FLORIDA POLYTECHNIC UNIVERSITY

Board of Trustees Meeting

Wednesday, January 16, 2019
4:00 PM - 5:00 PM

TELE-CONFERENCE MEETING

Dial In Number: 240-454-0887 | Access Code: 646 580 889

Don Wilson, Chair	**Cliff Otto, Vice Chair**	**Mark Bostick**
Dr. Jim Dewey	**Rear Admiral Philip Dur**	**Dr. Richard Hallion**
Travis Hills	**Frank Martin**	**Henry McCance**
Dr. Adrienne Perry	**Dr. Louis Saco**	**Bob Stork**
Gary C. Wendt		

AGENDA

I.	Call to Order	Don Wilson, Chair
II.	Roll Call	Michele Rush
III.	Public Comment	Don Wilson, Chair
IV.	Approval of New Academic Degree Programs *Action Required*	Dr. Terry Parker
V.	Approval of Collective Bargaining Agreement *Action Required*	Dr. Terry Parker
VI.	Adopt Third Amended and Restated Bylaws *Action Required*	Gina DeIulio
VII.	Closing Remarks and Adjournment	Don Wilson, Chair

AGENDA ITEM: IV.

Florida Polytechnic University
Board of Trustees Meeting
January 16, 2019

Subject: New Academic Degree Programs

Proposed Committee Action

Recommend approval of the following degree programs:

- Bachelor of Science in Engineering Physics
- Bachelor of Science in Engineering Mathematics
- Bachelor of Science in Environmental Engineering

Background Information

Dr. Terry Parker will present the formal degree program proposals for review and approval by the Board of Trustees in compliance with FPU-5.0001AP and BOG Regulation 8.011.

Supporting Documentation: PowerPoint Presentation and Degree Program Proposals (3 PDFs).

Prepared by: Dr. Terry Parker, Executive Vice President and Provost

FLORIDA POLYTECHNIC UNIVERSITY

Special Board Meeting:
Degree Proposal Approvals
and
Collective Bargaining Agreement Approval

Terry Parker

January 16, 2018

Today: Degree Approvals and Collective Bargaining Agreement

- **Degree approvals**
  - **Engineering Mathematics**
  - **Engineering Physics**
  - **Environmental Engineering**
- **Collective Bargaining Agreement**
  - **Formal discussion and request for Board approval**

Within the Florida SUS*, approval of new degrees requires several formal steps

- **Degree "approval" process**
  - Initial development
  - Presentation to Council of Academic Vice Presidents for the State University System
  - Concept approval from the Board of Trustees (BOT)
  - Formal proposal development
  - BOT approval of formal proposal
  - Submission to Board of Governors staff
  - Addition to the Inventory of Degrees after acceptance of the proposal
- **BOT approval is of the Formal proposal for each degree**
  - The template is provided by the Board of Governor's staff

We are Here

*SUS – State University System

The three degrees are added with different foundational philosophies

- **Degree Philosophy**
  - **Environmental Engineering: Application area that has demonstrated demand,**
    - ***Concentration in Hydrology***
    - ***Organizational foundation in Florida Industrial and Phosphate Research Institute***
  - **Engineering Physics and Engineering Mathematics:**
    - ***traditional fields with a forward thinking application overlay (including nontraditional concentrations)***
  - **Mathematics is Engineering Mathematics**
    - ***Concentration in Mathematical Medicine and Biology***
    - ***Concentration in Complex Systems Mathematics***
  - **Physics is Engineering Physics**
    - ***Concentration in Physics of Space***
    - ***Concentration in Physics of Medicine (Premed)***
    - ***Concentration in Energy and Sustainability***

Each degree is supported by employment demand and student demand

- **Job Growth**
  - **Environmental Engineering, state employment growth 18.5% 2016 to 2026**
  - **Mathematics, 33% growth nationwide 2016 to 2026**
    - ***2026, 13500 positions***
  - **Engineering Physics, 14 percent (2016 to 2026) growth rate based on applicable occupations**
- **Student Demand**
  - **Environmental Engineering, ~25% growth 2014 to 2024 within the SUS***
  - **Applied Mathematics demand based on degree completions in the southeast region projected up by 21% (applied mathematicians) and 39% (statisticians)***
  - **Engineering Physics, number of students interested in Physics has increased by 22% in the past five years****
    - ***Combining a pure science with ties to application areas***

* *Ten year projection by Hanover Research, ** based on expressions of interest from SAT testing*

Curriculum Overview, Common elements

- Common Freshman Year
  - Includes the foundation sequence (8 units)
- Mathematics
  - 18 units
- Arts and Humanities
  - 15 units
- Foundational Sciences
  - 16 credits
- Capstone Sequence (4 credits minimum)
- Required Internship

Specific Degree Elements

- **Environmental Engineering**
  - Arts and Humanities, 3 additional credits
  - Engineering Fundamentals, 13 credits
  - Core Program Classes, 24 credits
  - Applied Research, 4 credits (led by FIPR*)
  - Concentration Electives, 12 credits
  - In-Degree technical elective, 3 credits
- **Engineering Mathematics**
  - Arts and Humanities, 3 additional credits
  - Additional Science courses, 4 credits
  - Foundational math and science, 8 credits
  - Core Program Classes, 30 credits
  - Concentration Electives, 12 credits
  - Capstone Sequence, 2 credits in addition to those listed as common

* FIPR is Florida Industrial and Phosphate Research Institute

FLORIDAPOLY

- **Engineering Physics**
  - **Additional Science courses, 6 credits**
  - **Foundational math and science, 4 credits**
  - **Core Program Classes, 32 credits**
  - **Concentration Electives, 15 credits**
  - **Capstone Sequence, 2 credits in addition to those listed as common**
- **Degree “Maps” are included at the end of the package**

Expected Student Population

- Year 1
  - ~ 12 students per program (freshman)
- Build each year due to annual admission cycle
- Transfers into the degree from other universities starting in year 3
- Year 5
  - ~90 students (head count) for Eng. Math and Eng. Physics
  - ~115 students (head count) for Env. Eng.

Resources

- **Total New Faculty Required**
  - Eng. Math., up to 5 new faculty
  - Eng. Physics, up to 5 new faculty
  - Env. Eng., up to 6 new faculty
  - Recruited over a three year period
- **Equipment for Teaching Laboratories**
  - Eng. Math, ~$70k
  - Eng. Physics, ~150k
  - Env. Eng., ~90k

Resources

- **Support staff**
  - **Possible small growth in administrative support, laboratory technician support, student advising support**
- **Space**
  - **Faculty offices: very tight**
  - **Laboratory space for teaching: Shared laboratory resource with existing Biology, Chemistry, and Physics**
  - **Functions are included in planning for the ARC**

Proposed Resolutions

Proposed Resolution #1

The Academic and Student Affairs Committee recommends approval of the Environmental Engineering Degree

Proposed Resolution #2

The Academic and Student Affairs Committee recommends approval of the Engineering Mathematics Degree

Proposed Resolution #3

The Academic and Student Affairs Committee recommends approval of the Engineering Physics Degree

Collective Bargaining Agreement Approval

- **Discussion or Questions??**

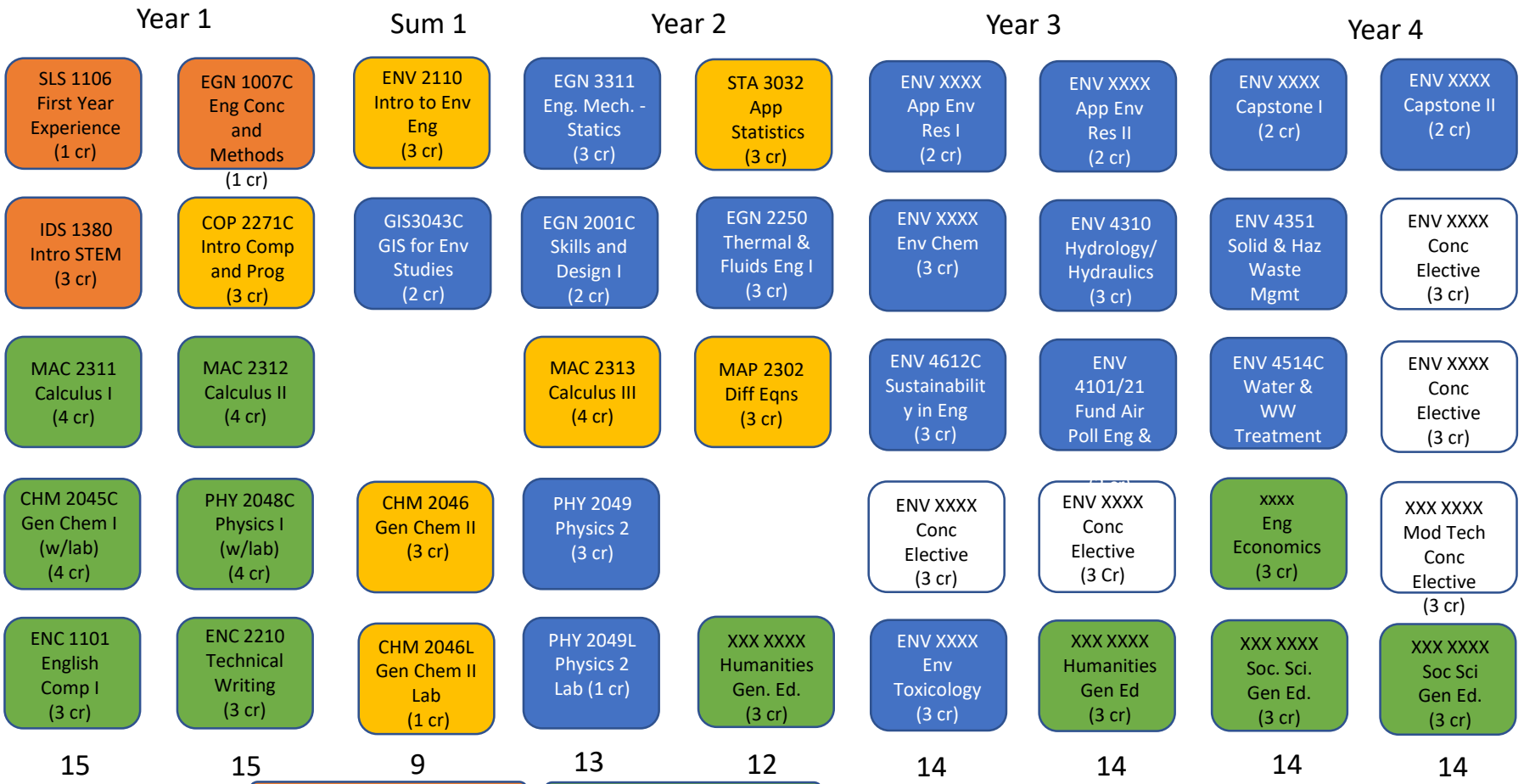
Proposed Resolution: **The Academic and Student Affairs Committee recommends approval of the Collective Bargaining Agreement that was ratified by the United Faculty of Florida, Florida Polytechnic University Chapter on January 15, 2018.**

FLORIDA POLYTECHNIC UNIVERSITY

Degree “Maps”

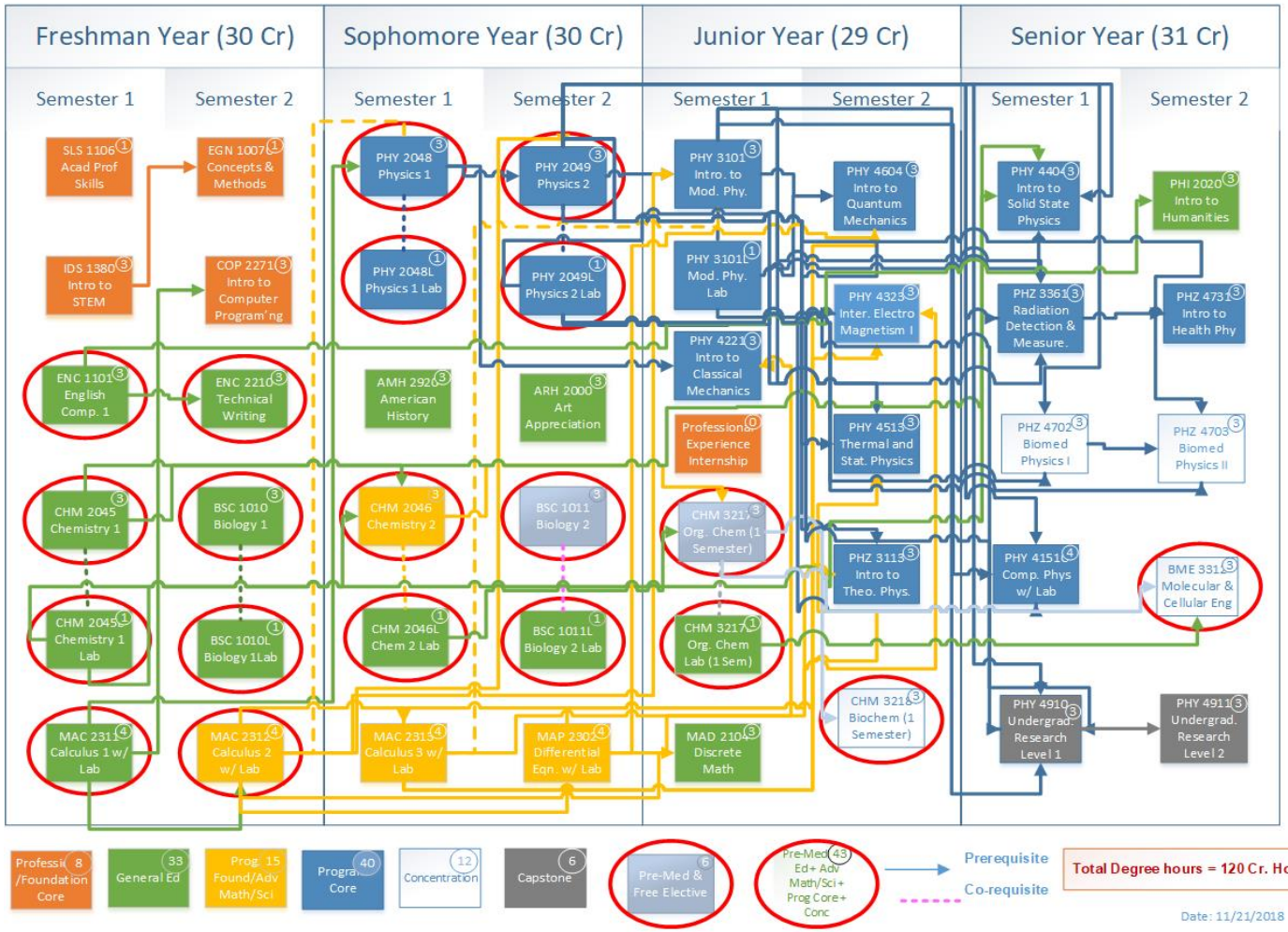
January 16, 2018

Environmental Engineering Degree

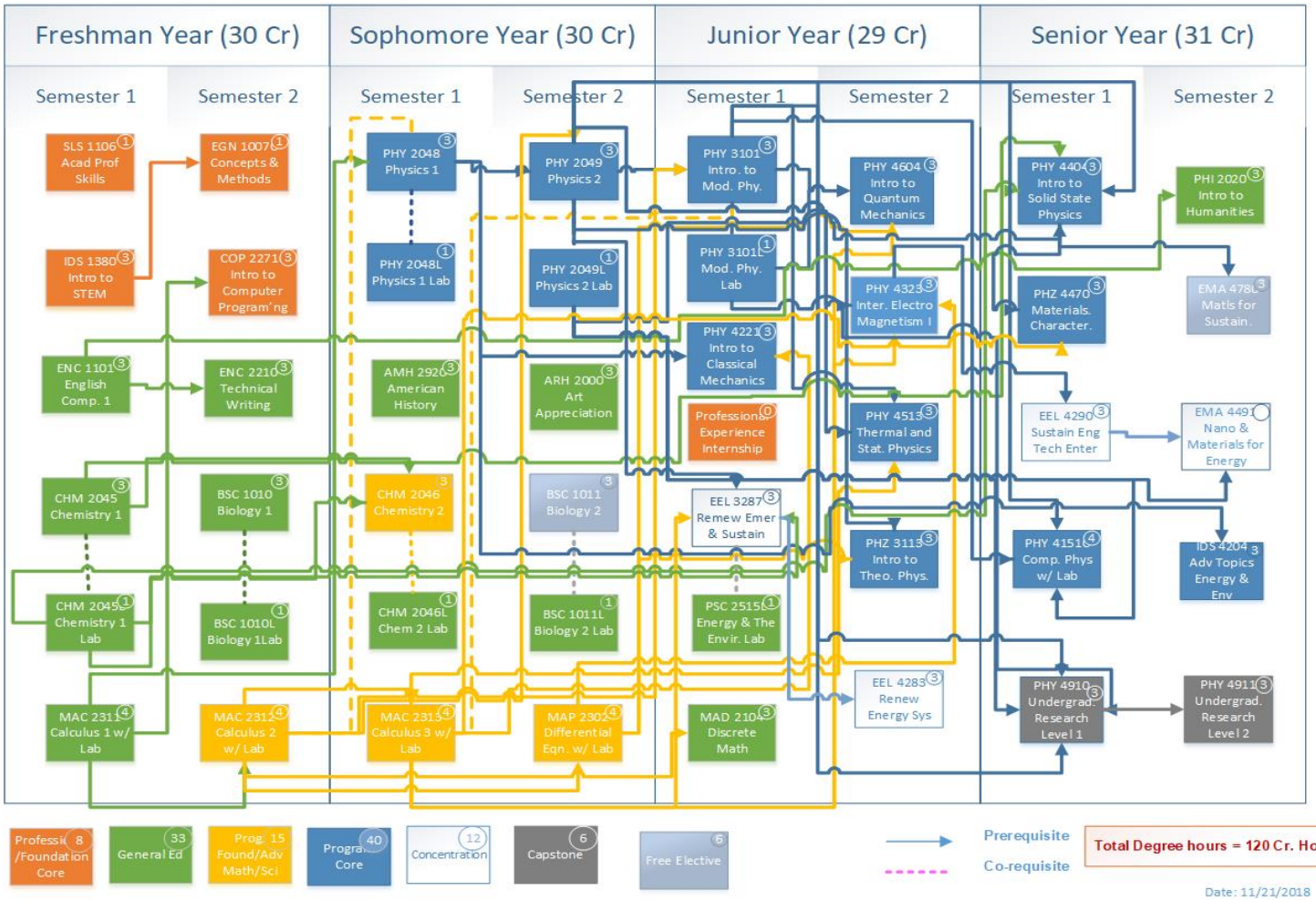


FLORIDA POLYTECHNIC UNIVERSITY

BS in Engineering Physics
Physics of Medicine Concentration (w/ Pre Med Option) – Course Map

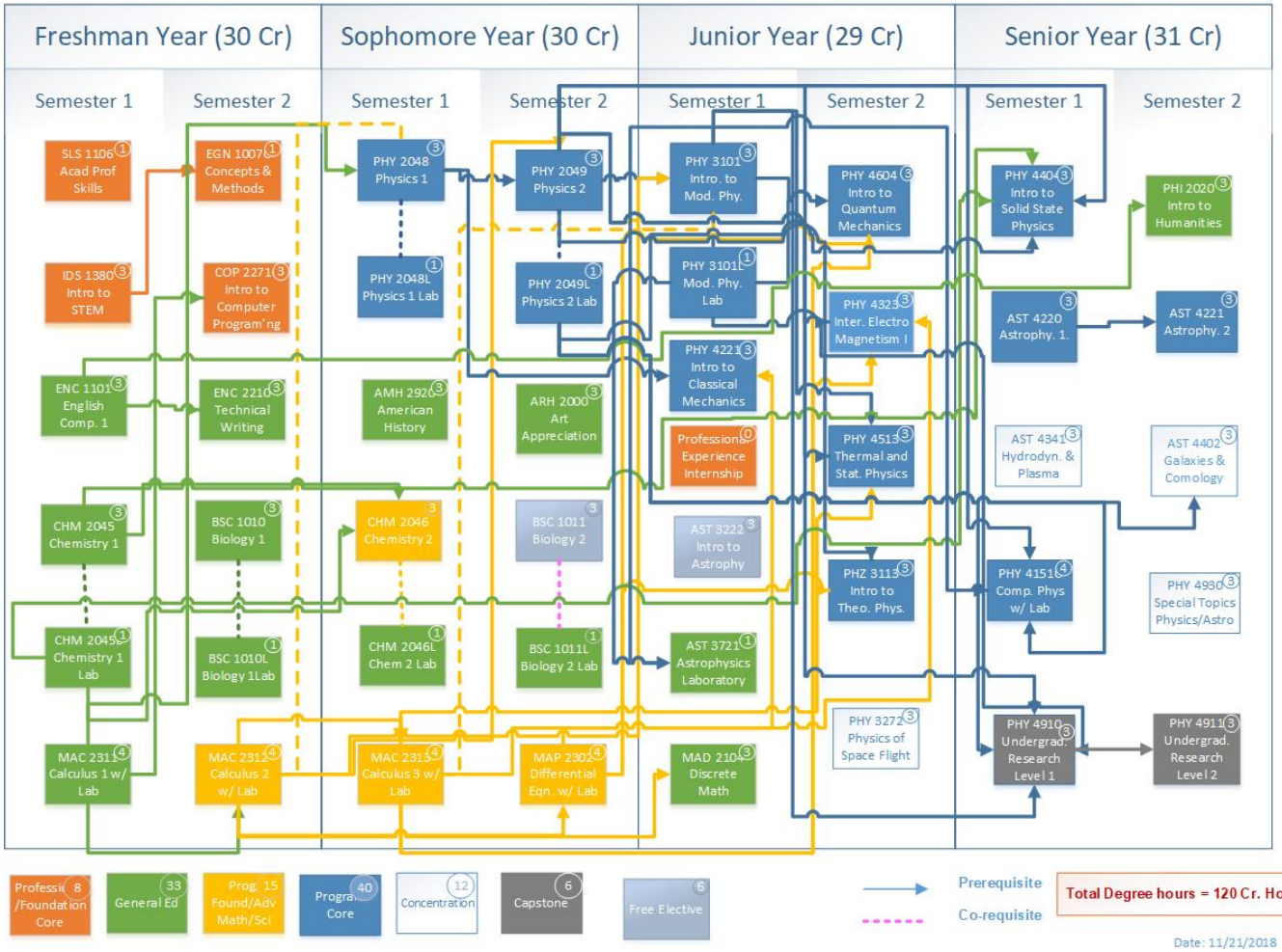


BS in Engineering Physics
Physics of Energy & Sustainability Concentration – Course Map



