	3			
COP		4935C	FA 2020	IS	Senior Design 2	3	2	1	2.0 (Supervision of Interns)
CAP		4730	SP 2021	01FX	Computer Graphics	3	2	1	0
COP		4935C	SP 2021	02FX	Senior Design 2	3			

	COP	4935C	SP 2021	03FX	Senior Design 2	3			
	CEN	4065	SP 2021	IS	Software Design and Architecture	3			
	CAP	5930	SP 2021	01	Advanced Graphics	3			
	COP	4934C	SP 2021	IS	Senior Design 1	3			
	COP	4935C	SP 2021	IS	Senior Design 2	3			
	IDS	5970	SP 2021	02	Thesis 1	3			
		<b>8 Course(s)</b>				<b>22</b>			
Habib, Md Selim	EEE	3310	FA 2020	01FX	Digital Electronics	3			
	IDS	1380	FA 2020	07FX	Introduction to STEM	3			
	EEE	4376	FA 2020	IS	Analog Integrated Circuits	3			
	EEE	3351	<b>FA 2020</b>	01FX	Electronic Devices	3	2	1	0
	EEE	4376	<b>SP 2021</b>	01	Analog Integrated Circuits	3	2	1	0
	EGN	1007C	SP 2021	02OL	Concepts and Methods	1			
	EEE	4304C	SP 2021	01	Analog Electronics	3			
	IDS	1380	SP 2021	04FX	Introduction to STEM	3			
			<b>10 Course(s)</b>				<b>30</b>		
Hamam, Abdelwahab	CAP	4034	FA 2020	01OL	Computer Animation	3			
	CEN	4721	FA 2020	01FX	Human Computer Interaction	3			
	COP	2271C	FA 2020	05FX	Introduction to Computation and Programming	3			
	IDS	5970	<b>FA 2020</b>	07	Thesis 1	3	2	1	0.5 (Other Instruction)
	CAP	4122	<b>SP 2021</b>	01	Virtual Reality	3	2	1	
	COP	3530	SP 2021	01FX	Data Structures & Algorithms	3			
	IDS	5975	SP 2021	03	Thesis 2	3			
	CEN	4072	SP 2021	01	Software Verification and Quality Assurance	3			
	CEN	4721	SP 2021	IS	Human Computer Interaction	3			
	CAP	4034	SP 2021	IS	Computer Animation	3			

<b>Karaman, Bayazit</b>	<b>6 Course(s)</b>					<b>18</b>			
	COP	2271C	FA 2020	01FX	Introduction to Computation and Programming	3			
	COP	4415	FA 2020	02FX	Data Structures	3			
	COP	3337C	<b>FA 2020</b>	03FX	Object Oriented Programming	3	2	1	2.5 (Interns & Other Instr.)
	COP	3337C	<b>SP 2021</b>	01FX	Object Oriented Programming	3	2	1	0
	COP	3337C	SP 2021	03FX	Object Oriented Programming	3			
	COP	3337C	SP 2021	02FX	Object Oriented Programming	3			
<b>Khalghani, Mohammad Reza</b>	<b>12 Course(s)</b>					<b>34</b>			
	EEL	3287	FA 2020	01FX	Renewable Energy and Sustainability	3			
	IDS	1380	FA 2020	10FX	Introduction to STEM	3			
	EEL	4251	FA 2020	01FX	<i>Power System Analysis</i>	3			
	EEL	5250	FA 2020	01FX	<i>Power System Analysis</i>	3			
	EGN	5970	<b>FA 2020</b>	03	Thesis 1	3	2	1	0
	EEL	4283	<b>SP 2021</b>	01	Renewable Energy Systems	3	2	1	0
	EEL	5286	SP 2021	01	Advanced Renewable Energy Systems	3			
	EGN	1007C	SP 2021	01OL	Concepts and Methods	1			
	IDS	1380	SP 2021	01FX	Introduction to STEM	3			
	EEL	4312	SP 2021	IS	Electric and Hybrid Vehicles	3			
	EEL	4251	SP 2021	IS	Power System Analysis	3			
	EGN	5975	SP 2021	09	Thesis 2	3			
	<b>Mahmood, Hisham</b>	<b>9 Course(s)</b>					<b>27</b>		
EEE		4531	FA 2020	01FX	Techniques for High Fidelity Signal Acquisition	3			
EEL		3135	FA 2020	01FX	Systems and Signals	3			
EEL		4220	FA 2020	01FX	<i>Electronic Motor Control</i>	3			
EEL		5235	FA 2020	01FX	<i>Electronic Motor Control</i>	3			
EGN		5970	<b>FA 2020</b>	05	Thesis 1	3	3	1.5	0
EEL		3135	<b>SP 2021</b>	01	Systems and Signals	3	3	1.5	0