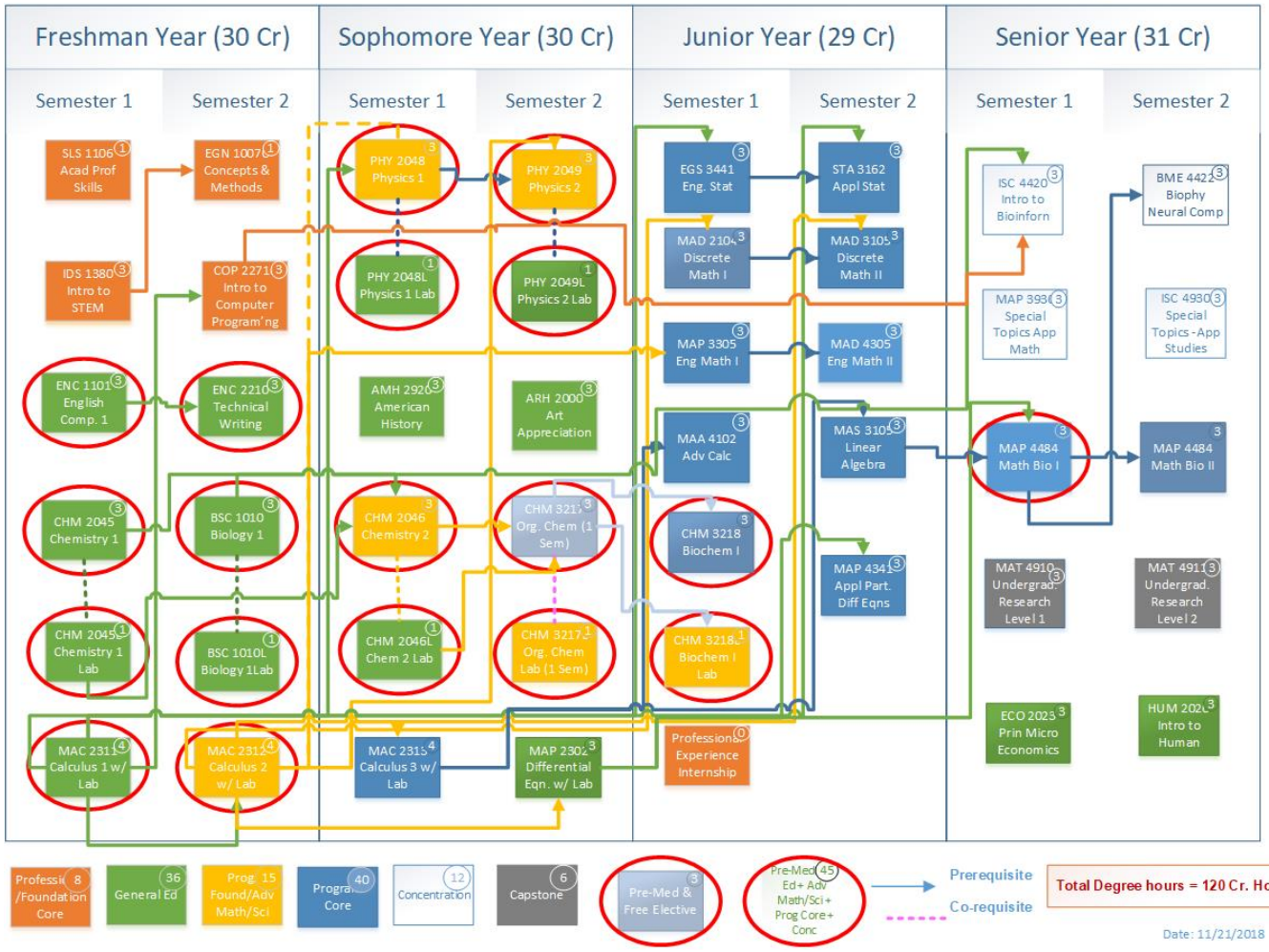
Date: 11/21/2018

BS in Engineering Physics
Physics of Space Concentration – Course Map

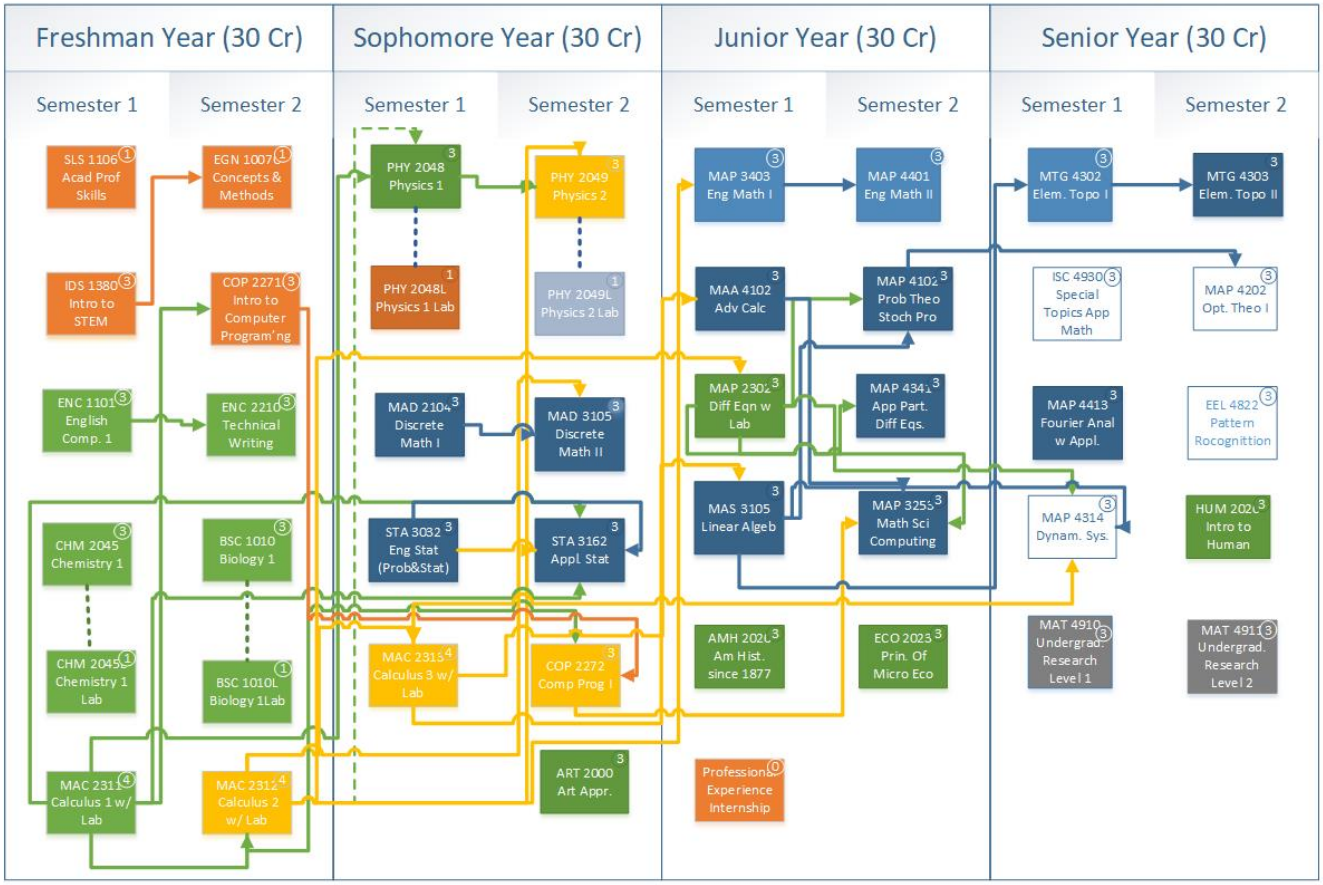


Date: 11/21/2018

BS in Engineering Mathematics
Mathematical Medicine & Biology (w/ Pre Med Option) – Course Map



BS in Engineering Mathematics
Complex Systems – Course Map



Board of Governors, State University System of Florida

Request to Offer a New Degree Program

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

Florida Polytechnic University	**Fall 2019**
University Submitting Proposal	**Proposed Implementation Term**
Division of Science, Arts, and Mathematics; Department of Natural Sciences	
Name of College(s) or School(s)	**Name of Department(s)/ Division(s)**
	B.S. in Engineering Physics
Academic Specialty or Field	**Complete Name of Degree**
14.1201	
Proposed CIP Code	

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**	**Date**	
Signature of Chair, Board of Trustees	**Date**	**Vice President for Academic Affairs**	**Date**

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 in Appendix A. Indicate the program costs for the first and the fifth years of implementation as shown in the appropriate columns in Table 2 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	Projected Enrollment (From Table 1)		Projected Program Costs (From Table 2)				
	HC	FTE	E&G Cost per FTE	E&G Funds	Contract & Grants Funds	Auxiliary / Philanthropy Funds	Total Cost
Year 1	12	12	$27,447	$329,362	0	0	$329,362
Year 2	30	30					
Year 3	68	58					
Year 4	84	74					
Year 5	90	80	$11,778	$942,268	0	0	$942,268

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.

(a) The proposed Bachelor of Science in Engineering Physics will be offered within the Department of Natural Sciences in the Division of Science, Arts, and Mathematics (SAM). The B.S. degree program in Engineering Physics will prepare aspiring students to be knowledgeable in conceptual understanding of Physics and critical thinking encompassed with problem solving skills. The acquisition of the above skills are paramount values for Poly Physics Majors to get ready for high paying industrial jobs, or graduate school in Advanced Physics, Engineering, or related disciplines.

(b) The proposed program in engineering physics has three concentrations (i) Physics of Medicine, (ii) Physics of Space and (iii) Physics of Energy and Sustainability. Each concentration has 4 concentration focused courses (12 credits) which enable students to obtain depth in that subfield. The Physics of Medicine concentration has Pre-Med Track embedded.

(c) The Bachelor of Science in Engineering Physics will be offered in 8 semesters (4 years) for a total of 120 credit hours.

(d) The program in Engineering Physics focuses on the use of Physics in the analysis and evaluation of engineering problems and scientific applications. Engineering Physics offers a unique program in which students acquire the in-depth understanding of concepts based on defined physics principles and theoretical derivations, while also practicing its real world applications. The Engineering Physics program is proposed to fill the gaps what the current Engineering programs are missing, that is to use the Physics principles and provide innovative solutions to problems of industrial value.

Florida Poly's current engineering programs are focused on preparing students for the practice of engineering in fields such as Mechanical, Electrical and Computer engineering. A new Engineering Physics program would offer our students an alternative track that develops a stronger understanding of the underlying science and mathematics of engineering, as well as the application of the scientific methods to engineering problems. In comparison to a standard engineering degree, a graduate of Engineering Physics is better prepared for technical R&D jobs, developing new knowledge in the sphere of engineering problems, and enrolling in Master's or Ph.D. programs of both Physics and Engineering. An Engineering Physics bachelor's degree offers diverse employment opportunities in research, space and astronomy, healthcare, engineering, energy, environment science, and technology. Graduates of Engineering Physics will have ample of opportunities as engineers/physicist in National Laboratories, High-Tech Industries (GE, GM, Raytheon, Harris, Intel, IBM, Google, Mosaic etc.), Department of Defense, Air force and Military, NASA, Higher Education (MS or PhD programs), regional, state and federal government agencies.

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 CAVP Academic Program Coordination group on April 6, 2018. No concerns were raised.

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).

Directly Support
Florida Polytechnic University's proposed Bachelor of Science program in Engineering Physics will directly support the following SUS Strategic Planning 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
    - Productivity Goal: Increase undergraduate participation in research to strengthen the pipeline of researchers pursuing graduate degrees.

Indirectly Support

- Teaching and Learning Goal to strengthen quality and reputation of academic programs and universities;
- Scholarship, Research, and Innovation Goals to strengthen the quality and reputation and increase collaboration through external funding and collaboration with private industry (research and commercialization).

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:

1. Critical Workforce:
    - Education
    - Health
    - Gap Analysis
2. Economic Development:
    - Global Competitiveness
3. 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 Bachelor of Science in Engineering Physics (CIP 14.) would be included as a program of strategic emphasis under Economic Development – STEM.

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.

All courses will be offered at Florida Polytechnic University's J.D. Alexander, main campus.

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.

As the only state institution in Florida dedicated wholly to STEM education, Florida Polytechnic University is working to build its portfolio of STEM programs at the undergraduate level. The university is seeking to establish a mix of both traditional science and engineering programs along with a smaller selection of specialized programs on the leading edge of technology. As a new, growing institution, engineering physics is a unique blend of engineering foundations and physics that grounds the "S" in this STEM institution as the first "traditional" science degree program at the University.

To help in identifying viable traditional and specialized programs to grow the University's portfolio, Florida Poly has conducted research internally and worked with Hanover Research to develop a shortlist of programs that demonstrate viability for meeting national, state, and local needs. Based on our research findings, institutional capacity and mission, the university chose to develop a program in engineering physics with focuses in the physics of medicine, the physics of space, and the physics of energy and sustainability.

Hanover's market analysis for engineering physics reviewed occupations profiled by O*Net OnLine (https://www.onetonline.org/) for which engineering and physics knowledge areas (and degree holders) are prevalent. The analysis shows that graduates of an engineering physics program enter many specialized engineering disciplines such as laser engineering, nuclear engineering, process engineering, and metallurgical engineering as well as closely related fields that draw on analytical and scientific skills. Overall, Hanover suggests that program requiring knowledge of both engineering and physics prepares students for a broad range of fields across all industry sectors but heavily in areas such as government, defense contractors, and healthcare. The proposed engineering physics program's concentrations are designed to tap into all of these markets and more. A regional and state look at employment opportunities 2014 – 2024 shows growth for physicists, engineers in general, and related fields.

SOC Code + Title	Southeast					Florida				
	Employment		Change		Annual Average Openings	Employment		Change		Annual Average Openings
	2014	2024	Number	Percent		2014	2024	Number	Percent	
11-9121 Natural Sciences Managers	7,280	7,950	670	9.2%	210	990	1,170	180	18.2%	40
17-2031 Biomedical Engineers	2,470	3,180	710	28.7%	140	760	1,030	270	35.5%	50
17-2111 Health and Safety Engineers, Ex	7,480	8,400	920	12.3%	330	900	1,120	220	24.4%	50
17-2131 Materials Engineers	3,480	3,770	290	8.3%	180	560	640	80	14.3%	30
17-2199 Engineers, All Other	28,210	30,470	2,260	8.0%	780	4,970	5,660	690	13.9%	170
19-2012 Physicists	3,040	3,380	340	11.2%	110	620	790	170	27.4%	30

Nationally, the Bureau of Labor Statistics shows at 14% growth in the job rate (2016 – 2026), which is faster that the average for all occupations (see https://www.bls.gov/ooh/life-physical-and-social-science/physicists-and-astronomers.htm). The BLS also identifies a range of industries with employment in this occupation, including scientific research and development, general medical and surgical hospitals, navigational and control instruments manufacturing, and so on (see https://www.bls.gov/oes/2017/may/oes192012.htm). The American Institute of Physics (April 2017) provides a detailed view of initial employment for bachelor's degrees in physics, noting that the median starting salary is $55,000. The report also provides detail on employment by industry sector and career satisfaction (see https://www.aip.org/sites/default/files/statistics/employment/bachinitemp-p-

14.1.pdf).

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.

Within the SUS, current enrollments in Physics programs (broad program, two-digit CIP) ranges from 15 (FAMU, on the low end) to 140 (Florida State, on the high end). As a smaller institution but one that is STEM focused, Florida Poly will reasonably attract the enrollment numbers it projects in the proposal. Add to the fact that the program is not just a straight or applied physics program, but one that includes concentrations in pre-med (a growing field), physics of space (important for Florida), and sustainability (also a growing area), and demand will likely follow. To that point, Florida Polytechnic University's admissions staff has informally solicited feedback on its regular recruiting circuit leading up to the fall 2019 class. The number of students expressing interest in majoring in engineering physics in that period is 9,549 students. Given that interest level is considerably higher than what we could reasonably expect to admit, we are confident we will meet the projected enrollments for the next five years.

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.

Currently, there are no SUS institutions offering Engineering Physics/Applied Physics under this CIP code. Under the Physics, general CIP code (40.0801) there were 306 degrees awarded in 2015-2016, and under the two-digit 40 CIP, there were 1,246 total awards in 2015-2016. The closest related program in the SUS is from UWF. UWF's BS in Engineering Physics (Applied Physics) includes specializations in Electronics and Electro-Mechanical Systems (120 Credits) and as of 2017 reported an enrollment of 148, with 47 awards granted in 2015-2016.

Similar programs in the state include the following:

1. Embry-Riddle Aeronautical University: BS Engineering Physics (128 Credits) with concentrations (a) Spacecraft Systems, and (b) Spacecraft Instrumentation.
2. Embry-Riddle Aeronautical University: MS Engineering Physics (30 Credits) with Thesis or Non-Thesis Options
3. Jacksonville University: BS Engineering Physics (62-68 Credits)
4. University of West Florida: BS Engineering Physics (Applied Physics) with specialization in Electronics and Electro-Mechanical Systems (120 Credits).
5. University of Miami: BS Applied Physics (Total 120 Credits, 22 Credits in Physics + 9 Credits of Engineering and Computer Science courses and Electives) – No specialized concentration is offered.
6. University of South Florida – PhD degree in Applied Physics (with specialized concentration in Medical Physics.

The proximity to USF's doctoral program with similar emphases to the proposed program provides an opportunity for advanced study for our graduates.

D. Use Table 1 in 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 has a carefully considered enrollment management growth plan. As such, the enrollment tables were built with several constraints in mind. These include a strong effort at sustainable program growth within the existing and projected facilities resources, projected enrollment over the next five years, and awareness of potential impacts on existing programs.

Florida Poly will open the program admitting only FTICs (no transfers, except for other programs already underway) for the first two years until program core courses are fully offered. All programs at Florida Poly begin with a common freshman year and most of the courses taught in the sophomore year of the plan of study are already offered and staffed. This enables us to observe student interest and recruit from within the existing admissions pool, if needed, while not straining or under-utilizing, current resources.

We do not anticipate significant changes in major; however, we do anticipate that new programs will siphon off some of the prospects other programs might have ordinarily anticipated. (We typically have very low numbers of students who change major.) Given that we are looking at relatively small numbers of this and our other proposed programs, that adjustment should not impact any one program too significantly.

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. <u>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</u>.

Goal #1 of Florida Poly's strategic plan 2018 – 2023 is to enroll a high-quality and diverse incoming class. To impact this goal, the University has restructured its admission and financial aid operations to support stronger evidenced-based decision making, including market segmentation, reorganized its staffing model to improve coverage, tactics, and messaging, and changed its admissions process to include a holistic view of prospects through items such as essays and recommendation letters.

Both FAMU and FIU offer bachelor's degrees in Physics, but these are in a different CIP code. Moreover, it is unlikely that Florida Poly's program will draw students from FIU or FAMU, given our respective locations and institutional missions. Given the small size of Florida Polytechnic University and its limited capacity, the enrollment projections for the program in engineering physics would have minimal impact on FAMU or FIU's programs. Finally, neither institution expressed comment or concern related to program content or enrollment impact during Florida Poly's presentation of its pre-proposal at the April 6, 2018 CAVP coordinating group meeting.

III. Budget

A. Use Table 2 in Appendix A to display projected costs and associated funding sources for Year 1 and Year 5 of program operation. Use Table 3 in 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.)

Table 2 Summary, Assumptions, Methodology

In the last year, the University received a reoccurring appropriation of $4.8 million for faculty salaries to grow programs and faculty expertise. As such, we have budged based on reallocated (or non-expensed) E&G funds. In addition to growing the faculty by five FTE for by year five of the program, additional expenses include startup funds (research kick-starts, non-recurring); professional development; supplies and lab materials; computing supporting; library support; educational assistants (student labor); and lab

assistant support broken out over multiple programs.

Table 3 Summary, Assumptions, Methodology
Table 3 is zeroed because no funds will be reallocated in year one. All funds used for the program in year one come from unallocated E&G resulting from the reoccurring $4.8 million appropriation.

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 2.

The university does not intend to operate this program through continuing education or seek any alternative or differentiated tuition model.

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).

As an engineering and STEM-focused institution, Florida Poly started with a strong resource support for physics. Including a focused degree program in engineering physics will only serve to strengthen the existing and planned engineering programs at Florida Poly. By drawing new faculty and faculty research in the field, the quality and breadth of physics courses and research opportunities that complement our existing offerings will expand.

Since the new degree program in Engineering Physics will have existing and new faculty to handle the upper level physics core courses and concentration related courses, this will have no adverse impact on the faculty work load of other engineering departments. Similarly, our engineering physics program has self-sufficient resources to conduct curriculum; the reallocation of resources is not necessary which again will have zero impact on other engineering programs.

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 proposed program will create opportunities for existing programs and students, but will not create any additional demand that existing programs offer courses to support the program. As a program that starts from a general education-based department, there will be no additional requirements from either a general education or common prerequisite standpoint. Courses created for the program will afford existing engineering programs opportunities for electives or enhanced physics foundations to existing curricula. For programs in the departments of Electrical and Computer Engineering (ECE) and Mechanical Engineering (ME) program, students can opt to take specialized courses as their Science (Tech) elective offered by the engineering physics program. Example courses include the following: Quantum Mechanics, Modern Physics with lab, Thermodynamics and Statistical Physics, Solid State and Condensed Matter Physics, and so on. Furthermore, the proposed Engineering p program will potentially create research opportunities at the University via NSF funded REU and RUI programs and enhance our students' participation in Physics Club/Society of Physics Students/American Institute of Physics/American Physical Society-National Mentoring Community research and outreach activities.

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.

Faculty of Physics, the Department Chair of Natural Sciences, and the Division Director of SAM will explore outside resources both financial and in-kind support for the sustainable operation of the proposed new B.S. degree program in Engineering Physics. Current collaborators from industry include Mosaic, Harris, Lockheed Martin, Chastain Skillman, Global Clean Diesel, NASA, Central Florida Development Council (CFDC), Florida Energy Systems Consortium (FESC), Florida American Association of Physics Teachers (FL-AAPT), Research (R1) institutions such as University of Central Florida, Florida Solar Energy Center, the University of South Florida and the new team of in-kind supporters will be maintained for the support of our Engineering Physics program. The course instructors will seek potential funding from Federal, State, Regional and private funding for undergraduate education, curriculum development and research for sustaining the B.S. degree program in Engineering Physics. A Sigma Pi Sigma Honor Physics Society will be launched which can be merged with our current initiatives of SPS Florida Poly's chapter for providing platform for our Physics majors to find their internship and other career opportunities. The course instructor is also actively involved in Statewide Florida Academy of Sciences Council, hence the current or proposed Engineering Physics program and its mission can be spread out to the entire State of Florida for students' recruitment and creating research opportunities for those enrolled students.

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

Use information from Tables 1 and 2 in 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.

Benefit to the University: As physics is foundational to engineering, adding a physics degree program to the university will enhance all program offerings and student experience by drawing on a highly experienced faculty to deliver the program. A faculty strong in program delivery and related research will raise the quality of our existing core physics offerings while similarly creating collaborative research opportunities for student and faculty alike.

Benefit to the local community: The program will benefit local industries with which we already have relationships such as Mosaic, Harris, Lockheed Martin, NASA, the Central Florida Development Council (CFDC), FDOT, Lakeland Regional Hospital, Baycare, and SunTrax through internships, qualified graduates, and applied research opportunities.

Benefit to the State: The proposed program fills growing marketplace employment needs and by creating a program not currently offered by any state institution. The program's concentrations in Medicine, Space, and Energy and Sustainability enable students to obtain strong foundations in physics and engineering with exposure to critical areas that demonstrate long-term employment prospects.

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)

The program will not exceed 120 credit hours.

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.

Florida Poly's engineering physics program would be the first in the state using this CIP, thus no existing common pre-requisites have been defined. However, the program has been designed along the lines of other engineering and physics programs and will specify its prerequisites in common with those for CIP 40.0801, Physics, offered at other SUS institutions.

The program's requisites include the following:

CHM 2045 - Chemistry 1	3
CHM 2045L - Chemistry 1 Laboratory	1
CHM 2046 - Chemistry 2	3
CHM 2046L - Chemistry 2 Lab	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
PHY 2048 - Physics 1	3
PHY 2048L - Physics 1 Laboratory	1
PHY 2049 - Physics 2	3
PHY 2049L - Physics 2 Laboratory	1

State common prerequisites for 40.0801 are as follows:

Program:	Physics	**CIP:**	40.0801
		Track:	1/3
Offered At:	FAMU, FAU, FIU, FSU, UCF, UF, UNF, USF, UWF	**Program Length:**	120 Cr. Hrs.

REVISED 5/27/09
Revised 2/24/2010

LOWER LEVEL COURSES

	Cr. Hrs.
CHMX045C	4
or CHMX040	3
& CHMX041	3
or CHMX045/X045L	4
& CHMX046C	4
or CHMX046/X046L	4
& MACX311	4
or MACX281	4
& MACX312	4
or MACX282	4
& MACX313	4
or MACX283	4
& PHYX048/X048L	4
& PHYX049/X049L	4
or PHYX048C	4
& PHYX049C	4

FOR ALL MAJORS: Students are strongly encouraged to select required lower division electives that will enhance their general education coursework and that will support their intended baccalaureate degree program. Students should consult with an academic advisor in their major degree area.

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 Educational Objectives (PEOs) or "goals" of the engineering physics program identify what graduates are expected to attain within a few years of graduation. These are expressed as follows are directly implement Florida Polytechnic University's mission:

1. Graduates of the engineering physics program will establish relevant careers in government, industry, or academia through strong technical proficiency, effective collaboration, leadership, and communication skills, and ethical behavior;
2. Graduates Achieve research leadership or management roles in their respective careers;

3. Graduates will successfully complete an advanced degree and/or achieve appropriate licensure, registration, or certifications demonstrating ongoing learning and professional development.

The mission of Florida Polytechnic University is to "serve students and industry through excellence in education, discovery, and application of engineering and applied sciences." Engineering physics fits squarely within the STEM mission of the university as a program that blends applied mathematics and engineering foundations. The program's objectives help deliver the University's mission by producing STEM graduates who will be equipped to execute careers and research at an accomplished level. Moreover, the program aligns with the University's strategic goal (4) to grow the number of academic programs in strategic disciplines. The University's plan specifically states that programs will be chosen on the bases of complementing and strengthening existing programs and to serve existing industries and create new ones in the state of Florida. Finally, the program supports the SUS's strategic mission including its goals for supporting strategic priorities for a knowledge economy through STEM programs, undergraduate research, and research in collaboration with other state and private entities.

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.

Florida Poly's Department of Natural Sciences currently offers all the physics general education and many of the program core courses listed on the proposal. Thus, the foundation to begin offering the program already exists with all Florida Poly students at some point taking multiple courses from the department. Department faculty collaborate with colleagues in computer science, computer and electrical engineering, and data science on research associated with the University's Advanced Mobility Institute (AMI), an institute dedicated to testing and certification methodologies for autonomous vehicles. This interdisciplinary relationship and the opportunities provided by AMI and SunTrax serve as strengths for the program in multiple ways. First, the research opportunities, focus, and facility will be a draw to highly qualified, prospective faculty. Second, these resources provide unique opportunities for students to apply physics principles to engineering problems in real world and research based settings. Finally, the university has a strong internship placement program as internships are a graduation requirement for all of our majors.

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.

Florida Poly's 2017 Work Plan submitted to the Board of Governors (approved by the BOT on June 8, 2017) broadly identifies several STEM and engineering programs for consideration in 2018-2020. Subsequent to this preliminary identification, faculty, staff, and administration collaborated with Hanover Research and conducted internal research to develop a market analysis of potential programs. The planning process follows the process outlined in FPU-5.0001AP New Degree Program Planning and Approval.

Planning Process

Date	Participants	Planning Activity
June – Dec 2017	Provost, staff, department chairs, faculty and Hanover Research.	Market analysis of potential programs, internal assessment of ease of development and implementation from a resource, capacity, and planned growth standpoint.
Jan – April 2018	Dr. Nicoleta Hickman, Division Director of SAM Dr. Sesha Srinivasan, Engineering Physics Faculty Coordinator	Broad development of program structure and features, analysis of need and demand, workforce impact, and development of pre-proposal for CAVP.
May - August 2018	Dr. Nicoleta Hickman, Division Director of SAM	Engineering Physics Plan of Study and Course Level Mapping discussions

	Dr. Sesha Srinivasan, Engineering Physics Faculty Coordinator	
August – Dec 2018	Dr. Robert Green, Chair of Department of Natural Sciences Dr. Sesha Srinivasan Dr. Nicoleta Hickman Department Faculty University Curriculum Committee Institutional Research Registrar's Office	Reviewed the status of the Engineering Physics program at department level, continued to review and refine curriculum, plan of study and courses, as well as prepare program request materials for UCC and others for review and recommendation.

Events Leading to Implementation

Date	Implementation Activity
June 8, 2017	University Work Plan submitted to BOG
April 6, 2018	Pre-proposal submitted to CAVP coordinating group
May 22, 2018	University's Board of Trustees confers preliminary approval of program
Dec 13, 2018	University Undergraduate Curriculum Committee recommends approval of the program.
Jan 9, 2018	Approvals by Provost and President
Jan 16, 2019	University's Board of Trustees meets to decide whether to approve program.
Jan 31, 2019	Submission of materials to BOG for inclusion in State Degree Inventory
Fall 2019	Formally launch program with incoming admissions class.

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.

The University hosted two visits in October 2018, one from the Engineering Accreditation Commission of ABET and the other from the Computing Accreditation Commission of ABET. Programs reviewed include Computer, Electrical, and Mechanical Engineering (ABET-EAC) and Computer Science (ABET-CAC). No deficiencies were identified for any program (a barrier to achieving accreditation). While some weakness were found with each program, none of the weaknesses involved curricular issues or, more specifically, issues related to physics foundations. From this standpoint, the scope and quality of physics being offered at Florida Poly is of sufficient quality to support its existing engineering programs signaling a strong foundation for a degree program focused on engineering physics.

Recommendations related to existing programs reviewed included revising program educational objectives (goals) to be consistent with the accreditor's expectations; disaggregating assessment data to enable a focused view of students in the program in all courses; and ensuring laboratory access. All programs have already remedied or are in the process of remedying these issues. Formal due process does not end until this summer and decisions regarding each program will be rendered in August 2019.

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 in engineering physics has identified six student learning outcomes that articulate what students should be able to demonstrate upon graduation. These outcomes include the broad skill categories of communication, critical thinking, and program content required by the academic learning compact and align with ABET-EAC criterion for student outcomes.

Student Learning Outcomes	Academic Learning Compact
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	Content
2. 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	Content, Critical Thinking
3. an ability to communicate effectively with a range of audiences	Communication
4. 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	Critical Thinking
5. 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	Communication
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	Content, Critical Thinking
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	Critical Thinking

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

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

Graduation requirements may be found here: http://catalog.floridapoly.edu/content.php?catoid=12&navoid=552#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 following table reflects the standard university template for all Florida Poly programs. Each program includes a professional foundations core, general education, advanced math and science, program content core, electives (if available), concentration course, and finally a capstone sequence. This table reflects the course options for both the mathematics of medicine and biology and complete systems concentrations.

Note: EP-EM = Physics of Medicine; EP-PS = Physics of Space; EP-PES = Physics of Energy and Sustainability.

University Undergraduate Program Curriculum Template
Engineering Physics

Approved 4/7/2017 (upd. 07/06/18)

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	EP-PM	EP-PS	EP-PES
I. Professional Foundations Core			**8**	**8**	**8**	**8**
		SLS 1106 - Professional Foundations (formerly First Year Experience)	**1**	**1**	**1**	**1**
		IDS 4941 - Professional Experience Internship	**0**	**0**	**0**	**0**
		IDS 1380 - Introduction to STEM	**3**	**3**	**3**	**3**
		EGN 1007C - Concepts and Methods for Engineering and Computer Science (req of Engineering and CS programs only).	**1**	**1**	**1**	**1**
		COP 2271C - Introduction to Computation and Programming (required for all programs)	**3**	**3**	**3**	**3**
		All but Professional Foundations may be distributed in categories below to allow for appropriate credit hour allocations.				
II. General Education		*State Required Minimum*	**36**	**33**	**32**	**32**
	Rules	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.				
	Section A	**Communication**	**6**	**6**	**6**	**6**
		ENC 1101 - English Composition 1: Exp and Arg Writing (W) ♦	**3**	**3**	**3**	**3**
		ENC 2210 - Technical Writing (W)	**3**	**3**	**3**	**3**
	Section B	**Humanities**	**3 to 6**	**6**	**6**	**6**
		ARH 2000 - Art Appreciation ♦	3	**3**	**3**	**3**
		PHI 2010 - Introduction to Philosophy ♦	3			
		HUM 2020 - Introduction to the Humanities ♦	3	**3**	**3**	**3**
		HUM 2022 Explorations in the Humanities (Special Topics)	3			
		IDS 2144 Legal, Ethical, and Management Issues in Technology	3			
	Section C	**Social Science**	**3 to 6**	**3**	**3**	**3**
		AMH 2010 - American History to 1877	3			
		AMH 2020 - American History Since 1877 (W) ♦ Satisfies Florida State Civics Requirement	3	**3**	**3**	**3**
		AMH 2930 - History: Special Topics	3			
		ECO 2013 - Principles of Macroeconomics (W) ♦	3			
		ECO 2023 - Principles of Microeconomics (W)	3			
		PSY 2012 - General Psychology (W) ♦				
	Section D	**Mathematics**	**7**	**7**	**7**	**7**
		MAC 2311 - Analytic Geometry and Calculus 1 ♦	4	**4**	**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**	**3**	**3**
		MAP 2302 - Differential Equations	3			
		MAC 1147 - Pre-calculus Algebra and Trigonometry	4			
	Section E	**Natural Sciences**	**8**	**8**	**8**	**8**
		BSC 1010 - Biology 1 ♦	3	**3**	**3**	**3**
		BSC 1010L - Biology 1 Laboratory	1	**1**	**1**	**1**
		CHM 2045 - Chemistry 1 ♦	3	**3**	**3**	**3**
		CHM 2045L - Chemistry 1 Laboratory	1	**1**	**1**	**1**
		PHY 2048 - Physics 1 ♦	3			
		PHY 2048L - Physics 1 Laboratory	1			
		PHY 2049 - Physics 2	3			
		PHY 2049L - Physics 2 Laboratory	1			
	Section F	**Open Inquiry**	**3**	**3**	**2**	**2**
		An additional 3 hours of general education coursework must be taken here.				
	***New**	CHM 2046L - Chemistry 2 Lab	1	**1**	**1**	**1**
	***New**	BSC 1011L - Biology II Lab	1	**1**	**1**	**1**
	***New**	CHM 3217L - Organic Chemistry Lab (One semester)	1	**1**		
II. Program Foundations / Advanced Math & Science			**12**	**15**	**15**	**15**
		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."				
		MAC 2312 - Anal Geo & Calc 2	4	**4**	**4**	**4**
		MAC 2313 - Anal Geo & Calc 3	4	**4**	**4**	**4**
		MAP 2302 - Differential Equation w Lab	4	**4**	**4**	**4**
	***New**	CHM 2046 - Chemistry 2	3	**3**	**3**	**3**
III. Program Core		40 credits represents a minimum, depending on how many credits are included in Category II, above.	**40**	**40**	**41**	**41**
		Pre-Capstone design sequences should be included in this category--may be listed as a subset in catalog to stand out.				
		The following may be counted in this category instead:				
		PHY 2048 - Physics 1		**3**	**3**	**3**
		PHY 2048L - Physics 1 Lab		**1**	**1**	**1**
		PHY 2049 - Physics 2		**3**	**3**	**3**
		PHY 2049L - Physics 2 Lab		**1**	**1**	**1**
	***New**	PHY 3101 - Intro to Modern Physics		**3**	**3**	**3**
	***New**	PHY 3101L - Intro to Modern Physics Lab		**1**	**1**	**1**
	***New**	PHY 4221 - Intro to Classical Mechanics		**3**	**3**	**3**
	***New**	PHY 4604 - Intro to Quantum Mechanics		**3**	**3**	**3**
	***New**	PHY 4323- Intro to Electromagnetism I		**3**	**3**	**3**

	*New	PHY 4513 - Thermal and Statistical Physics		3	3	3
	*New	PHZ 3113 - Intro to Theoretical Physics		3	3	3
		PHY 4404 - Intro to Solid State Physics		3	3	3
	*New	PHZ 3361 - Radiation Detection and Measurement		3		
	*New	PHY 4731 - Introduction to Health Physics		3		
	*New	PHY 4151 - Computational Physics w/ Lab		4	4	4
	*New	PHY 2515L - Energy & The Environment Lab (EEL 3287L)				1
	*New	AST 3721L - Astrophysics Laboratory			1	
	*New	AST 3222 - Introduction to Astrophysics			3	
	*New	AST/PHY 4930/IDS 4204 -Advanced Topics in Astro or Physics or Concentration - Energy & Environment			3	3
	*New	PHZ 4470 - Materials Characterization				3
IV. Concentration		Concentrations should consist of no more than 12 credits. If other than "Advanced Topics," up to six credits may come from electives or courses in other concentrations.	**12**	**12**	**12**	**12**
	Conc 1	**Physics of Medicine**	**12**	**12**		
	*New	CHM 3218 - Biochemistry (One Semester)	3	3		
	*New	BME 3312 - Molecular & Cellular Engineering	3	3		
	*New	PHZ 4702 Biomedical Physics I	3	3		
	*New	PHZ 4703 - Biomedical Physics II	3	3		
	Conc 2	**Physics of Space**			12	
	*New	AST 4220 - Astrophysics I			3	
	*New	AST 4221 - Astrophysics II			3	
	*New	AST 4341 - Hydrodynamics & Plasma for Astro			3	
	*New	AST 4402 - Galaxies & Cosmology			3	
	Conc 3	**Physics of Energy and Sustainability**				12
	*New	EEL 3287 - Renewable Energy & Sustainability				3
	*New	EEL 4290 - Sustainability for Engineering Technology & Entrepreneurship				3
	*New	EMA 4491 - Nanotechnology and Materials for Energy Storage & Production				3
	*New	EEL 4283 - Renewable Energy Systems				3
V. Electives		The number of electives may be reduced to fill out the program core or meet institutional or state required general education requirements.	**6**	***6***	***6***	***6***
	*New	BSC 1011 - Biology II		3	3	3
	*New	CHM 3217 - Organic Chemistry (One Semester)		3		
	*New	PHY 3272 - Physics of Space Flight			3	
	*New	EMA 4780 - Materials for Sustainability				3
VI. Capstone		All programs are required to have a 6 credit senior capstone sequence.	**6**	**6**	**6**	**6**
	*New	PHY 4910 - Directed Independent Research 1 (Senior Capstone 1)		3	3	3
	*New	PHY 4911 - Directed Independent Research 2 (Senior Capstone 2)		3	3	3
TOTAL HOURS			**120**	**120**	**120**	**120**

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

Three plans of study are presented below, one for each concentration: Physics of Medicine, Physics of Space, Physics of Energy and Sustainability.

ENGINEERING PHYSICS MAJOR – PHYSICS OF MEDICINE (w/ Pre-Med Option) PLAN OF STUDY

FRESHMAN YEAR

1st Semester			Cr.	2nd Semester			Cr.
SLS	1106	Acad. & Professional Skills	1	EGN	1007C	Concepts & Methods	1
IDS	1380	Introduction to STEM	3	COP	2271	Intro to Comp. Programing	3
ENC	1101	English Composition 1*	3	ENC	2210	Technical Writing*	3
CHM	2045	Chemistry 1*	3	BSC	1010	Biology 1*	3
CHM	2045L	Chemistry 1 Laboratory*	1	BSC	1010L	Biology 1 Laboratory*	1
MAC	2311	Analytic Geo & Calc 1*	4	MAC	2312	Anal. Geo & Calc. 2 w Lab*	4
Total			**15**	**Total**			**15**

SOPHOMORE YEAR

1st Semester			Cr.	2nd Semester			Cr.
PHY	2048	Physics 1*	3	PHY	2049	Physics 2*	3
PHY	2048L	Physics 1 Laboratory*	1	PHY	2049L	Physics 2 Laboratory	1
AMH	2020	Am. History Since 1877	3	ART	2000	Art Appreciation	3
CHM	2046	Chemistry 2*	3	BSC	1011	Biology 2*	3
CHM	2046L	Chemistry 2 Laboratory*	1	BSC	1011L	Biology 2 Laboratory*	1
MAC	2313	Anal. Geo. & Calc 3 w Lab	4	MAP	2302	Differential Equations	3
Total			**15**	**Total**			**14**

JUNIOR YEAR

1st Semester			Cr.	2nd Semester			Cr.
PHY	3101	Intro to Modern Physics	3	PHY	4604	Introductory Quantum Mech.	3
PHY	3101L	Modern Physics Lab	2	PHY	4323	Electromagnetism I	3
PHY	4221	Intro to Classical Mechanics	3	PHY	4513	Thermal & Statistical Physics	3
IDS	4941	Professional Exp. Internship	0	PHZ	3113	Intro to Theoretical Physics	3
CHM	3217	Organic Chemistry (1 Sem) *	3	CHM	3218	Biochemistry (One Sem)*	3
CHM	3217L	Organic Chem. Lab (1 Sem)*	1				
MAD	2104	Discrete Mathematics	3				
Total			**14**	**Total**			**16**

SENIOR I YEAR

1st Semester			Cr.	2nd Semester			Cr.
PHY	4404	Intro to Solid State Physics	3	HUM	2020	Introduction to Humanities	3
PHZ	3361	Radiation Detection & Measurement	3	PHY	4731	Intro to Health (Medical) Physics	3
PHZ	4702	Biomedical Physics 1	3	PHZ	4703	Biomedical Physics 2	3
PHY	4151C	Computational Physics w Lab	4	BME	3312	Molecular & Cellular Eng*	3
PHY	4910	Undergraduate Research 1	3	PHY	4911	Undergraduate Research 2	3
Total			**16**	**Total**			**15**

Total Degree Hours = 120 Credit Hours; **EP Courses: PHY/PHZ = 45 Cr. Hrs.;**

EP Concentration Courses: = 12 Cr. Hrs.; ***Courses with Asterisk: Pre-Med Req.**

ENGINEERING PHYSICS MAJOR – PHYSICS OF SPACE: PLAN OF STUDY

FRESHMAN YEAR

1st Semester			Cr.	2nd Semester			Cr.
SLS	1106	Acad. & Professional Skills	1	EGN	1007C	Concepts & Methods	1
IDS	1380	Introduction to STEM	3	COP	2271	Intro to Comp. Programing	3
ENC	1101	English Composition 1	3	ENC	2210	Technical Writing	3
CHM	2045	Chemistry 1	3	BSC	1010	Biology 1	3
CHM	2045L	Chemistry 1 Laboratory	1	BSC	1010L	Biology 1 Laboratory	1
MAC	2311	Analytical Geo & Calc 1	4	MAC	2312	Anal. Geo & Calc. 2 w Lab	4
Total			**15**	**Total**			**15**