	EEL	3211	SP 2021	01	Basic Electric Energy Engineering	3			
	EGN	5975	SP 2021	06	Thesis 2	3			
	EEL	4612	SP 2021	01	Control System Design	3			
		<b>8 Course(s)</b>				<b>24</b>			
Patel, Ashokkumar	CIS	4204	FA 2020	02FX	Ethical Hacking	3			
	CIS	4369	FA 2020	01FX	Web Application Security	3			
	COP	5727	FA 2020	01FX	Advanced Database Systems Design	3			
	IDS	5970	<b>FA 2020</b>	02	Thesis 1	3	2	1	0
	CIS	4203	<b>SP 2021</b>	01	Digital Forensics	3	2	1	0
	CIS	4204	SP 2021	01FX	Ethical Hacking	3			
	IDS	5975	SP 2021	05	Thesis 2	3			
	CIS	4203	SP 2021	02	Digital Forensics	3			
			<b>5 Course(s)</b>				<b>15</b>		
Rashid, Muhammad	EEL	4242	FA 2020	01OL	Power Electronics Circuits	3			
	EEL	4652	FA 2020	01FX	Control Theory	3			
	EEL	5245	<b>FA 2020</b>	01OL	Power Electronics	3	2	1	3 (Dept. Chair)
	EEE	5311	<b>SP 2021</b>	01OL	Analog IC Design	3	2	1	6 (Dept. Chair)
	EEL	4242	SP 2021	IS	Power Electronics Circuits	3			
			<b>6 Course(s)</b>				<b>18</b>		
Sakib, Ashiq	CDA	3631C	FA 2020	01FX	Embedded Operating Systems	3			
	EEL	3702C	<b>FA 2020</b>	01	Digital Logic Design	3	5	1	0
	EEL	3702C	<b>SP 2021</b>	02	Digital Logic Design	3	2	1	0
	EEL	3702C	SP 2021	03	Digital Logic Design	3			
	EEL	4685C	SP 2021	01	<i>Embedded Control</i>	3			
	EEL	5685C	SP 2021	01	<i>Embedded Control</i>	3			
			<b>9 Course(s)</b>				<b>27</b>		
Toker, Onur	EEL	4914C	FA 2020	01FX	Senior Design 1	3			

	EEL	4915C	FA 2020	01FX	Senior Design 2	3			
	EGN	5970	FA 2020	01	Thesis 1	3			
	EEL	4724	<b>FA 2020</b>	01FX	Hardware Design with FPGAs and Reconfigurable Computing	3	2	1	0
	EEL	4759	<b>SP 2021</b>	01FX	Digital Image Processing	3	2	1	0
	EEL	4914C	SP 2021	01FX	Senior Design 1	3			
	EEL	4915C	SP 2021	01FX	Senior Design 2	3			
	EEL	5820	SP 2021	01FX	Digital Image Processing	3			
	EGN	5975	SP 2021	07	Thesis 2	3			
		<b>13 Course(s)</b>				<b>39</b>			
<b>Ullah, Muhammad</b>	CDA	4210	FA 2020	01FX	VLSI Design	3			
	EEL	3112C	FA 2020	01	Circuits 2	3			
	EEL	3112C	FA 2020	02	Circuits 2	3			
	EEL	3702C	FA 2020	02	Digital Logic Design	3			
	EEL	3702C	FA 2020	03	Digital Logic Design	3			
	EGN	5970	<b>FA 2020</b>	02	Thesis 1	3	2	1.5	0
	EEL	3112C	<b>SP 2021</b>	01FX	Circuits 2	3	2	1	0
	EEL	3112C	SP 2021	02FX	Circuits 2	3			
	EEL	3702C	SP 2021	01	Digital Logic Design	3			
	EEL	4794	SP 2021	01	Power Aware Design	3			
	EEL	5930	SP 2021	02	Advanced Power Aware Design	3			
	EGN	5975	SP 2021	08	Thesis 2	3			
	CDA	4210	SP 2021	IS	VLSI Design	3			
	Notes on this table: teaching workload source is SIS; instances of same course at both 4000 and 5000-level <i>indicate cross-list (one) delivery</i> . Research/Service, and Other (noted) credit is taken from Faculty Activity Reports developed each academic term; first line represents fall, second line spring. The total credits for the AY may be as many as 15 = 1 FTE, though closer to 12 is typical. CVs indicate specifics on research and service activity. This table documents assigned workload only. Workload Credits normally correspond with course credits except in C-courses, Thesis, and IS, where the value is lower due to shared load among faculty, student support, or in other cases small, focused enrollment.								
<b>Spring 2021 Faculty Activity Report forms show estimate for research and service at the time of this submission.</b>									