SOPHOMORE YEAR

1st Semester			Cr.	2nd Semester			Cr.
PHY	2048	Physics 1	3	PHY	2049	Physics 2	3
PHY	2048L	Physics 1 Laboratory	1	PHY	2049L	Physics 2 Laboratory	1
AMH	2020	Am. History Since 1877	3	ART	2000	Art Appreciation	3
CHM	2046	Chemistry 2	3	BSC	1011	Biology 2	3
CHM	2046L	Chemistry 2 Laboratory	1	BSC	1011L	Biology 2 Laboratory	1
MAC	2313	Anal. Geo. & Calc 3 w Lab	4	MAP	2302	Differential Equations	3
Total			**15**	**Total**			**14**

JUNIOR YEAR

1st Semester			Cr.	2nd Semester			Cr.
PHY	3101	Intro to Modern Physics	3	PHY	4604	Introductory Quantum Mech.	3
PHY	3101L	Modern Physics Laboratory	2	PHY	4323	Electromagnetism I	3
PHY	4221	Intro to Classical Mechanics	3	PHY	4513	Thermal & Statistical Physics	3
IDS	4941	Professional Exp. Internship	0	PHZ	3113	Intro to Theoretical Physics	3
AST	3222	Introduction to Astrophysics	3	PHY	3272	Physics of Space Flight	3
AST	3721L	Astrophysics Laboratory	1				
MAD	2104	Discrete Mathematics	3				
Total			**16**	**Total**			**15**

SENIOR I YEAR

1st Semester			Cr.	2nd Semester			Cr.
PHY	4404	Intro to Solid State Physics	3	HUM	2020	Introduction to Humanities	3
AST	4220	Astrophysics I	3	AST	4221	Astrophysics II	3
AST	4341	Hydrodynamics & Plasma for Astro	3	AST	4402	Galaxies & Cosmology	3
PHY	4151C	Computational Physics w Lab	4	PHY	4930	Special Topics-Space Phys	3
PHY	4910	Undergraduate Research 1	3	PHY	4911	Undergraduate Research 2	3
Total			**16**	**Total**			**15**

Total Degree Hours = 120 Credit Hours **EP Courses: PHY/PHZ/AST = 44 Cr. Hrs.;**
EP Concentration Courses: = 12 Cr. Hrs.;

ENGINEERING PHYSICS MAJOR – PHYSICS OF ENERGY & SUSTAINABILITY TRACK: PLAN OF STUDY

FRESHMAN YEAR

1st Semester			Cr.	2nd Semester			Cr.
SLS	1106	Acad. & Professional Skills	1	EGN	1007C	Concepts & Methods	1
IDS	1380	Introduction to STEM	3	COP	2271	Intro to Comp. Programing	3
ENC	1101	English Composition 1	3	ENC	2210	Technical Writing	3
CHM	2045	Chemistry 1	3	BSC	1010	Biology 1	3
CHM	2045L	Chemistry 1 Laboratory	1	BSC	1010L	Biology 1 Laboratory	1
MAC	2311	Analytical Geo & Calc 1	4	MAC	2312	Anal. Geo & Calc. 2 w Lab	4
Total			**15**	**Total**			**15**

SOPHOMORE YEAR

1st Semester			Cr.	2nd Semester			Cr.
PHY	2048	Physics 1	3	PHY	2049	Physics 2	3
PHY	2048L	Physics 1 Laboratory	1	PHY	2049L	Physics 2 Laboratory	1
AMH	2020	Am. History Since 1877	3	ART	2000	Art Appreciation	3
CHM	2046	Chemistry 2	3	BSC	1011	Biology 2	3
CHM	2046L	Chemistry 2 Laboratory	1	BSC	1011L	Biology 2 Laboratory	1
MAC	2313	Anal. Geo. & Calc 3 w Lab	4	MAP	2302	Differential Equations	3
Total			**15**	**Total**			**14**

JUNIOR YEAR

1st Semester			Cr.	2nd Semester			Cr.
PHY	3101	Intro to Modern Physics	3	PHY	4604	Introductory Quantum Mech.	3
PHY	3101L	Modern Physics Laboratory	2	PHY	4323	Electromagnetism I	3
PHY	4221	Intro to Classical Mechanics	3	PHY	4513	Thermal & Statistical Physics	3
MAD	2104	Discrete Mathematics	3	PHZ	3113	Intro to Theoretical Physics	3
EEL	3287	Renewable Energy & Sustain.	3	EEL	4283	Renewable Energy Systems	3
PSC	2515L	Energy & Environment Lab	1				
IDS	4941	Professional Exp. Internship	0				
Total			**15**	**Total**			**15**

SENIOR I YEAR

1st Semester			Cr.	2nd Semester			Cr.
PHY	4404	Intro to Solid State Physics	3	HUM	2020	Introduction to Humanities	3
PHZ	4470	Materials Characterization	3	EMA	4780	Materials for Sustainability	3
EEL	4290	Sustainability for Engineering, Technology & Entrepreneur.	3	EMA	4491	Nanotech & Matls. for Energy Storage & Production	3
PHY	4151C	Computational Physics w Lab	4	IDS	4204	Advanced Topics in Energy & Environment	3
PHY	4910	Undergraduate Research 1	3	PHY	4911	Undergraduate Research 2	3
Total			**16**	**Total**			**15**

Total Degree Hours = 120 Credit Hours **EP Courses: PHY/PHZ/AST = 44 Cr. Hrs.;**

EP Concentration Courses: = 12 Cr. Hrs.;

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

Program Core

PHY 3101 – Introduction to Modern Physics
Credits: 3
Prerequisites: PHY 2049 - Physics 2, MAC 2312 - Analytic Geometry and Calculus 2
Co-requisite: PHY 3101L – Modern Physics Laboratory, MAC 2313 – Analytic Geometry and Calculus 3
Course Description: This is an introductory modern physics course designed primarily for students majoring in the sciences and engineering or mathematics. Topics include the special theory of relativity, wave properties of matter, the Schrodinger wave equation, atomic structure, molecular bonding, the electrical and magnetic properties of solids, semiconductors, the atomic nucleus and nuclear interactions.

PHY 3101L – Modern Physics Laboratory
Credits: 1
Prerequisites: None
Co-requisite: PHY 3101 – Intro to Modern Physics
Course Description: This course studies experiments that explore radiation and the atomic nature of matter including the photoelectric effect, atomic emission and absorption spectroscopy, the Franck-Hertz experiment, electron spin resonance and nuclear radiation.

PHY 4221 – Introduction to Classical Mechanics
Credits: 3
Prerequisites: PHY 2049 - Physics 2, MAC 2313 - Analytic Geometry and Calculus 3
Co-requisite: None
Course Description: An introduction to classical mechanics. Topics include, Newton's laws, particle dynamics, central forces, oscillatory motion, Lagrangian and Hamiltonian mechanics, system and rigid body dynamics.

PHY 4604 – Introduction to Quantum Mechanics
Credits: 3
Prerequisites: PHY 3101 & PHY 3101L - Intro to Modern Physics & Modern Physics Lab, MAC 2313 – Anal. Geo & Calculus 3, MAP 2302 – Differential Equations
Co-requisite: None
Course Description: This course introduces the modern theory of quantum mechanics. It considers both wave and matrix mechanics, as well as their inter-relation in the modern theory. The subject is developed by studying applications to particle systems, simple harmonic oscillators and the hydrogen atom.

PHY 4323 – Introduction to Electromagnetism
Credits: 3
Prerequisites: PHY 2049 – Physics 2, MAC 2313 – Anal. Geo & Calculus 3, MAP 2302 – Differential Equations
Co-requisite: None
Course Description: The theory of electromagnetic fields and waves is developed from basic principles. Vector calculus, coulomb's law, Gauss's law, electrostatic potential, dielectrics, solutions to Laplace's and Poisson's equations, magnetic induction, vector potential, magnetic materials, Maxwell's equations and propagation of waves in space and various media are discussed.

PHY 4513 – Thermal & Statistical Physics
Credits: 3
Prerequisites: PHY 2049 – Physics 2, MAC 2313 – Anal. Geo & Calculus 3, PHY 3101 – Intro to Modern Physics
Co-requisite: None

Course Description: The fundamental laws of thermodynamics and their application to simple systems. The kinetic theory of an ideal gas. An introduction to the classical and quantum statistical mechanics of weakly interacting systems.

PHY 3113 – Intro to Theoretical Physics
Credits: 3
Prerequisites: MAP 2302 – Differential Equations, PHY 2049 – Physics 2
Co-requisite: None
Course Description: Analytical techniques to solve problems of Physics. The course is designed to develop the basic mathematical skills required in subsequent courses in Physics as well as form the basis for a fundamental understanding of the Mathematics needed for the study of Physics.

PHZ 4404 - Introduction to Solid State Physics
Credits: 3
Prerequisites: CHM 2045 - Chemistry 1, CHM 2045L - Chemistry 1 Laboratory, PHY 2049 - Physics 2, and PHY 2049L - Physics 2 Laboratory
Course Description: This course introduces students of to the structural, electronic, optical, and magnetic properties of materials.

PHY 4151C – Computational Physics w Lab
Credits: 4
Prerequisites: PHY 2049 - Physics 2, and PHY 2049L - Physics 2 Laboratory, PHY 3101 – Intro to Modern Physics
Course Description: The topics cover in this course include computer applications in Physics, Numerical Modeling and Simulations of Physics Processes using Linear Algebra and Differential Equations and Monte Carlo Methods.

PHY 4910 – Undergraduate Research 1
Credits: 3
Prerequisites: PHY 2049 - Physics 2, and PHY 2049L - Physics 2 Laboratory, PHY 3101 – Intro to Modern Physics, PHY 3101L – Modern Physics Laboratory
Course Description: Projects in experimental, theoretical or computational Physics conducted in collaboration with Physics faculty. This course requires an oral and written research report by the student.

PHY 4911 – Undergraduate Research 2
Credits: 3
Prerequisites: PHY 4910 - Undergraduate Research 1
Course Description: The primary purpose of this course is to provide students with an opportunity for firsthand, supervised research in Physics. Projects may involve inquiry, design, investigation, scholarship, discovery or application in Physics.

Physics of Medicine & Electives

CHM 3217 – Organic Chemistry (One Semester)
Credits: 3
Prerequisite: CHM 2046 & CHM 2046L – Chemistry 2 & Chemistry 2 Lab
Co-requisite: CHM 3217L – Organic Chemistry 1 Lab
Course Description: A rigorous one-semester overview of the structure properties and reactions of organic compounds. This is the first half of a two- semester biochemically oriented sequence.

CHM 3217L – Organic Chemistry Laboratory (One Semester)
Credits: 1
Co-requisite: CHM 3217 – Organic Chemistry (One Semester)

Course Description: Students perform basic organic lab techniques. Synthesis, recrystallization, separations, extraction, chromatography, introduction to Nuclear Magnetic Resonance (NMR) and Infrared (IR) Spectroscopy.

CHM 3218 – Biochemistry (One Semester)
Credits: 3
Prerequisite: CHM 3217 (One Semester Organic Chemistry)
Co-requisite: None
Course Description: An introduction to the basic concepts of Biochemistry and Molecular Biology from an Organic Chemistry structural and mechanistic perspective.

PHZ 3361 – Radiation Detection and Measurement
Credits: 3
Prerequisites: PHY 2049 - Physics 2, and PHY 2049L - Physics 2 Laboratory, PHY 3101 – Intro to Modern Physics
Course Description: This course introduces students to the interaction of radiation with matter, radiation detectors, Gamma Spectroscopy, Pulse Processing, Counting Statistics and Radiation Shielding.

PHZ 4702 – Biomedical Physics 1
Credits: 3
Prerequisites: PHY 2049 - Physics 2, and PHY 2049L - Physics 2 Laboratory Course Description: This is the first in a series of two introductory courses on the applications of Physics in Biology and Medicine. It discusses applications of classical mechanics, hydrodynamics, and thermodynamics to motion and the structure of musculoskeletal system, the respiratory system and the circulatory system, as well as to the biology of cell.

PHZ 4702 – Biomedical Physics 1
Credits: 3
Prerequisites: PHY 2049 - Physics 2, and PHY 2049L - Physics 2 Laboratory Course Description: This is the first in a series of two introductory courses on the applications of Physics in Biology and Medicine. It discusses applications of classical mechanics, hydrodynamics, and thermodynamics to motion and the structure of musculoskeletal system, the respiratory system and the circulatory system, as well as to the biology of cell.

PHZ 4731 – Introduction to Health (Medical) Physics
Credits: 3
Prerequisites: PHY 3361 – Radiation Detection and Measurement
Course Description: An introduction to health (medical) Physics. Topics include the biological effects of radiation exposure, environmental and personnel monitoring, dosimetry and dose calculations and Governmental regulations.

PHZ 4703 – Biomedical Physics 2
Credits: 3
Prerequisites: PHY 2049 - Physics 2, and PHY 2049L - Physics 2 Laboratory, PHZ 4702 – Biomedical Physics 1
Course Description: The second semester of a two semester sequence to discuss the applications of the physical concepts introduced in the general Physics sequence to biological systems and for medical applications.

BME 3312 – Molecular and Cellular Engineering
Credits: 3
Prerequisite: CHM 3217 (One Semester Organic Chemistry) and CHM 3217L – Organic Chemistry Laboratory (One Semester)
Course Description: This course is designed to convey the basics of biological systems and the roles that engineers play in industrial biology to Engineering Physics students.

Physics of Space & Electives

AST 3222 – Introduction to Astrophysics
Credits: 3
Prerequisite: PHY 2048; C or better
Co-requisite: PHY 2049 or None
Course Description: Comprehensive survey of the universe and its appearance from earth seasons, tides, eclipses. The solar system, stellar evolution and galaxies, quasars, pulsars, black holes.

AST 3721 – Astrophysics Laboratory
Credits: 1
Prerequisites: PHY 3101 & PHY 3101 – Intro to Modern Physics
Co-requisite: None
Course Description: An introduction to experiments methodology, data analysis and interpretation, calibration techniques, scientific model validation, data presentation and communication of results. The experiments are chosen for astrophysical relevance and include magnetic fields, optical interference and diffraction, wave polarization, line spectroscopy, photoelectric effect and radioactive decay.

PHY 3272 – Physics of Space Flight
Credits: 3
Prerequisite: PHY 2049 – Physics 2
Co-requisite: None
Course Description: Basic Physics is used to describe the motions of space craft, with a discussion of various types of propulsion systems, including chemical methods, nuclear systems, electric and photon propulsion.

AST 4220 – Astrophysics 1
Credits: 3
Prerequisites: PHY 2049 - Physics 2, and PHY 2049L - Physics 2 Laboratory, AST 3222 – Intro to Astrophysics
Course Description: This course introduces students to the interaction of radiation with matter, radiation detectors, Gamma Spectroscopy, Pulse Processing, Counting Statistics and Radiation Shielding.

AST 4221 – Astrophysics II
Credits: 3
Prerequisites: AST 4220 – Astrophysics I
Co-requisite: None
Course Description: The Physics of stellar objects: Classification of stars, nature of stellar spectra, Physics of stellar structure. The Sun, evolution of stars, neutron stars, black holes, binary systems. Galactic Astrophysics: Physics of the milky way, galactic structure, galactic evolution, large scale structure of the universe, active galaxies, cosmology, origin of the universe.

AST 4341 – Hydrodynamics and Plasma for Astrophysics 1
Credits: 3
Prerequisites: PHY 3221/4221 – Intro to Classical Mechanics, PHZ 3113 – Intro to Theoretical Physics
Course Description: An introduction to the hydrodynamics, plasma physics and magneto hydrodynamics (MHD) necessary for an understanding of astrophysical processes. No prior knowledge of hydrodynamics is required.

AST 3402 – Galaxies and Cosmology
Credits: 3
Prerequisites: PHY 2048 - Physics 2, and PHY 2048L - Physics 2 Laboratory, AST 3222 – Intro to Astrophysics

Course Description: Study of different types of galaxies, their evolution, their relationship to active galaxies and quasars and the evolution of the universe.

Physics of Energy and Sustainability & Electives

EEL 3287 - Renewable Energy and Sustainability
Credits: 3
Prerequisites: MAC 2313 - Analytic Geometry and Calculus 3 , PHY 2049 - Physics 2 , PHY 2049L - Physics 2 Laboratory , CHM 2045 - Chemistry 1, CHM 2045L - Chemistry 1 Laboratory
Course Description: This course covers the different types of energy sources and storages, energy distribution, energy policy and management. Computer-aided analysis of renewable energy resource information and data for evaluating energy potential and energy costs are also presented.

PSC 2515L – Energy and the Environmental Lab (EEL 3287L – Renewable Energy & Sustainability Lab)
Credits: 1
Co-requisite: EEL 3287 – Renewable Energy & Sustainability or PSC 2515 – Energy and the Environment
Course Description: A laboratory course designed to complement EEL 3287 lecture course. Mini projects and problem based activities will be administered.

EEL 4283 - Renewable Energy Systems
Credits: 3
Prerequisites: EEL 3287 Renewable Energy and Sustainability
Course Description: This course covers the elements of renewable systems from the sources to the smart grid. Topics include generators, transformers, and converters. Different types of sources and systems such as solar, wind and hydropower are presented. MATLAB Simulink will be used extensively to simulate and evaluate the performance and control characteristics of renewable energy systems.

PHZ 4470 – Materials Characterization
Credits: 3
Prerequisites: PHY 4404 – Intro to Solid State Physics, MAC 2313 – Analytic. Geo. and Calculus 3 w Lab
Course Description: This course introduces a large variety of materials characterization techniques that have been developed and are currently used in materials science research while comprehensive understanding of each technique can require substantial background in math, physics and chemistry. This course aims to deliver the basic concepts regarding the principles, the practical aspects and the limitations of these characterization methods.

EEL 4290 - Sustainability for Engineering, Technology, and Entrepreneurship
Credits: 3
Prerequisites: EEL 3112C - Circuits 2 EEL 3135 - Systems and Signals or PHY 4323 – Electromagnetism I
Course Description: This course discusses entrepreneurship, engineering, and technology development that accounts for society's growing needs for sustainability in all aspects of our infrastructure and society. Entrepreneurship plays a key role in how these technologies are deployed and made accessible, while supporting appropriate and fair opportunities for economic development (capacity building).

EMA 4780 - Materials for Sustainability
Credits: 3
Prerequisites: EMA 3811 - Multifunctional Materials or PHZ 4404 – Introduction to Solid State Physics or Permission from program director
Course Description: This course will explore how materials can contribute to more sustainable products and processes. Life cycle analysis, and optimizing competing design properties will also be covered.

EMA 4491 - Nanotechnology and Materials for Energy Storage and Generation
Credits: 3
Prerequisites: Permission of Instructor

Course Description: How nanomaterials are used in batteries, ultracapacitors, and solar cells. Theory of measurements used to evaluate energy storage devices. Overview of how devices are integrated into systems.

IDS 4204 – Advanced Topics in Energy & Sustainability
Credits: 3
Prerequisites: PSC 2515 – Energy and the Environment or Approval from the course instructor
Course Description: Contemporary topics in Energy and Sustainability. Seminars and lectures from industry, academia, government and other stakeholders. Students are required to work on individual or team assignments, research projects and present their work in the format of mini seminars.

Additional Electives

PHY 4930 – Special Topics in Physics
Credits: 3
Prerequisite: PHY 2048 and PHY 2048L – Physics 1 and Physics 1 Laboratory
Course Description: Special sessions exploring the current issues in Physics. Topics may vary and are selected on the basis of what is new or currently relevant in the field.

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 university has developed curriculum advisory boards for each of its programs. These advisory boards consist entirely of industry and educational leaders in the specific fields of the program. For engineering physics, a similar advisory board will be developed over the next one to two years as part of the program's plan to seek ABET accreditation at the earliest appropriate point (upon completion of its first graduate). The program curriculum and learning outcomes were developed explicitly to meet the criteria set forth by ABET for environmental engineering programs. The Program Educational Objectives were developed consistent with the ABET framework for PEOs and will be reviewed and approved upon organization of the program's curriculum advisory board.

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.

The university will seek ABET-EAC accreditation for the program at the earliest possible point (the program must graduate at least one student in the year under which it is being reviewed). The lead society supporting environmental engineering programs is the American Academy of Environmental Engineers and Scientists.

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 2 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 will be delivered in a traditional format, face-to-face setting, with courses administered on the main campus. In keeping with the University's strategic plan to be offering some level of online delivery by 2023, the program will evaluate its course offerings to determine what best serves the quality outcomes of the program as it considers online delivery. The program does not require any specialized services or require greater than normal financial support to deliver.

IX. Faculty Participation

A. Use Table 4 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).

Presently, the Department of Natural Sciences has seven full-time faculty (four assistant professors, one associate professor, and two instructors) who deliver all coursework. Currently, the department is conducting searches for two faculty of higher rank and anticipates an additional five faculty total by the fifth year. This brings the total FTE to 12 physics faculty. The department faculty include one chemist and one biologist. The remaining five full-time faculty are physicists. The hiring plan includes expanding faculty in these other disciplines in order to fully offer the program, its concentrations, and meeting the ongoing curricular needs of the university.

B. Use Table 2 in Appendix A to display the costs and associated funding resources for existing and anticipated full-time faculty (as identified in Table 4 in 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.

All faculty funding comes from E&G. New hires will come from unallocated E&G funds, based on a recent appropriation of $4.8 million to grow programs and faculty.

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

CVs are included in appendix C.

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.

The typical teaching load for assistant professors is 3/3, with time for research and service to meet the BOG required 12 – 15 credits for FTE productivity. The table below shows SCH production among faculty in the program over the last year. All faculty participate in some level of department or university service. Research productivity is reflected in the CVs provided in Appendix C.

Student Credit Hour Generated by Faculty

Program: Engineering Physics	Fall 2017	Spring 2018	AY 2017-2018
Astley, Victoria	332	342	674
Austin, Robert	293	265	558

Foaud, Emaldeden	437	303	740
Green, Robert	257	185	442
Sorloaica-Hickman, Nicoleta	-	21	21
Horton, Melba	239	-	239
Srinivasan, Sesha	120	153	273
Grand total (sum SCH)	**1,678**	**1,269**	**2,947**
Average SCH for program	**240**	**181**	**421**
Average Per Full Time Faculty	**238**	**243**	**456**

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 Masters and Bachelors programs in Computer, Electrical and Mechanical Engineering. Resources that directly support Florida Poly's current engineering programs will also directly support the proposed Engineering Physics program. Current library resources include: Engineering Village (Inspec and Compendex), Elsevier's Science Direct, EBSC Engineering Core eBook collection, IEEE Electronic Library, and ProQuest's SciTech Premium Collection.

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

Acoustical Physics (2000-present)
Advances in Physics ((1952-present)
Annals of Physics (2012-present)
Journal of Engineering Physics and Thermophysics (1997-present)
Materials Chemistry and Physics (2012-present)
Medical Engineering and Physics (2012-present)
Theoretical and Mathematical Physics (1997-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 2 in Appendix A. Please include the signature of the Library Director in Appendix B.

Additional library resources that are the Florida Poly library will seek to implement to support the Engineering Physics program include providing supported access to arXiv.org, an E-print service in the

fields of physics, mathematics, non-linear science, computer science, quantitative biology and statistics. Use of the IOP Publishing conference series will also be planned for implementation into the library discovery tool.

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.

Existing classroom, laboratory, research, and office space within the Innovation, Science, and Technology (IST) building on the main campus is sufficient to handle a total enrollment of approximately 2000 students (by headcount). Plans are currently in progress to expand office space within the IST given the existing buildup of faculty (institutionally) that is planned and in progress for fall 2019 for all programs. The University is currently building an additional classroom and research building, the Applied Research Center, which should be online sometime in academic year 2021 - 2022. The additional 85,000 square foot facility will provide laboratory, classroom, and office space to accommodate multiple programs. Instructional, research, and office programming is presently underway as part of the architectural planning for the building.

However, current on-campus Florida Poly facilities are adequate to implement the proposed classroom lectures and deliver laboratory coursework, research space, and the offices of the anticipated new hire faculty members.

Existing classrooms are all fully equipped with computers, projector equipment, Clarus glass boards for presentation and writing, Panopto lecture capture, and other software. The typical classroom serves 48 students and the typical lab seats 24.

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 2 in Appendix A. Do not include costs for new construction because that information should be provided in response to X (E) below.

As noted above, existing space is available to support the increase in new programs, faculty, and students. Classroom space is sufficient through the foreseeable period and office space will have to be expanded, although plans are already in progress. Presently, Florida Poly has two physics labs, biology, and chemistry labs, plus additional wet and dry labs necessary to deliver natural science and engineering curricula. As we move to implement the proposed programs, the University is engaged in a full analysis of laboratory space and cross-utilization to ensure effective delivery of all curricular content. Capital outlay expressed in Table 2 mostly reflects standard consumable supplies and equipment to enable lab instruction operations.

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 2 in 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.

No capital expenditure is required for instructional or research space that is not already part of the University's campus master plan and currently funded. Thus I&R costs are, in part, for ongoing, consumable laboratory expenses as noted above. We have included a modest uptick in indirect costs associated with libraries and student support, although these costs are already a part of our enrollment growth plan.

F. Describe specialized equipment that is currently available to implement the proposed

program through Year 5. Focus primarily on instructional and research requirements.

Existing resources are sufficient to open and operate the program through years one and two.

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 2 in Appendix A.

Project I&R costs include consideration for equipment to support laboratory needs in biology, chemistry, biochemistry and microbiology. Much of the equipment and costs associated with the natural sciences would support provide additional support to the general education curriculum as well as the proposed environmental engineering program.

Additional laboratory and equipment needs also considered include instruments for astrophysics, applied physics plasma laboratory, and appropriate radiologic technology. Total operating capital outlay in year five for engineering physics is budgeted at $150,000.

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 2 in Appendix A.

Additional, special category funding shown on table two reflects non-recurring research startup costs for new faculty.

I. Describe fellowships, scholarships, and graduate assistantships to be allocated to the proposed program through Year 5. Include the projected costs in Table 2 in Appendix A.

There is no special funding associated with this program outside of the scholarships available to all incoming students. Costs as reflected in Appendix A assume the institution's discount rate as it is planned to reduce over time. For example, instead of revenue based on full tuition and fees, it is based on the current year's discount rate applied to that cost and subsequently at gradually lower rates over the five year's calculated.

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.

With a degree in engineering physics, students will pursue internship opportunities in research and development, science and engineering. Companies that have attended our annual Career and Internship Fair and companies that have hired Florida Poly interns who will be interested in developing internship experiences for engineering physics include:

- Accusoft
- Publix Supermarkets
- Florida Department of Transportation
- Motorola Solutions

Additional sources for internships include the following:

- Society of Physics Students – American Institute of Physics – Summer Internships
- American Physical Society – Internships in National Laboratories and Industries
- State of Florida Entrepreneurial and Industrial Jobs – Bridg, Mosaic, Harris, KCG

APPENDIX A

TABLE 1-A
PROJECTED HEADCOUNT FROM POTENTIAL SOURCES
(Baccalaureate Degree Engineering Physics Program)

Source of Students (Non-duplicated headcount in any given year)*	Year 1		Year 2		Year 3		Year 4		Year 5	
	HC	FTE	HC	FTE	HC	FTE	HC	FTE	HC	FTE
Upper-level students who are transferring from other majors within the university**	0	0	0	0	0	0	0	0	0	0
Students who initially entered the university as FTIC students and who are progressing from the lower to the upper level***	12	12	30	30	48	48	64	64	70	70
Florida College System transfers to the upper level***	0	0	0	0	6	3	6	3	6	3
Transfers to the upper level from other Florida colleges and universities***	0	0	0	0	6	3	6	3	6	3
Transfers from out of state colleges and universities***	0	0	0	0	8	4	8	4	8	4
Other (Explain)***	0	0	0	0	0	0	0	0	0	0
Totals	**12**	**12**	**30**	**30**	**68**	**58**	**84**	**74**	**90**	**80**

* 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
PROJECTED COSTS AND FUNDING SOURCES

Instruction & Research Costs (non-cumulative)	Year 1								Year 5						
	Funding Source							Subtotal columns 1+… +7	Funding Source						Subtotal columns 9+… + 14
	Reallocated Base* (E&G)	Enrollment Growth (E&G)	New Recurring (E&G)	New Non-Recurring (E&G)	Contracts & Grants (C&G)	Philanthropy/ Endowments	Enterprise Auxiliary Funds		Continuing Base** (E&G)	New Enrollment Growth (E&G)	Other*** (E&G)	Contracts & Grants (C&G)	Philanthropy/ Endowments	Enterprise Auxiliary Funds	
Columns	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Faculty Salaries and Benefits	198,322	0	0	0	0	0	0	**$198,322**	525,532	0	0	0	0	0	**$525,532**
A & P Salaries and Benefits	0	0	0	0	0	0	0	**$0**	104,704	0	0	0	0	0	**$104,704**
USPS Salaries and Benefits	0	0	0	0	0	0	0	**$0**		0	0	0	0	0	**$0**
Other Personal Services	15,000	0	0	0	0	0	0	**$15,000**	44,284	0	0	0	0	0	**$44,284**
Assistantships & Fellowships	0	0	0	0	0	0	0	**$0**	0	0	0	0	0	0	**$0**
Library	0	0	0	0	0	0	0	**$0**	0	0	0	0	0	0	**$0**
Expenses	27,000	0	0	0	0	0	0	**$27,000**	58,100	0	0	0	0	0	**$58,100**
Operating Capital Outlay	50,000	0	0	0	0	0	0	**$50,000**	150,000	0	0	0	0	0	**$150,000**
Special Categories	39,040	0	0	0	0	0	0	**$39,040**	59,648	0	0	0	0	0	**$59,648**
Total Costs	**$329,362**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	$329,362	**$942,268**	**$0**	**$0**	**$0**	**$0**	**$0**	**$942,268**

*Identify reallocation sources in Table 3.

**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)	2.00	5.00
A & P (FTE)	0	0.6
USPS (FTE)	0	1.00

Calculated Cost per Student FTE

	Year 1	Year 5
Total E&G Funding	$329,362	$942,268
Annual Student FTE	12	80
E&G Cost per FTE	$27,447	$11,778

Table 2 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 3 – 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 of 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.
Subtotal columns 1+…+7	8	Subtotal of values included in columns 1 through 7.
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.
Subtotal columns 9+…+14	15	Subtotal of values included in columns 9 through 14.

APPENDIX A

TABLE 3
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
Academic Affairs - Faculty Lines	0	0	**$0**
	0	0	
	0	0	
	0	0	
	0	0	
	0	0	
Totals	$0	$0	**$0**

*** If not reallocating funds, please submit a zeroed Table 3**

APPENDIX A

TABLE 4

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	Nicoleta Hickman, Ph.D.	Assoc. Prof	MYA	Fall 2019	12	1.00	0.33	0.25	12	1.00	0.25	0.25
	Physics											
A	Sesha Srinivasan, Ph.D.	Asst. Prof	MYA	Fall 2019	9	0.75	0.50	0.38	9	0.75	1.00	0.75
	Physics											
A	Victoria Astley, Ph.D.	Asst. Prof	MYA	Fall 2019	9	0.75	0.50	0.38	9	0.75	1.00	0.75
	Physics											
A	Robert Green, Ph.D.	Asst. Prof	MYA	Fall 2019	9	0.75	0.25	0.19	9	0.75	0.25	0.19
	Chemistry											
A	Melba Horton, Ph.D.	Asst. Prof	MYA	Fall 2019	9	0.75	0.25	0.19	9	0.75	0.25	0.19
	Biology											
A	Robert Austin, Ph.D.	Inst.	MYA	Fall 2019	9	0.75	0.50	0.38	9	0.75	1.00	0.75
	Physics											
A	Enadelden Fouad, Ph.D.	Inst.	MYA	Fall 2019	9	0.75	0.50	0.38	9	0.75	1.00	0.75
	Physics											
C	TBD	Prof.	MYA	Fall 2019	9	0.75	0.90	0.68	9	0.75	1.00	0.75
	Physics											
C	TBD	Assoc. Prof	MYA	Fall 2019	9	0.75	0.90	0.68	9	0.75	1.00	0.75
	Chemistry											
C	TBD	Assoc. Prof	MYA	Fall 2020		0.00	0.00	0.00	9	0.75	1.00	0.75
	Physics											
C	TBD	Asst. Prof	MYA	Fall 2021		0.00	0.00	0.00	9	0.75	1.00	0.75
	Biology											
C	TBD	Asst. Prof	MYA	Fall 2021		0.00	0.00	0.00	9	0.75	1.00	0.75
	Physics											
	Total Person-Years (PY)							**3.48**				**7.38**

Faculty Code			PY Workload by Budget Classification	
		Source of Funding	**Year 1**	**Year 5**
A	Existing faculty on a regular line	Current Education & General Revenue	2.13	3.63
B	New faculty to be hired on a vacant line	Current Education & General Revenue	1.35	3.75
C	New faculty to be hired on a new line	New Education & General Revenue	0.00	0.00
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
		Overall Totals for	**Year 1** 3.48	**Year 5** 7.38

APPENDIX B

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

Signature of Equal Opportunity Officer	**Date**
Signature of Library Director	**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. Faculty CVs

Curriculum Vitae are provided for the following faculty members in the Department of Natural Sciences where engineering physics will be housed.

- Dr. Nicoleta Hickman, Associate Professor, Physics, Division Director for Science, Arts, and Mathematics
- Dr. Victoria Astley, Assistant Professor, Physics
- Dr. Robert Austin, Instructor, Physics
- Dr. Emadelden Fouad, Instructor, Physics
- Dr. Robert Green, Assistant Professor, Chemistry, Chair of Natural Sciences
- Dr. Melba Horton, Assistant Professor, Biology
- Dr. Sesha Srinivasan, Assistant Professor, Physics

Nicoleta Hickman

Work Address
Florida Polytechnic University
4700 Research Way
Lakeland, FL 33805-8531
W: 863.874.8523
nhickman@floridapoly.edu

Education:

Ph.D. Degree:	**Clemson University**, Clemson, SC, **Physics**, May 2006, Thesis Title: "Experimental and Theoretical Optimization of the Figure of Merit of TiNiSn Half-Heusler Doped and Substituted Thermoelectric Compounds" Advisor: Professor Terry M Tritt;
M.S. Degree:	**Clemson University**, Clemson, SC, **Physics** August 2004, Thesis Title: "Comparative Study of the Structure, Electronic, Thermal and Elastic Properties of the Crystalline System Cd_6Yb with the Quasicrystalline System $Cd_{5.7}Yb$", Advisor: Professor Terry M Tritt;
Ph.D. Candidate:	**"Lucian Blaga" University,** Sibiu, Romania, **Anthropology**, August 1999-August 2001, Thesis Title: "Discovery of Archeological Structures by Using Archeophysics Surveying Methods" Advisor: Professor Emeritus Radu Florescu
M.S. Degree:	**"Al. I. Cuza" University,** Iasi, Romania, **Physics**, July 1998, Thesis Title: "Electrical and Magnetic Surveying Methods used in Archeology" Advisor: Professor Emeritus Dumitru Papusoi
B.S. Degree:	**"Al. I. Cuza" University**, Iasi, Romania, Technological **Physics**, July 1997

Administrative Experience:

2016 - 2017 APC – Program of Arts and Sciences, Florida Polytechnic University

- Evaluated the administrative structure of the Division and proposed restructuring
- Created and maintained a sense of unity within the Division
- Fostered a student-centered approach to problem solving and decision making
- Oversaw Division budgets, grants, and other fiscal partnerships and identify grant and other fundraising opportunities
- Worked on sharing of information with advising and other related services in Admission, Arts and Sciences, Student Affairs and Academic Success Center.
- Participated in community initiatives and partnerships and represented the Division at internal and external events
- Helped to designed the academic road maps for students to facilitate planning of course offerings in Arts and Sciences
- Worked with the faculty to develop new active and collaborative teaching and learning methods in order to engage students with individual faculty and their disciplines.
- Helped to make the schedule planning more systematic, in order to increase seat availability in high-demand courses, particularly those that fulfill the arts and sciences requirements and core requirements.
- Started to work with the Liberal Arts faculty to improve student writing, quantitative reasoning, public speaking, and presentation skills across the curriculum.
- Addressed creatively the heavy faculty teaching load to encourage greater faculty research activity.
- Increased TA and other support for lecture classes and labs
- Worked on strategies to encourage faculty participation in/contribution to Arts and Sciences across the curriculum and other curricular initiatives.
- Continued growth of our faculty-especially our professorial faculty-- and strategic growth of targeted programs while maintaining a commitment to a broad arts and science education.
- Provided the physical and human infrastructure needed to allow the faculty to focus on teaching, research, and service.

- Supported all constituents-faculty, and undergraduate students-in presenting scholarly results at meetings.
- Supported unsponsored research and creative activity, particularly in fields with limited external grant funding.
- Supported departments with funds to invite outside speakers and publicize those events.
- Developed mechanisms for inclusion of social sciences and, wherever possible, humanities and arts in seeking research/creative activity funding.
- Partnered with the Office of Research and Office of the Provost to maximize institutional support to identify opportunities for internal and external funding and for preparing grant proposals.
- Proposed a water, food, energy research-generating center that could enhance external funding.
- Mentor and counsel laboratory staff to promote personal and professional development
- Advised the Provost on hiring, performance, and strategic planning decisions;
- Served in leadership role on University-level committees

Academic Experience:

2015 – present	**Associate Professor of Physics,** Florida Polytechnic University, Lakeland Fl
2015 - present	**Leader of the Sustainability and Renewable Energy Program,** Florida Polytechnic University, Lakeland Fl
2013 – present	**CEO and Director of Research**, HybridaSol, Orlando Fl.
2010 – 2015	**Associate Professor, Leader of the Thermoelectric and Photovoltaic Hybrid Laboratory,** Florida Solar Energy Center, UCF, Orlando, Fl
2010 – 2015	**Graduate Faculty Scholar**, Electrical Engineering, UCF Orlando, Fl
2008 – 2015	**Joint Appointment Associate Professor** – NanoScience Technology Center, UCF Orlando, Fl
2007 – 2010	**Assistant Professor,** Solar Energy Division, Florida Solar Energy Center, UCF, Orlando, Fl
2006 – 2007	**Visiting Research Assistant Professor,** Fuel Cell Research-Advanced Energy Division, Florida Solar Energy Center, UCF, Orlando, Fl
2003 – 2006	**Research Assistant,** Clemson University, Clemson, SC
2001 – 2003	**Teaching Assistant,** Clemson University, Clemson, SC
1999 – 2001	**Staff Scientist,** Romanian National History Museum – National Center of Cross-Disciplinary Researches, Bucuresti, Romania
1998 – 1999	**Staff Scientist,** Moldavian National History Museum- Interdisciplinary Center, Iasi, Romania

Funded and managed research projects:

PI "Back to Nature Intelligent Gardening Center"
Funding agency: Florida Polytechnic University
$25,000 April 01, 2017 to April 01, 2019

PI "Flexible, Lightweight, Low Cost and High Efficiency Thermoelectric Device Fabrication for Power Generation and Heat Management"
Funding agency: Florida Polytechnic University
$21,000 Jan 01, 2016 to Jan 01, 2017

PI "How possible is Net Zero Campus at Florida Poly?"
Funding agency: Florida Polytechnic University
$18,400 Jan 01, 2016 to Jan 01, 2017

PI "Investigation of Photovoltaic Surface Soiling and Its Mitigation in Qatar
Funding agency: QNRF
$185,000 September 01, 2015 to September 01, 2018

Co-PI "SBIR Phase I: High Efficiency - Low Cost Hybrid Photovoltaic-Thermoelectric Cells."
Funding agency: NSF
$150,000 Jan 01, 2014 to July 01, 2015

PI "SBIR Phase I: High Efficiency - Low Cost Hybrid Photovoltaic-Thermoelectric Cells." Matching funds
Funding agency: UCF
$50,000 Jan 01, 2014 to July 01, 2014

PI. "Fully-functional space and terrestrial Photovoltaic/Electrodynamic Dust Shield (PV/EDS) and Photovoltaic/Electrostatic Lunar Dust Collector (PV/ELDC) hybrid systems for dust"
Funding agency: Florida Space Institute
$90,000, September 01, 2012 to February 30, 2014

PI. "Multi-Level Decision Tool for Converting Landfill Sites into Sustainable Energy Parks"
Funding agency: University of Florida
$35,000, Jan 01, 2013 to April 30, 2014

P**I.** "Collaborative research between NREL and FSEC to establish reliability and degradation rates of the PV modules measured at FSEC and validate the energy rating models"
Funding agency: National Renewable Energy Laboratory
$119,410 Oct 7, 2009 — Oct 6, 2012

PI, "PV Laboratory Development"
Funding agency: State of Florida
$100,000, Jul 1, 2008 — Jun 30, 2012

PI. "PV/TE Hybrid Cell Research",
Funding agency: State of Florida
$167,000 , Jul 1, 2008 — Jun 30, 2011

PI. "Electrostatic Dust Hazard Prediction and Control for Lunar and Mars"
Funding agency: UF-UCF
$148,000, April 1, 2009 - March30, 2012

Co PI: "Research and Development of PV Devices Science and Laboratories"
Funding agency: State of Florida (Legislature)
$1,165,988 Jul 1, 2008 — Jun 30, 2012

Co PI. "A Joint Romanian/U.S. NanoScience Workshop"
Funding agency: National Science Foundation
$58,000 Jan 1, 2009 — Dec 31, 2009

PI. "Florida Space Grant Consortium's ESMD Senior Design Project: Ground Operations Habitat Design Project during the 2008-09 academic year at UCF"
Funding agency: NASA Kennedy Space Center
$1,500 Nov 1, 2008 — Oct 31, 2009

PI. "A Solar Energy Converter with Improved Photovoltaic Efficiency, Frequency Conversion and Thermal Management Permitting Super Highly Concentrated Collection" Funding agency: Corban Associates, LLC
$62,001 Jun 1, 2008 — Aug 14, 2009

PI. "Dust Mitigation for Solar Panels"
Funding agency: ASRC Aerospace Corporation
$60,000 Sep 16, 2008 — Sep 30, 2009

PI. "Research and Development for high Efficiency III-V Photovoltaic Solar Cell Technology"
Funding agency: The College of Optics & Photonics - CREOL UCF
$21,000 April 2008-April 2009

Teaching and mentoring experience

2015- Present Associate Professor,
Physics 1, Physics 2, Nanotechnology and Materials for Energy Storage and Generation, Sustainable Logistics, Introduction to Solid State Physics, Hybrid Devices and Systems
2016 Lecturer, Future Thinking: Renewable hybrid energy systems, PVSC,
2015 Lecturer, Novel Materials and Device Concepts for Photovoltaic Energy Conversion Tutorial PVSC,
2014 Lecturer, Novel Materials and Device Concepts for Photovoltaic Energy Conversion Tutorial PVSC,
2014 Lecturer, Thermoelectric and Photovoltaic materials, Materials Science Department UCF, Orlando
2013 Lecturer, Thermoelectric and Photovoltaic materials, Materials Science Department UCF, Orlando
2013 Lecturer, Novel Materials and Device Concepts for Photovoltaic Energy Conversion Tutorial PVSC, Austin TX 2013
2001 – 2003 Teaching assistant, Clemson University
2007 High school substitute teacher, Iasi, Romania

Masters Graduates:

Albert Leyte-Vidal, Establish Degradation Rates of Photovoltaic Modules and Systems M.S, Electrical Engineering and Computer Science Department UCF, August 2010, adviser
Monica Bonadies Analysis and Optimization of a Solar Thermal Collector with Integrated Storage M.S., Mechanical, Materials and Aerospace Engineering, UCF August 2010, committee

Graduate Advising and Co-Advising:

Steven Nason, Ph.D, Materials Science Department, UCF
Kris Davis, Ph.D, College of Optics & Photonics - CREOL, UCF
Rodica Kugler M.S. Mechanical, Materials and Aerospace Engineering, UCF
Michael Toth Ph.D, Environmental Engineering Sciences, UCF
Nima A-Mohajer, Ph.D. Environmental Engineering Sciences, University of Florida- external adviser

Undergraduate Advising and Co-Advising:

Inna Kravchunovska "Flexible, Lightweight, Low Cost and High Efficiency Thermoelectric Device Fabrication for Power Generation and Heat Management" Florida Poly
Yassir Bello "How possible is Net Zero Campus at Florida Poly?" Florida Poly
Frank Calas "How possible is Net Zero Campus at Florida Poly?" Florida Poly
Hardin, Dejai "Smart organic community garden" Florida Poly
Eric Rippe "Smart organic community garden" Florida Poly
Kristi Folds "Flexible, Lightweight, Low Cost and High Efficiency Thermoelectric Device Fabrication for Power Generation and Heat Management" Florida Poly
Michael Midence "Investigation of Photovoltaic Surface Soiling and Its Mitigation in Qatar" Florida Poly
Mark Glaser "Flexible, Lightweight, Low Cost and High Efficiency Thermoelectric Device Fabrication for Power Generation and Heat Management" Florida Poly
Enrique Hernandez "Flexible, Lightweight, Low Cost and High Efficiency Thermoelectric Device Fabrication for Power Generation and Heat Management" Florida Poly
Lucille Bridges "Back to Nature Intelligent Garden" Florida Poly
Rodriguez Stephen "Back to Nature Intelligent Garden" Florida Poly
Christian Crosser "Back to Nature Intelligent Garden" Florida Poly
Aleck Johnson "Back to Nature Intelligent Garden" Florida Poly

Internship students:

Gilles Lemagnen, "Thermoelectric/Photovoltaic hybrid device" Exchange Graduate Student, France
Albert Casanciuc, "Indoor and outdoor measurements of the High efficiency solar cells"**.** Exchange college student

"Al. I. Cuza" Iasi Romania
Travis Thorn, "PV laboratory development" College student UCF
Sumner Albright, "Natural Dye-sensitized Solar Cells" High School, Viera, Florida
Henry Chiang, "Thermoelectric/Photovoltaic hybrid device - design and tests" College student University of Mississippi
Rodica Krueger, "PV laboratory development" **G**raduate student UCF
Abby Fenton, "Unconventional PV architectures" High School, Viera, Florida
Zoe Barbeau, "3D geometry of photovoltaic", home schooled

Post Doctoral Research Advisees:

Dr. Amare Benor Belay "Organic/Inorganic hybrid nanostructure for PV solar devices"
Dr. Wei Zhou, "Mutijunction organic/inorganic PV solar cells" and "Glass fiber based PV organic cells"
Dr. K Shavitranuruk "Inexpensive row semiconductor studies for PV application" and **"**Dust mitigation technologies for space and terrestrial application"
Dr. Hajrah Moin Quddusi " Thermolectric/Photovoltaic incorporated device"

Visiting Professor:

Assoc. Prof. Dr. Umit Alver, Dept. of Physics, Kahramanmaras Sutcu Imam University, Turkey

Peer-reviewed journal articles and conference papers

N. Sorloaica, "Identification of the Dig that Surrender the Neolithic Settlement from Tg-Frumos" SCIVA Archaeology Journal, Romania, (1998)

N. Sorloaica, "Reconstitution of the XIXth Century Building Planimetry of the Unification Museum Iasi Using Electrical Surveying Methods" Archeological Research Chronicle, Romania, (1998)

N. Sorloaica, M. Hamilton, "Discovery of some Archeological Structures for Defining the Type and Character of the Anthropic Occupation of the Space by Using Geophysics Surveying Methods, Archeological Research Chronicle, Romania 1998

S. Culp, S. J. Poon, **N. Sorloaica-Hickman**, T. Tritt, and J. Blumm, "Effect of substitutions on the thermoelectric figure of merit of half-Heusler phases at 800 °C", Applied Physics Letters 88, 042106 (2006).

N. Sorloaica, A. L. Pope, D. W. Winkler and Terry M. Tritt**,** V. Keppens, D. Mandrus and B. Sales "Order-Disorder Transition in the Crystalline Phase of Cd_6Yb" Materials Research Society, Symposium S, Boston, MA S8-16 (2003)

N. Sorloaica, A. L. Pope, D. W. Winkler and Terry M. Tritt, V. Keppens, "Evidence of an Order-Disorder Transition in the Crystalline Phase of Cd_6Yb, 1/1 cubic Approximant of Icosahedral Cd $_{5.7}$ Yb", Materials Research Society Proceedings, 793, 247 (2004)

N. Sorloaica, T.M. Tritt, S Culp and J. Poon "Experimental Investigation and Modeling of the Lattice Thermal Conductivity of the New Power Generation TiNiSn- Based Half-Heusler System" Proceedings of the 24th International Conference on Thermoelectric, Clemson, SC, (2005)

S. Culp, **N. Sorloaica,** J. Poon and T.Tritt **"**Optimization Through Substitution and Doping of the High-Temperature Thermoelectric System" Proceedings of the 24th International Conference on Thermoelectrics, June 19-23, 2005, Clemson, SC, (2005)

V. Ponnambalam, S. Lindsay, **N. Sorloaica-Hickman**, T. Tritt, "Next Generation probe design for thermopower and resistivity measurements at very high temperatures (300-1200K)" Review of Scientific Instruments 77, 073904 (2006)

A.Leyte-Vidal, K. Davis, **N. Sorloaica-Hickman**, "Performance and solar illumination assessment and evaluation of

three different PV Systems in Florida", Proceedings of the SHPE Conference (2009)

N. Afshar-Mohajer, B. Damit, , C. Y. Wu, and **N. Sorloaica-Hickman**, "Electrostatic Particle Collection in Vacuum", Advances in Space Res., doi:10.1016/j.asr.2011.04.030, 48, 933-942, (2011)

U. Alver, W. Zhou, A.B. Belay, R. Krueger, K.O. Davis, **N. Hickman,** "Optical and structural properties of ZnO nanorods grown on graphene oxide and reduced graphene oxide film by hydrothermal method" Applied Surface Science, 258, 7, 3109-3114, DOI: 10.1016/j.apsusc.2011.11.046, (2011).

N. Sorloaica-Hickman, S. Nason, K. Davis, E. Arens, J. McFall, C. Calle, "Optimization of Photovoltaic Performance through the Integration of Electrodynamic Dust Shield Layers" 9th European Space Power Conference Proceedings , (2011)

N. Afshar-Mohajer, B. Damit, B.; C.Y. Wu, & **N. Sorloaica-Hickman,** "Efficiency Evaluation of an Electrostatic Lunar Dust Collector", 41st International Conference on Environmental Systems (ICES), AIAA-2011, Portland, OR, USA. DOI: 10.2514/6.2011-5201 (2011).

K.O. Davis, S. Kurtz, D. Jordan, J. Wohlgemuth, **N. Hickman**, "Multi-pronged strategy for determining degradation rates of photovoltaic modules and arrays from archived data sets", Progress in Photovoltaics: Research and Applications, DOI: 10.1002/pip.2154 (2012)

W Zhou ; A.B. Belay, K Davis, **N**. **Sorloaica-Hickman,** Transparent conductive film fabrication by carbon nanotube ink spray coating and ink-jet printing PVSC Proceedings (2012)

K. Davis, A. Leyte-Vidal, S. Kurtz,; D. Jordan, **N**. **Sorloaica-Hickman,** Comparative study of the performance of field-aged photovoltaic modules located in a hot and humid environment, PVSC Proceedings (2012)

J. McFall, S. Nason, K. Davis, E. Arens, N. **Sorloaica-Hickman, "**Optimization of the photovoltaic powered systems with dust mitigation technology for future lunar and martian missions", PVSC Proceedings (2012)

M. Toth, **N. Sorloaica-Hickman**, D.R. Reinhart, "Converting landfill sites into sustainable energy parks", 14th Waste Management and Landfill Symposium Processing, Sardinia (2013)

A. Belay, W. Zhou, R. Krueger, K.O. Davis, U. Alver, **N. Hickman**, "Effect of UV-Ozone Exposure on PCBM", IEEE Journal of Photovoltaics 2(2), pp. 148-143, DOI: 10.1109/JPHOTOV.2012.218357 (2012)

N. Afshar-Mohajer, C.Y. Wu, & **N. Sorloaica-Hickman,** "Efficiency Estimation of an Electrostatic Lunar Dust Collector by Discrete Element Method (DEM)", Journal of Applied Physics, Vol. 112, No. 2, 023305. DOI: 10.1063/1.4739734, (2012).

N. Afshar-Mohajer, C.-Y. Wu, & **N. Sorloaica-Hickman,** "Design of an Electrostatic Lunar Dust Repeller for Mitigating Dust Deposition and Evaluation of its Removal Efficiency", Journal of Aerosol Science, Vol. 69, No. 12, pp. 21-31. DOI: 10.1016/j.jaerosci.2013.11.005, (2013).

N. Afshar-Mohajer, Y. Thakker, C.Y. Wu, & **N. Sorloaica-Hickman,** "Influence of Back Electrostatic Field on Collection Efficiency of an Electrostatic Lunar Dust Collector", International Journal of Aerosol and Air Quality Research (2014)

N. Afshar-Mohajer, C.Y. Wu, & **N. Sorloaica-Hickman,** "Electrostatic Collection of Tribo-charged Lunar Dust Simulants", Powder Technology Journal (2014)

Invited talks, Presentations and Posters,

N. Sorloaica, "Identification of the Neolithic settlement using geophysics surveying methods**"** Physics National

Symposium of Students, Iasi, Romania, (1994)

N. Sorloaica, "Theoretical Analysis of the Factors which can Influence the measurements of the ground resistivity" National Symposium of Archeometry, Cluj, Romania, (1994)

N. Sorloaica, "Measurements of the Ground Resistivity Conducted at the Garden of the Unification Museum Iasi**"** National Symposium of Ethno-Archeology, Cluj, Romania, (1997)

N. Sorloaica, "Electrical Surveying Methods used in Archeology", National Symposium of Archeometry, Cluj, Romania, (1998)

N. Sorloaica, "Possibilities and Limits of the Geophysics Surveying Methods", National Symposium of Ethno-Archeology, Cluj, Romania, (1998)

N. Sorloaica, "Reconstruction of the Planimetry of the Unification Museum Iasi using Electrical Surveying Method", Communication Session of the National History Museum of Romania, Bucharest, (1998)

N. Sorloaica, "Geophysics Research Conducted at the Neolithic Site from Vitanesti and Laceni-Magura Villages", Archeological Report Session, Vaslui, Romania, (1999)

N. Sorloaica, "Identification of the dig that surrender the Neolithic Settlement from Poduri Village. Comparison of the Maps Resulted from Geophysics Surveying and Archeological Digging". Communication Session of the National History Museum of Romania, Bucharest, (1999)

N. Sorloaica, "Interdisciplinary Research Conducted at the Neolithic Site from Tg-Frumos. Possibilities and Limits", Proceeding of the Communication Session of the National History Museum of Moldova, Iasi, (1999)

N. Sorloaica, A. L. Pope, D. W. Winkler and Terry M. Tritt, V. Keppens, D. Mandrus and B. Sales, **"**Order-Disorder Transition in the Crystalline Phase of Cd_6Yb" MRS, Symposium S, Boston, MA S8-16, (2003)

N. Sorloaica, V. Keppens, M. Skove, T. Tritt, "Heat Capacity and Magnetoresistivity Measurements on Cubic System Cd_6Yb Near the Structural Phase Transition**,** American Physical Society, 71st Annual Meeting of the Southeastern Section, (2004)

N. Sorloaica, A. L. Pope, D. W. Winkler and Terry M. Tritt, V. Keppens, D. Mandrus and B. Sales, "Evidence of an Order-Disorder Transition in the Crystalline Phase of Cd_6Yb, 1/1 cubic Approximant of Icosahedral $Cd_{5.7}Yb$ Thermoelectric Materials" Research and Applications Editors: G. Nolas, J. Yang, T. Hogan and D. Johnson Materials Research Society Proceedings, 793, 247 (2004)

J. Poon, Slade Culp, **N. Sorloaica** and T. Tritt, **"**Effect Of Substitutional Doping On the Structural, Electronic and Thermal Properties of TiNiSn-Based Half-Heusler Compounds"**,** MRS (2005)

S. Culp, **N. Sorloaica,** S. Joseph Poon and Terry M. Tritt**, "**Optimization through Substitution and Doping of the High-Temperature Thermoelectric System" **Proceedings** of the 24th International Conference on Thermoelectrics, Clemson, SC (2005)

J. Poon, T. Tritt, S. Culp, **N. Sorloaica "**Complex MNiSn Phases as Stable High-Temperature Thermoelectric Materials" Proceedings of the 24th International Conference on Thermoelectrics, Clemson, SC, (2005)

N Sorloaica-Hickman, T. Tritt, S. Culp, and J. Poon, "Experimental Investigation and Modeling of the Lattice Thermal Conductivity of the New Power Generation TiNiSn- Based Half-Heusler Systems", Proceedings of the 24th International Conference on Thermoelectric, June 19-23, 2005, Clemson, SC, (2005)

N Sorloaica-Hickman, Invited talk T. Tritt, S. Culp, and J. Poon, "Improved Thermoelectric Properties in TiNiSn-based materials", University Of Bucharest, Bucharest, Romania, (2007)

N. Sorloaica-Hickman, Invited talk **"**New Direction and Ideas in Solar Energy Application", Al. I. Cuza University Iasi, Romania, (2007)

N. Sorloaica-Hickman, Invited talk "Thermoelectric Materials Basic Research and Application", Nanoscience and Technology Center, Orlando (2007)

N. Sorloaica-Hickman, "From Uncontrolled and Controlled Size and Shape Intercalated Nanostructures to Bulk Materials for Thermoelectric Device Application", AVS 54th International Symposium, Seattle, WA, USA (2007)

N. Sorloaica-Hickman, Invited talk "Novel Material and Device Architectures for High-Performance Inorganic and Composite Solar Cell", The College of Optics & Photonics - CREOL UCF, Fl (2009)

N. Sorloaica-Hickman, Invited talk "High Efficiency Photovoltaic/Thermoelectric Hybrid System", Joint Romanian/U.S. NanoScience Workshop, Iasi Romania (2009)

A.Leyte-Vidal, K. Davis, **N. Sorloaica-Hickman**, "Performance and solar illumination assessment and evaluation of three different PV Systems in Florida", SHPE Conference (2009)

A. Leyte-Vidal, K. Davis, **N. Sorloaica-Hickman,** "Establish Degradation Rates of Photovoltaic Modules and Systems Trough Comprehensive Electrical and Mechanical Analysis", AVS 56th International Symposium, San Jose Ca, USA (2009)

S. Nason, K. Davis, E. Arens, J. McFall, C. Calle, **N. Sorloaica-Hickman**, "Optimization of Photovoltaic Performance through the Integration of Electrodynamic Dust Shield Layers", AVS 56th International Symposium, San Jose Ca, USA (2009)

K. Davis, S. Nason, **N. Sorloaica-Hickman, "**Experimental Evaluation of Cheap, Overly Abundant Semiconductor Materials for Wide-Spread Photovoltaic Applications", AVS 56th International Symposium, San Jose Ca, USA (2009)

N. Sorloaica-Hickman, A. Leyte-Vidal, K. Davis, S. Kurtz, D. Jordan, "Comparative Study of the Long-Term Performance of Three PV Systems Installed in Florida", Photovoltaic Module Reliability Workshop, (2010)

N. Sorloaica-Hickman, Invited talk "New direction in PV research", FIT (2010) ,

N. Afshar-Mohajer, B. Damit, C.Y. Wu, and **N. Sorloaica-Hickman,** "Discrete Element Method (DEM) Modeling of a Lunar Electrostatic Precipitator", International Conference on Multiphase Flow 2010, Abstract No. P1.94, Tampa, FL, (2010)

N. Afshar-Mohajer, B. Damit, C.Y. Wu, and **N. Sorloaica-Hickman,** "Lunar dust control by an Electrostatic Precipitator (ESP)", International Aerosol Conference, Abstract No. 862, Helsinki, Finland, (2010)

N. Sorloaica- Hickman and B. Reedy "Advanced Thermal Management Techniques for Increasing the Efficiency and Longevity of PV Cells", FESC Summit, (2010)

N**. Sorloaica-Hickman** and B. Reedy "Solution and Support Facility for Photovoltaic Research, Innovation, Manufacturing & Development at UCF's Florida Solar Energy Center" FESC Summit, (2010)

N. Afshar-Mohajer, B. Damit, C. Y. Wu, and **N. Sorloaica-Hickman,** "Lunar Dust Control by an Electrostatic Precipitator (ESP)", 29th Annual Meeting of the American Association for Aerosol Research, Abstract No. 2.I.3, Portland, OR, (2010)

A. Leyte-Vidal, K. Davis, **N. Sorloaica-Hickman**, "Performance and solar illumination assessment and evaluation of three different PV Systems in Florida", SHPE Conference, (2010)

N. Afshar-Mohajer, B. Damit, CY Wu, and **N. Sorloaica-Hickman**, "Lunar Dust Control by an Electrostatic Precipitator (ESP)", 29th Annual Meeting of the American Association for Aerosol Research, Abstract No. 2.I.3, Portland, OR, (2010)

N. Afshar-Mohajer, CY Wu, and **N. Sorloaica-Hickman**, "Efficiency Evaluation of an Electrostatic Lunar Dust Collector", 41st International Conference on Environmental Systems (ICES), Portland, Oregon, (2011)

N. Afshar-Mohajer, CY Wu, and **N. Sorloaica-Hickman**, "Efficiency Estimation of an Electrostatic Lunar Dust Collector by Discrete Element Method", 30th Annual Meeting of the American Association for Aerosol Research, Abstract No. 127, Orlando, FL, (2011)

N. Sorloaica-Hickman, J. McFall, S. Nason, K. Davis & E. Arens, "Improved Photovoltaic Powered Systems with Dust Mitigation Technology for Future Lunar and Martian Missions" 9th European Space Power Conference, (2011)

N. Sorloaica-Hickman, keynote speaker "Nanostructured Materials and Novel Device Architectures for Advanced Energy Conversion" The 4th Annual NanoScience Technology Symposium NanoFlorida (2011)

N. Sorloaica-Hickman, Invited Talk JPL/ Caltech "Improved PV Powered systems including dust mitigation technologies for future Lunar and Martian mission" (2011)

N. Sorloaica-Hickman, **keynote speaker** "Nanostructured Materials and Novel Device Architectures for Advanced Energy Conversion", Diaspora in scientific research and higher education in Romania Conference, Bucharest Romania, (2012)

N. Sorloaica-Hickman, Invited Talk, Novel Materials and Device Concepts for Thermoelectric and Photovoltaic Energy Conversion, School of Photovoltaic and Renewable Energy Engineering UNSW, (2012)

W Zhou ; A.B. Belay, K Davis, **N**. **Sorloaica-Hickman, "**Transparent conductive film fabrication by carbon nanotube ink spray coating and ink-jet printing" PVSC (2012)

K. Davis, A. Leyte-Vidal, S. Kurtz,; D. Jordan, **N**. **Sorloaica-Hickman,** "Comparative study of the performance of field-aged photovoltaic modules located in a hot and humid environment", PVSC (2012)

J. McFall, S. Nason, K. Davis, E. Arens, N. **Sorloaica-Hickman, "**Optimization of the photovoltaic powered systems with dust mitigation technology for future lunar and Martian missions" PVSC (2012)

N. Sorloaica-Hickman, Invited Talk, "Novel Materials and Device Concepts for Thermoelectric and Photovoltaic Energy Conversion", Materials Science Department, UCF, (2013)

N. Sorloaica-Hickman, Invited Talk, "TE/PV laboratory", Physics Department, Rollins College (2013)

N. Afshar-Mohajer, CY Wu, and **N. Sorloaica-Hickman** , "Electrostatic Lunar Dust Collection", 32nd American Association of Aerosol Research (AAAR), Portland, OR, USA (4CH.7) (2013)

N. Afshar-Mohajer, CY Wu, and **N. Sorloaica-Hickman,** "Influence of Electrostatic Field on Collection Efficiency of an Electrostatic Lunar Dust Collector", 32nd American Association of Aerosol Research (AAAR), Portland, OR, USA (12AP.2) (2013)

M. Toth, **N. Sorloaica-Hickman**, D.R. Reinhart, "Converting landfill sites into sustainable energy parks", 14th Waste Management and Landfill Symposium (2013)

N. Afshar-Mohajer, CY Wu, and **N. Sorloaica-Hickman**, "Design of an Electrostatic Lunar Dust Repeller", 43rd International Conference on Environmental Systems (ICES), Vail, CO, USA, (2013)

N. Afshar-Mohajer, CY Wu, and **N. Sorloaica-Hickman**, "Electrostatic Lunar Dust Repeller", 106rd A&WMA Annual Conference & Exhibition, Chicago, IL, USA (2013)

N. Hickman, Invited Talk, "Fully-Functional Space And Terrestrial Photovoltaic/Electrodynamic Shield (PV/ES) Hybrid System For Dust Mitigation" Florida Space Institute (2014)

N. Hickman, key note speaker Texas A&M Qatar Anti-dust Technology Workshop (2015)

N. Hickman, Invited Talk **"**FSEC's responsibilities to conduct research, test and certify solar systems, and to develop education programs", Green Day - Orlando International & Orlando (2015)

N. Hickman, Invited Talk **"**Solar energy- past, present, future" Sustainability and Renewable Energy Workshop, Florida Polytechnic University 2015

N. Hickman, Invited Talk **"**The world in 2040" Jewett Middle Academy Magnet – Great American Teach-In (2015)

Nicoleta Hickman, Invited Talk, Building a green culture at Florida Poly, STEM DOE Tallahassee October 2016

Yassir Bello, **Nicoleta Hickman**, Building Energy Independent Cities, Polk County History Center, October 2016,

Muneer Tatum, **Nicoleta Hickman**, Back to Nature Intelligent Garden Polk County History Center, October 2016

Inna Kravchunovska**, Nicoleta Hickman**, Family Weekend Event, October 14th 2016

Nicoleta Hickman, Invited Talk, The world in 2040 Sunshine State Scholar, April 2017

Inna Kravchunovska, Bing Guo, **Nicoleta Hickman**, Carbon Electrode Materials for Solar Photovoltaic Anti-Dust Applications, Eighth Annual Symposium on Material Sciences and Engineering, March 2017

Nicoleta Hickman, Invited Talk, Building the world in 2040, Florida Poly, Foundation Board Meeting May 2017

Inna Kravchunovska**, Nicoleta Hickman**, GRAPHENE-Fast, Strong, Cheap, and… Impossible to Use? Florida Poly, Foundation Board Meeting, May 2017

Nicoleta Hickman, Yassir Bello, Eric Rippe, Enrique Hernandez, Inna Kravchunovska, Invited Talk, Building a Net Zero Energy Campus and Culture at Florida Poly, Florida Polytechnic University, Robert Reedy, FSEC UCF June, 2017

Yassir Bello, Inna Kravchunovska, Eric Rippe, Enrique Hernandez, Scott Wallen, **Nicoleta Hickman**, Ink-jet nanoprinting Graphene/Perovskite combined solar cells, The Renewable Energy Systems and Sustainability Conference, Florida Polytechnic University, June, 2017

Eric Rippe, Inna Kravchunovska, Yassir Bello, Enrique Hernandez, **Nicoleta Hickman,** Nano-Printed flexible Graphene coated Aluminum Electrodes for highly efficient Supercapacitor, , , The Renewable Energy Systems and Sustainability Conference, Florida Polytechnic University June, 2017

Enrique Hernandez, Eric Rippe, Inna Kravchunovska, Yassir Bello, Scott Reinhart, **Nicoleta -Hickman**, Printable Thermoelectric Elements for Energy Harvesting and Heating / Cooling Applications, , The Renewable Energy Systems and Sustainability Conference, Florida Polytechnic University June, 2017

Inna Kravchunovska, Eric Rippe, Yassir Bello, Scott Reinhart, **Nicoleta Hickman**, Fabrication of Graphene nanoflake highly conductive inks, , The Renewable Energy Systems and Sustainability Conference, Florida Polytechnic University June, 2017

Muneer Tatum,, Eric Rippe, Inna Kravchunovska, Yassir Bello, Enrique Hernandez, Scott Reinhart, Ryan Integlia, **Nicoleta Hickman**, Back to Nature Intelligent Gardening , The Renewable Energy Systems and Sustainability Conference, Florida Polytechnic University June, 2017

Nicoleta Hickman, Invited Talk, Building the world in 2040, Lakeland Rotary Club, October, 2017

Patents:

"Hybrid solar cell integrating Photovoltaic and Thermoelectric cell elements for high efficiency and longevity" **Patent Number US 8,420,926**

"Photovoltaic modules incorporating lateral heat removal" **patent application**

"Hybrid incorporation TE/LED for thermal management" **patent application**

Former and Present Professional Memberships:

Member of American Vacuum Society
Member of Materials Research Society
Member of American Physical Society
Member of the Society of Physics Students
Member of the Institute of Electrical and Electronics Engineers
Member of the International Thermoelectric Society
Member of the American Solar Energy Society

Faculty Bio Template

Victoria Astley
Assistant Professor of Physics
Department of Natural Sciences

Contact

- 863.874.4562
- vastley@floridapoly.edu
- Office: IST 2025
    - Mailing Address: Innovation Science and Technology Building, Room 2025, 4700 Research Way, Lakeland, FL 33805-8531

Education

PhD in Applied Physics, 2012, Rice University
MS in Applied Physics, 2009, Rice University
BS in Astronomy/Astrophysics, Applied Mathematics, and Physics, 2005, at Florida Institute of Technology

Courses taught a Florida Poly in the last 2 semesters

PHY 2048 Physics 1
PHY 2048L Physics 1 Laboratory
PHY 2049 Physics 2
PHY 2049 Physics 2 Laboratory

Google Scholar Profile

https://scholar.google.com/citations?hl=en&user=JDcadF4AAAAJ

About

Dr. Astley is teaching courses in Physics, with a focus on providing a "solid scientific education for undergraduates in technical fields" and making darn sure they know how to do vectors. She is known for incorporating movies, animal combat, and doomsday machines into her practice problems. In 2017 she received the Faculty Award for Teaching Excellence.

When she isn't teaching (i.e. the summer), Dr. Astley can be found on the deck of a historical replica 17th-century Dutch pinnace. She volunteers as an educator, deckhand, and occasional bosun for the Kalmar Nyckel Foundation in Delaware, teaching students about the history and practice of colonial-era sailing. She also assisted in developing a STEM program for K-12 to teach physics and math concepts using sailing and navigation.

Her bachelor's degrees are in Astronomy/Astrophysics, Applied Mathematics, and Physics from Florida Institute of Technology in Melbourne. She has a doctorate and master's degree in Applied Physics from Rice University in Houston. Her research has mostly focused on terahertz technology, an interdisciplinary field overlapping physics and electrical engineering with real-world applications.

She did make a foray into biology, publishing one paper on the use of digital image analysis for snake measurement as a collaborative project with University of Akron and her Physics 1 Laboratory sections.

Expertise

1. Terahertz time-domain spectroscopy
2. Terahertz waveguides
3. Snake measurement

Awards and Honors

1. 2017 Faculty Award for Teaching Excellence
2. Finalist for Rice University Thesis Award, 2012
3. NDSEG Graduate Fellowship, 2006- 2009

Selected Publications

A. Astley, Henry C., Astley, Victoria E., Brothers, David, and Mendelson, Joseph R. Digital Analysis of Photographs for Snake Length Measurement. Herpetological Review, 2017, 48(1), 39-43. Note: This work was completed in conjunction with the PHY2048L laboratory sections as part of an exercise in data analysis/error analysis, as well as an introduction to image analysis software. The students received an acknowledgement at the end of the paper.

B. Victoria Astley, Kimberly S. Reichel, Jonathan Jones, Rajind Mendis, and Daniel M. Mittleman, "A mode matching analysis of dielectric-filled resonant cavities coupled to terahertz parallel-plate waveguides," Optics Express, 20, 21766-21772 (2012).

C. Victoria Astley, Kimberly Reichel, Rajind Mendis, and Daniel M. Mittleman, "Terahertz microfluidic sensing using a parallel-plate waveguide sensor," Journal of Visualized Experiments, 66, e4304 (2012).

D. Victoria Astley, Kimberly Reichel, Jonathan Jones, Rajind Mendis, and Daniel M. Mittleman, "Terahertz multichannel microfluidic sensor based on parallel-plate waveguide resonant cavities," Applied Physics Letters, 100, 231108 (2012).

E. Jie Shu, Ciyuan Qiu, Victoria Astley, Daniel Nickel, Daniel M. Mittleman, and Qianfan Xu, "High-contrast terahertz modulator based on extraordinary transmission through a ring aperture," Optics Express, 19, 26666-26671 (2011).

F. Victoria Astley, Blake McCracken, Rajind Mendis, and Daniel M. Mittleman , "Analysis of rectangular resonant cavities in terahertz parallel-plate waveguides," Optics Letters, 36, 1452-1454 (2011).

G. Victoria Astley, Julianna Scheiman, Rajind Mendis, and Daniel M. Mittleman, "Bending and coupling losses in terahertz wire waveguides," Optics Letters, 35, 553-555 (2010).

H. C. Jansen, S. Wietzke, V. Astley, D. M. Mittleman, and M. Koch, "Mechanically flexible polymeric compound 1D photonic crystals for terahertz frequencies," Applied Physics Letters, 96, 111108 (2010).

I. Rajind Mendis, Victoria Astley, Jingbo Liu, and Daniel M. Mittleman, "Terahertz microfluidic sensor based on a parallel-plate-waveguide resonant cavity," Applied Physics Letters, 95, 171113 (2009).

J. Victoria Astley, Rajind Mendis, and Daniel M. Mittleman, "Characterization of terahertz field confinement at the end of a tapered metal wire waveguide," Applied Physics Letters, 95, 031104 (2009).

Faculty Bio Template

Robert Austin
Instructor of Physics
Department Physics

Contact

- 863-874-8649
- raustin@floridapoly.edu
- Office mailing address: Innovation Science and Technology Building, Room 2022, 4700 Research Way, Lakeland, FL 33805-8531

Education

PhD Physics (1990), Purdue University
MS Physics (1987), Purdue University
BS Physics (1982), Purdue University
University of Chicago 1979 - 1981

Courses taught a Florida Poly in the last 2 semesters

PHY2048, PHY2049, PHY2048L, PHY2049L

Google Scholar Profile

https://scholar.google.com/citations?hl=en&user=z0wS8yMAAAAJ

Other Social Media Accounts/websites
https://www.linkedin.com/in/robert-austin-physics/
https://www.researchgate.net/profile/Robert_Austin4

About:

* Over two decades of experience in the radiation detection field.
* Nuclear physicist with a decade of experience with high-pressure xenon-filled ionization chambers and solid state (HgI2) gamma ray detectors.
* High energy astrophysicist who pioneered hard x-ray photoelectric polarimetry using a gas-filled optical avalanche chamber.
* Scientific programmer who has written many simulations of nuclear detection devices and scenarios using Matlab, Visual Basic, Fortran, and C++. Developed an Excel spreadsheet that was used in the calibration planning of NASA's $1 billion+ Chandra X-ray Observatory.

Specialties: Nuclear instrumentation, Monte Carlo simulation, noble gas purification.

Expertise:

1. X-ray Astrophysics
2. X-ray and gamma ray detection
3. Nuclear Magnetic Resonance.
4. Very high energy gamma ray astronomy

Professional Activities:

1. American Association of Physics Teachers
2. American Physical Society.

Awards and Honors:

1. Winner of Physics Today's Physics in 2116 essay contest

Selected Publications:

Austin, Robert A; Ramsey, Brian D; Optical imaging chamber for x-ray astronomy Optical Engineering 32 8 1990-1995 1993 International Society for Optics and Photonics

Austin, Robert A; Minamitani, Takahisa; Ramsey, Brian D; Development of a hard X-ray imaging polarimeter X-Ray and Ultraviolet Polarimetry 2010 118-126 1994 International Society for Optics and Photonics

Ramsey, Brian D; Alexander, Cheryl D; Apple, Jeff A; Austin, Robert A; Benson, CM; Dietz, Kurtis L; Elsner, Ronald F; Engelhaupt, Darell E; Kolodziejczak, Jeffery J; O'Dell, Stephen L; HERO: high-energy replicated optics for a hard-x-ray balloon payload X-Ray Optics, Instruments, and Missions IV 4138 147-154 2000 International Society for Optics and Photonics

Ramsey, Brian D; Austin, Robert A; Decher, Rudolf; Instrumentation for X-ray astronomy Space science reviews 69 2-Jan 139-204 1994 Kluwer Academic Publishers

Kolodziejczak, Jeffery J; Elsner, Ronald F; Austin, Robert A; O'Dell, Stephen L; Ion transmission to the focal plane of the Chandra X-ray Observatory X-Ray and Gamma-Ray Instrumentation for Astronomy XI 4140 135-144 2000 International Society for Optics and Photonics

Kolodziejczak, Jeffery J; Austin, Robert A; Elsner, Ronald F; Joy, Marshall K; Sulkanen, Martin E; Kellogg, Edwin M; Wargelin, Bradford J; X-ray source system at the Marshall Space Flight Center X-ray calibration facility X-Ray and Extreme Ultraviolet Optics 2515 420-436 1995 International Society for Optics and Photonics

Lacy, Jeffrey L; Athanasiades, A; Shehad, NN; Austin, RA; Martin, CS; Novel neutron detector for high rate imaging applications Nuclear Science Symposium Conference Record, 2002 IEEE 1 392-396 2002 IEEE

Ghigo, Mauro; Citterio, Oberto; Mazzoleni, Francesco; Kolodziejczak, Jeffery J; O'dell, Stephen L; Austin, Robert A; Zirnstein, G; X-ray measurements of a prototype WFXT SIC mirror at the MSFC X-Ray Calibration Facility X-Ray Optics, Instruments, and Missions II 3766 207-221 1999 International Society for Optics and Photonics

Ramsey, Brian D; Engelhaupt, Darell E; Speegle, Chet O; O'Dell, Stephen L; Austin, Robert A; Kolodziejczak, Jeffery J; Weisskopf, Martin C; HERO program: high-energy replicated optics for a hard-x-ray balloon payload EUV, X-Ray, and Gamma-Ray Instrumentation for Astronomy X 3765 816-822 1999 International Society for Optics and Photonics

Austin, Robert; Megatelescope releases its first image Physics today 69 12 42 2016 American Institute of Physics

Faculty Bio Template

Emadelden Fouad
Instructor of Physics
Natural Science

Contact

- **863.874.8617**
- efouad@floridapoly.edu
- Office mailing address:
    - Mailing Address: **Innovation Science and Technology Building, Room 2021, 4700 Research Way, Lakeland, FL 33805-8531**

Education

PhD : "***Investigation of the Quantum transport characteristics of some Nanodevices***"
MS :"***Electromagnetic Properties of type-II Superconductors***"
BS: **Physics**

Courses taught a Florida Poly in the last 2 semesters:
PHY1 (PHY2048), Phy2 (PHY2049), PHY209L, Precalculus Algebra/Trigonometry MAC1147,

Google Scholar Profile:
https://scholar.google.com/citations?hl=en&user=TKe41Q4AAAAJ&view_op=list_works&gmla=AJsN-F64rgMMPebUI5YtyNFlcyQlcZp7TfHitCxSPeKSRKFmgCgtlqA5r94kmoZYkqh3zyDo-AF0ezEjJl8jHrOHJQmDvOrNJHCHuMla6keoVx3I2qft0PM

Other Social Media Accounts/websites https://www.researchgate.net/profile/Emadelden_Fouad

About

Emadelden Fouad received his B. Sc and M. Sc degree with Theoretical Physics from Cairo University, Egypt in 1996 and 2001 respectively. Emadelden also finished his PhD with theoretical Nano device from Cairo University, Egypt in 2005. Previously he worked as a teaching assistant, and instructor with the department of Physics at Cairo University and in in Mathematics and Physics departments at American University in Cairo AUC. Currently he is working as an Instructor of physics with the department of natural science at Florida Polytechnic University. His research interest include but not limited to quantum transport characteristics of energy efficient devices, Electromagnetic properties of type II superconductors and emerging nanomaterials like graphene.

Expertise

1. Quantum Transport in nanodevices
2. High Temperature Superconductivity
3. Dielectric materials , High-k materials, Hafnium Oxide

Professional Activities

1. Member of natural Science Committee
2. Member of Enrollment Management
3. Member of the Safety committee
4. Member of Hiring Chemistry committee

Selected Publications

1- Responsivity of quantum dot photodetector at Terahertz detection frequencies
AH Phillips, AN Mina, MS Sobhy, EA Fouad
Journal of Computational and Theoretical Nanoscience 4 (1), 174-178

2- A Semi-Infinite Superconductor with Monotonous T_c Variation
AG Saif, AN Mina, MA El-Sabagh, FM Shahin, EA Fouad
physica status solidi (b) 231 (2), 519-528

3- Electron Dynamics properties of a quantum dot turnstile coupled to superconducting reservoirs
AH Phillips, AN Mina, MS Sobhy, EA Fouad
Egypt. J. Physics 37

4- Scrutiny of Leakage Currents with Insulating Materials for Transistor Applications

[1]Muhammad Sana Ullah[*], [2]Emadelden Fouad

Accepted for publication in International Journal of Materials Science and Applications

Faculty Bio Template

Robert L. Green, Ph.D.
Chair and Assistant Professor of Chemistry
Department: Natural Sciences

Contact

- (863) 874-8584
- rgreen@floridapoly.edu
- Office mailing address:
    - Office Location: Innovation, Science and Technology Building (IST) Room 2020.
    - 4700 Research Way, Lakeland, FL 33805-8531

Education

PhD: University of South Carolina
MS: Purdue University
BS: Morehouse College

Courses taught a Florida Poly in the last 2 semesters

-General Chemistry 1 (CHM2045)
-General Chemistry 1 Laboratory (CHM2045L)

Google Scholar Profile

https://scholar.google.com/citations?view_op=list_works&hl=en&user=-i6ckLAAAAAJ&gmla=AJsN-F47oOIlP4XsADa5vh_7RNv4Jzooil2gNCy-gasON7QI2_pX3c8F9Al7sVsUH7ovgIEeRUhKdB9rObSTozcw3oW_1dL80NG_ZmQq-QAIRy_5HoVpJrHotLLipSOntg3JNKjs798E
Citations: 40
h-index: 3
i10-index: 1

About

Dr. Robert L. Green is a native of Johns Island, South Carolina. He has earned a B.S. from Morehouse College, an M.S. from Purdue University and his Ph.D. from the University of South Carolina in chemistry. For the majority of Dr. Green's 12 year career in higher education, he has devoted time to promoting STEM education to both K-12 teachers and students underserved communities. Dr. Green is a member of the American Chemical Society and is the founder of the Florida Polytechnic University Chapter of the National Society of Black Engineers (NSBE).
Since 2006, he served as taught a variety of Chemistry courses, including General Chemistry, Physical Chemistry, Analytical Chemistry, Inorganic Chemistry, and Instrumental Analysis. His higher education background also includes teaching appointments at the University of South Carolina (2014) and Huntingdon College (2006-2007), where he taught General Chemistry courses, managed lecture materials and assisted students to help them in successful course completion.

Dr. Green's funded research includes a Department of Energy grant through the Consortium for Materials and Energy Security. The grant provides undergraduate research opportunities at national labs and/or other consortium institutions. His current research is focused on the study of ordered defects in anti-Perovskite materials as well as the synthesis of novel oxy-fluorides for potential phosphors.

Expertise

1. Solid-State Chemistry
2. X-ray Diffraction
3. Neutron Diffraction
4. Photoluminescence
5. Rietveld Analysis

Professional Activities

1. American Chemical Society
2. National Society of Black Engineers
3. Electrochemical Society
4. National Organization for the Professional Advancement of Black Chemist and Chemical Engineers (NOBCChE)

Selected Publications:

R. Green, M. Avdeev, and T. Vogt, Synthesis and Structural Characterization of the Hexagonal Anti-Perovskite Na_2CaVO_4F. *Journal of Solid State Chemistry* **250** (2017), 134-139. http://dx.doi.org/10.1016/j.jssc.2017.03.027

R. Green, M. Avdeev, and T. Vogt, Structural Changes and Self-Activating Photoluminescence in Reductively Annealed Sr_3AlO_4F. *Journal of Solid State Chemistry* **228** (2015), 1-8. http://dx.doi.org/10.1016/j.jssc.2015.04.017

E. Sullivan, M. Avdeev, D.A. Blom, C.J. Gahrs, **R.L. Green**, C.G. Hamaker, T. Vogt, Structure, stability, and photoluminescence in the anti-perovskites $Na_3W_{1-x}Mo_xO_4F$ ($0 \leq x \leq 1$). *Journal of Solid State Chemistry* **230** (2015), 279-286. http://dx.doi.org/10.1016/j.jssc.2015.07.018

R. Green and T. Vogt. Structures and Self-activating Photoluminescent Properties of $Sr_{3-x}A_xGaO_4F$ (*A*=Ba, Ca) materials. *Journal of Solid State Chemistry* **194** (2012), 375-384. http://dx.doi.org/10.1016/j.jssc.2012.06.001

Meaghan L. Clark, **Robert L. Green**, Olivia E. Johnson, Phillip E. Fanwick and David R. McMillin. DNA-Binding and Physical Studies of Pt(4′-NR_2-trpy)CN^+ Systems (trpy = 2,2′:6′,2″-Terpyridine) *Inorg. Chem.*, **2008**, *47* (20), pp 9410–9418. **DOI:** 10.1021/ic8009354

Faculty Bio Template

Melba Horton
Assistant Professor
Natural Sciences

Contact
863-874-8585
mhorton@floridapoly.edu
Innovation Science and Technology Building, Room 2026, 4700 Research Way, Lakeland, FL 33805-8531

Education

PhD in Biological Sciences
MS Marine Science
BS Marine Biology
Other

Courses taught a Florida Poly in the last 2 semesters
BSC 1010 (Biology 1)
BSC 1010L (Biology 1 Laboratory)
BME 4577 (Nanomedicine and Nanotherapeutics)

Google Scholar Profile
https://scholar.google.com/citations?hl=en&user=qDxVJJ4AAAAJ&view_op=list_works&citft=1&citft=2&citft=3&email_for_op=melba.horton%40gmail.com&gmla=AJsN-F7HnWuqO_KtEJDodOcnjOSlNOJDn4D0oZ1WG-EUbHZPt6iapJ3CXGayDqDoqyjwYui1RUqWTUkso1R2DdblrEvZUmX1pGfaZ5C2lXW6pLgG1cTl9KO3FJwPqj4aHm2NF1c125Tuheo3Vru_oV6lq6BH_bGSgf8lYUjN09PVtsJ1xsdxbmKXOp_kZgIEujV4dJE1fryEi8GKfHxQ7KCGeV1pvGeclrOZ_fEVapfA8zZ1tKfmB6bbog3HhsqYijVwSfIqB5kR

Other Social Media Accounts/websites (Optional: ResearchGate, LinkedIn, etc.)
https://www.linkedin.com/in/melba-horton-84834092/

https://www.researchgate.net/profile/Melba_Horton2

About
Dr. Melba Horton holds a Ph.D. in Biology from Michigan Technological University. Her concentration was in Algal Eco-Physiology. She received her master's degree in Marine Science from the University of the Philippines. Her bachelor's degree is in Marine Biology from Mindanao State University in the Philippines.

She has taught a variety of life science courses that include Marine Biology, Ecology, Limnology, Marine Plankton, Genetics, Introduction to Physiology, Embryology, Cell Biology, Nanomedicine and Nanotherapeutics, Zoology, Botany, Introductory Biology for both science and non-science majors, and Environmental Science.
"Among the most satisfying experiences for me as a faculty has been imparting basic biological concepts and being able to demonstrate through actual observation with active student participation. I believe that students get a better grasp of the scientific process by conducting their own investigations. Hence, research projects are usually incorporated in my courses." Dr. Horton is very passionate about students' learning and the ability to put the relevance of Biology in different degree fields. "This is what STEM is all about and this is the essence of Florida Polytechnic University." Her mantra has been "It's only at Poly where great minds intertwine."
Dr. Horton is al actively conducting research on algal ecology and physiology, most specifically on diatom uses and applications, biomimicry, biofuels, and environmental sustainability. She is also doing collaborative work with Professors from the different department on various research topics including health-related technological applications, alternative energy, and phosphatic clay remediation.
She serves as Advisor for student organizations such as the Rotaract Club of Florida Polytechnic University, and the Association of Space, Technology, Rocketry, and Observation (ASTRO). She is also currently serving as the university's representative to the NASA-Florida Space Grant Consortium and the American Council of Education

(ACE) Women's Network of Florida. Despite her busy schedule, Dr. Horton tries to find time to play her guitar while singing along melodies from various genre or watch movies with her family.

Expertise

1. Ecology and Physiology of Algae
2. Diatom Uses and Applications
3. Biomimicry
4. Biofuels and Environmental Sustainability
5. Environmental Protection and Management

Professional Activities

1. NASA-FSGC University Representative
2. ACE Womens Network of Florida University Representative
3. Founding Advisor, Fl Poly Rotaract Club
4. Co-Faculty Advisor, ASTRO
5. Member, Phycological Society of America

Awards and Honors

1. Entrepreneurial Spirit Award (2016) by Fl Poly Faculty Assembly
2. Inspiration Award (2016-2017) by Fl Poly Rotaract Club
3. Mentorship Award (2017) by Propak Company

Selected Publications

Horton, M. D. (2018). *"BIOLOGY Laboratory Manual, 2nd Edition."* XanEdu Publishing, Inc., Ann Arbor, MI.

Horton, M. D., Vital, D., Spaulding, S., Albarelli, G., & Defino, P. (2018). Enhancing Percolation in Phosphatic Clay Using Diatoms under Laboratory Conditions. *bioRxiv*, 357889.

B. C. Gray, S. Cloud, J. Brown, M. Mills, G. Albarelli, & **M. D. Horton.** Production, Characterization, and Utilization of Polk County Diatoms for Biofuel and Technological Applications. Poster presented at the International Conference on Algal Biomass, Biofuels, and Bioproducts, Motif Seattle, Seattle, USA. Jun 11-13, 2018.

Vital, D., Reith, D., Coughlin, C., Integlia, R., Srinivasan, S., Birky, B., & **Horton, M. D.** (2016). Capacitive Property of Phosphatic Clay-Diatom Medley. *Bulletin of the American Physical Society*.

Malanga, A., Vital, D., Vickers, E., **Horton, M**., Duthie, R., & Srinivasan, S. (2015). Advanced Nano-Photonics for Chemical and Biological Detoxification in Potable Water. *Bulletin of the American Physical Society*.

Subers, C. A., & **Horton, M.** (2014). Assessment of Algal Diversity and Water Quality in Lake Lanier, Georgia.

Apoya-Horton, M. D., Underwood, G. J. C., & Gretz, M. R. (2009). Probing The Relationship Between Movement Modalities In Cylindrotheca Closterium (Bacillariophyceae): Effects Of Osmotic Shock And Cytoskeletal And Metabolic Inhibitors On Movement. *Journal of Phycology*, *45*, creators-Underwood.

Apoya-Horton, M. D., Yin, L., Underwood, G. J., & Gretz, M. R. (2006). MOVEMENT MODALITIES AND RESPONSES TO ENVIRONMENTAL CHANGES OF THE MUDFLAT DIATOM *CYLINDROTHECA CLOSTERIUM* (BACILLARIOPHYCEAE) 1. *Journal of Phycology*, *42*(2), 379-390.

Gretz, M. R., Riccio, M. L., Hungwe, T. R., Burger, H. M., Kiemle, S. N., **Apoya-Horton, M. D**., & Spaulding, S. A. (2006, April). A fresh look at an invasive species, *Didymosphenia geminata*: Chemical and structural analysis of the extracellular polymers. In *Journal of Phycology* (Vol. 42, pp. 45-45). 9600 GARSINGTON RD, OXFORD OX4 2DQ, OXON, ENGLAND: BLACKWELL PUBLISHING.

Apoya-Horton, M. D. (2006). *Motility of the Mudflat Diatom Cylindrotheca Closterium (Bacillariophyceae): Behavior, Physiology and Ecology* (Doctoral dissertation, Michigan Technological University).

Faculty Bio Template

Sesha S. Srinivasan
Assistant Professor
Physics/Natural Sciences

Contact

- (863) 874 8527; Cell (813) 451 1876
- ssrinivasan@floridapoly.edu
- Office mailing address: Innovation Science and Technology Building, Room 2023, 4700 Research Way, Lakeland, FL 33805-8531

Education

PhD – Physics (Specialization: Solid State and Condensed Matter)
MS – Physics (Specialization: Microprocessors and Electronics)
BS – Physics Major (Ancillaries: Chemistry and Mathematics)
Higher Diploma Certificate in Software Engineering

Courses taught a Florida Poly in the last 2 semesters

Fall 2018: PHY 2049GENS03 – Physics 2, Section 03
PHY 2049GENS04 – Physics 2, Section 04
PHY 2049LGENS01 – Physics 2 Lab, Section 01
PHY 2049LGENS12 – Physics 2 Lab, Section 12

Spring 2018: PHY 2049GENS01 – Physics 2, Section 01
PHY 2049GENS02 – Physics 2, Section 02
EGN5973ENGR01 – Thesis 1, Section 01

Fall 2017: PHY 2048GENS04 – Physics 1, Section 04
PHY 2048GENS05 – Physics 1, Section 05
EGN5970ENGR01 – Thesis 1, Section 01

Google Scholar Profile
https://scholar.google.com/citations?hl=en&user=agf5U_0AAAAJ

Other Social Media Accounts/websites
ResearchGate Profile: https://www.researchgate.net/profile/Sesha_Srinivasan
LinkedIn Profile: https://www.linkedin.com/in/seshasrinivasan/
ORCID Profile: https://orcid.org/0000-0003-4961-8496/print

About

Dr. Sesha Srinivasan is currently an Assistant Professor of Physics, at Florida Polytechnic University, Florida, USA. Before moving to FPU in 2014, he was a Tenure Track Assistant Professor of Physics, at Tuskegee University, Alabama, USA. Dr. Srinivasan has more than a decade of research experience in the interdisciplinary areas of Solid State and Condensed Matter Physics, Inorganic Chemistry, Chemical and Materials Science Engineering. His PhD problem focused on the development various rare-earth, transition metals and intermetallic alloys, composites, nanoparticles and complex hydrides for reversible hydrogen storage applications. He and his Post-Doctoral advisor has extensively collaborated with Scientists around the world for the hydrogen storage on light weight complex hydrides which were funded by the US Department of Energy (DOE) and WE-NET, Japan. After two years at University of Hawaii, he has joined as a Research Scientist, Clean Energy Research Center (CERC) at University of South Florida under the leaderships of Professor Elias Stefanakos and Professor Yogi Goswami. He has also served as an Associate Director of Florida Energy Systems Consortium (FESC) at USF to coordinate a number of research projects on clean energy and environment, which was funded by the State Energy Office Florida ($9M grant). In his current and previous positions at TU and FPU, Dr. Srinivasan was awarded many research grants,

worth of $1M from both federal (DOE, NSF, ONR) and private (BP-Oil Spill, QuantumSphere Inc.) funding sources. He has recently awarded with two US patents on Hydrogen storage nano-materials' development and methodologies and two US patents are pending. He published six book chapters and review articles, more than 100 journal publications and many more peer-reviewed conference proceedings.

Expertise

1. Hydrogen Energy Storage via Metal Hydrides, Complex Hydrides, Sorbents
2. Photocatalyis using TiO_2 type semiconducting Oxides for Water Remediation
3. Synthesis and Characterization of Nanomaterials, Composites and Alloys
4. Thermal Energy Storage via inexpensive calcites and dolomites characterization
5. Landfill Leachate Characterization and remediation using Advanced Oxidation

Professional Activities

1. Undergraduate Curriculum Committee Member at Florida Polytech University
2. Faculty Search Committee Chair for the Chemistry at Florida Polytech Univ.
3. Faculty Advisor for the Society of Physics Students Florida Poly Chapter
4. Faculty Liaison and Awards Committee Chair of Florida Academy of Sciences
5. Faculty Liaison and Steering Committee Member for Florida Energy Systems Consortium (FESC)

Awards and Honors

1. Best Paper Award Certificate given by the Applied Sciences Journal Publications at the Renewable Energy and Sustainability Conference at FL Poly, August 2017.
2. Research Excellency Award by Faculty Assembly of Florida Polytech, 2015
3. Academic Enrichment Faculty Liaison Award by Tuskegee University Center for Academic Excellence and Innovative Learning, Tuskegee University, AL, 2014.

Selected Publications

1. **Sesha S. Srinivasan,** Scott L. Wallen, Jephte Douyon, Synergistic Chemical Oxidative and Photocatalytic Enhancer System (SCOPES) for the Wastewater Remediation, Florida Polytechnic University, *Provisional Disclosure*, SH Reference *2954.12,* May, 2018.
2. **Sesha Srinivasan**, Michael Niemann, D.Yogi Goswami, and Elias K. Stefanakos, *Method of Generating Hydrogen-storing hydride complexes*, *US Patent # 8,440,100*, May 14, 2013.
3. **Sesha Srinivasan***,* Michael Niemann, D.Yogi Goswami, and Elias K. Stefanakos, Hydrogen Storing Hydride Complexes, USF, FL, *US Patent # 8,440,100,* 2013**;** *8,153,020*, 2012.
4. **Sesha S. Srinivasan,** Project Based Curriculum for Millennial Learners @ Florida Polytechnic University, Journal of Engineering Education Transformations, Volume 31, No. 3, ISSN 2349-2473, eISSN 2394-1707, January 2018.
5. Dervis Emre Demirocak, **Sesha S. Srinivasan** and Elias K. Stefanakos, A Review on Nanocomposite Materials for Rechargeable Li-ion Batteries, Appl. Sci. 2017, 7(7), 731; DOI:10.3390/app7070731.
6. **Sesha S. Srinivasan**, Nanostructured Materials for Next-Generation Energy Storage and Conversion, Edited by Ying-Pin Chen, Sajid Bashir and Jingbo Louise Liu; ISBN: 978-3-662-53512-7; Chapter 8, Pages: 225-255, 2017, DOI: 10.1007/978-662-53514-1.
7. **Srinivasan, S.S**.; Demirocak, D.E.; Goswami, Y.; Stefanakos, E. Investigation of Catalytic Effects and Compositional Variations in Desorption Characteristics of $LiNH_2$-nanoMgH_2. Appl. Sci. 7, 701, 2017; https://doi.org/10.3390/app7070701.
8. **Sesha Srinivasan,** Arunachalanadar M. Kannan, Nikhil Kothurkar, Yehia Khalil, Sarada Kuravi, "Nanomaterials for Energy and Environmental Applications", Editorial section, *J. Nanomaterials,* Hindawi Publications, Article ID 979026, 2 pages, January 2016. DOI: 10.1155/2015/979026.
9. David Baah, Tobias Donnell, **Sesha Srinivasan**, Tamara Floyd-Smith, "Stop flow lithography synthesis and characterization of structured microparticles", *J. Nanomaterials,* Volume 2014, Article ID 142929, 9 Pages, 2014. http://dx.doi.org/10.1155/2014/142929.
10. Robert I. MacCuspie, Harvey Hyman, Chris Yaymyshyn, **Sesha Srinivasan**, Jaspreet Dhau, Christina Drake, "A framework for identifying performance targets for sustainable nanomaterials", *Sustainable Materials and Technologies,* 1-2, (2014) 17-25. https://doi.org/10.1016/j.susmat.2014.11.003.

Board of Governors, State University System of Florida

Request to Offer a New Degree Program

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

Florida Polytechnic University	**Fall 2019**
University Submitting Proposal	**Proposed Implementation Term**
	Mathematics/Science Arts & Math (SAM)
Name of College(s) or School(s)	**Name of Department(s)/ Division(s)**
Applied Math	**B.S. in Engineering Mathematics**
Academic Specialty or Field	**Complete Name of Degree**
27.0301	
Proposed CIP Code	

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**	**Date**
Signature of Chair, Board of Trustees	**Date**	**Vice President for Academic Affairs**	**Date**

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 in Appendix A. Indicate the program costs for the first and the fifth years of implementation as shown in the appropriate columns in Table 2 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	Projected Enrollment (From Table 1)		Projected Program Costs (From Table 2)				
	HC	FTE	E&G Cost per FTE	E&G Funds	Contract & Grants Funds	Auxiliary / Philanthropy Funds	Total Cost
Year 1	12	12	$26,587	$319,048	0	0	$319,048
Year 2	30	30					
Year 3	68	58					
Year 4	84	74					
Year 5	90	80	$14,894	$1,191,522	0	0	$1,191,522

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.

(a) The proposed Bachelor of Science in Engineering Mathematics will be offered within the Department of Mathematics in the Division of Science, Arts, and Mathematics (SAM). The B.S. degree program in Engineering Math will prepare aspiring students to be knowledgeable in conceptual understanding of Math and critical thinking encompassed with problem solving skills. The acquisition of the above skills are paramount values for Poly Math Majors to get ready for high paying industrial jobs, or graduate school in Advanced Mathematics or related disciplines.

(b) The program includes two concentrations as follows: complex systems; and mathematical medicine and biology.

(c) The Bachelor of Science in Engineering Mathematics will be offered in 8 semesters (4 years) for a total of 120 credit hours.

(d) The program in Engineering Mathematics will focus on the use of Math in the analysis and evaluation of engineering problems and scientific applications. Engineering math offers a unique program in which students acquire the in-depth understanding of the concepts based on defined mathematical principles and theoretical derivations, while practicing its real world applications. The engineering mathematics program is proposed to fill gaps in current engineering programs, specifically how to use mathematical principles to provide innovative solutions to problems of industrial value.

Florida Poly's current engineering programs are focused on preparing students for the practice of engineering in areas such as mechanical, electrical and computer engineering. An engineering math program would offer our students an alternate track which develops a stronger understanding of the underlying science and mathematics of engineering, as well as the application of the scientific methods to engineering problems. In comparison to a standard engineering degree, a graduate of engineering math is better prepared for technical R&D jobs, developing new knowledge in the sphere of engineering problems, and enrolling in Masters' or Ph.D. study programs of both Math and Engineering. An Engineering Math bachelor's degree offers very diverse employment opportunities in research, space and astronomy, healthcare, engineering and applied mathematics. Graduates of Engineering Math major will have ample of opportunities as engineers/Mathematicians /Software Engineer in National Laboratories, High-Tech Industries (GE, GM, Raytheon, Harris, Intel, IBM, Google, Mosaic etc.), Department of Defense, Air force and Military, NASA, Higher Education (MS or PhD programs), regional, state and federal government agencies.

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 CAVP Academic Program Coordination group on April 6, 2018. No concerns were raised.

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).

Directly Support
Florida Polytechnic University's proposed Bachelor of Science program in Engineering Mathematics will directly support the following SUS Strategic Planning 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
    - Productivity Goal: Increase undergraduate participation in research to strengthen the pipeline of researchers pursuing graduate degrees.

Indirectly Support

- Teaching and Learning Goal to strengthen quality and reputation of academic programs and universities;
- Scholarship, Research, and Innovation Goals to strengthen the quality and reputation and increase collaboration through external funding and collaboration with private industry (research and commercialization).

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:

1. Critical Workforce:
    - Education
    - Health
    - Gap Analysis
2. Economic Development:
    - Global Competitiveness
3. 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 Bachelor of Science in Engineering Mathematics (CIP 27.) would be included as a program of strategic emphasis under Economic Development – STEM.

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.

All courses will be offered at Florida Polytechnic University's J.D. Alexander, main campus.

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.

As the only state institution in Florida dedicated wholly to STEM education, Florida Polytechnic University is working to build its portfolio of STEM programs at the undergraduate level. The university is seeking to establish a mix of both traditional science and engineering programs along with a smaller selection of specialized programs on the leading edge of technology. As a new, growing institution, engineering mathematics is a unique blend of engineering foundations and applied mathematics that grounds the "M" in this STEM institution by being the only mathematics degree program at the University.

To help in identifying viable traditional and specialized programs to grow the University's portfolio, Florida Poly has conducted research internally and worked with Hanover Research to develop a shortlist of programs that demonstrate viability for meeting national, state, and local needs. Based on our research findings, institutional capacity and mission, the university chose to develop a program in engineering mathematics with focuses in complex systems and mathematical medicine and biology that will prepare students for medical school.

Both regionally and statewide, the job growth rate for mathematicians and statisticians is relatively small but stable with approximately 70 openings per year, but the competition for these position is low, suggesting too few graduates in the marketplace to fill the positions. What is important for Florida Poly's program, however, is that it is not limited to these traditional mathematics-oriented positions, but with a firm foundation in engineering science and design along with concentrations in complex systems and mathematics of medicine, the market opens up considerably. A look at relevant SOC data, provided by Hanover Research, illustrates this point.

SOC Code + Title	Southeast					Florida				
	Employment		Change		Annual Average Openings	Employment		Change		Annual Average Openings
	2014	2024	Number	Percent		2014	2024	Number	Percent	
11-9041 Architectural and Engineering Managers	35,240	38,740	3,500	9.9%	1,410	6,780	8,320	1,540	22.7%	360
11-9199 Managers, All Other	177,280	190,300	13,020	7.3%	5,250	36,790	42,750	5,960	16.2%	1,410
13-1051 Cost Estimators	48,140	56,880	8,740	18.2%	2,250	13,150	17,400	4,250	32.3%	800
15-2011 Actuaries	1,720	2,160	440	25.6%	90	530	670	140	26.4%	30
15-2021 Mathematicians	660	800	140	21.2%	20	120	150	30	25.0%	10
15-2031 Operations Research Analysts	21,800	29,480	7,680	35.2%	1,150	6,270	8,450	2,180	34.8%	330
15-2041 Statisticians	5,610	7,790	2,180	38.9%	320	820	1,310	490	59.8%	60
17-2199 Engineers, All Other	28,210	30,470	2,260	8.0%	780	4,970	5,660	690	13.9%	170

Nationally, the Bureau of Labor Statistics shows that overall employment of mathematicians and statisticians is projected to grow 33 percent from 2016 to 2026, much faster than the average for all occupations (https://www.bls.gov/ooh/math/mathematicians-and-statisticians.htm), with projected openings at around 13,500 positions.

In light of local, regional, and national employment demand and projections for mathematicians and statisticians, Florida Poly feels confident that a marketplace demand exists for its graduates in these fields. Given unique aspects of the proposed program—engineering foundations, complex systems and

mathematics of medicine—the employment prospects would likely be significantly higher.

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.

According to Hanover Research, student growth in applied mathematics programs is high in the southeast region with student completions projected to grow over the next ten years (2014-2016) in SOCs for mathematicians and statisticians by 21.2% and 38.9% respectively. Florida Polytechnic University's admissions staff has informally solicited feedback on its regular recruiting circuit leading up to the fall 2019 class. The number of students expressing interest in majoring in engineering mathematics in that period is 7,354 students. Given that interest level is considerably higher than what we could reasonably expect to admit, we are confident we will meet the projected enrollments for the next five years.

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.

In the Florida SUS and statewide the following institutions offer applied or engineering math as specialized programs in their curricula at the undergraduate level. However, none of these institutions offer concentrations related to those included in this proposal.

1. New College of Florida – Applied Mathematics - https://www.ncf.edu/academics/undergraduate-program/division-of-natural-sciences/applied-mathematics/ - BS
2. Florida Agriculture and Mechanical University – Mathematical Sciences - http://www.famu.edu/index.cfm?math&MathematicalSciences – BS
3. Embry Riddle Aeronautical University – Computational Mathematics - https://erau.edu/degrees/bachelor/computational-mathematics/ - BS

The presences of graduate-level programs in applied mathematics at state institutions such as FAU, FGCU, FIU, UCF, UNF, and FSU opens up opportunities for our undergraduates to continue their studies in similar SUS graduate programs.

None of these programs are in close proximity to Florida Poly, nor are they constructed similarly to the proposed program. Given the projected workforce demand, we are confident that our program has a niche and a clear pathway for employment and graduate work for our students.

D. Use Table 1 in 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 has a carefully considered enrollment management growth plan. As such, the enrollment tables were built with several constraints in mind. These include a strong effort at sustainable program growth within the existing and projected facilities resources, projected enrollment over the next five years, and awareness of potential impacts on existing programs.

Florida Poly will open the program admitting only FTICs (no transfers, except for other programs already

underway) for the first two years until program core courses are fully offered. All programs at Florida Poly begin with a common freshman year and most of the courses taught in the sophomore year of the plan of study are already offered and staffed. This enables us to observe student interest and recruit from within the existing admissions pool, if needed, while not straining or under-utilizing, current resources.

We do not anticipate significant changes in major; however, we do anticipate that new programs will siphon off some of the prospects other programs might have ordinarily anticipated. (We typically have very low numbers of students who change major.) Given that we are looking at relatively small numbers of this and our other proposed programs, that adjustment should not impact any one program too significantly.

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. <u>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</u>.

Goal #1 of Florida Poly's strategic plan 2018 – 2023 is to enroll a high-quality and diverse incoming class. To impact this goal, the University has restructured its admission and financial aid operations to support stronger evidenced-based decision making, including market segmentation, reorganized its staffing model to improve coverage, tactics, and messaging, and changed its admissions process to include a holistic view of prospects through items such as essays and recommendation letters.

There is no similar program at FIU, and FAMU's program is significantly different in content and focus with three tracks: actuarial science; traditional mathematics designed for graduate school preparation; and mathematical sciences designed for students to work in industry. With its focus on applied mathematics, foundations in engineering and concentrations in complex systems or mathematics of medicine, Florida Poly's program is markedly different from FAMU's. It is, however, unlikely that the program will draw students from FAMU, given our respective locations and institutional mission. Finally, given the small size of Florida Polytechnic University and its limited capacity, the enrollment projections for the program in engineering mathematics would have minimal impact on FAMU's program. Finally, FAMU expressed no comment or concern related to program content or enrollment impact during Florida Poly's presentation of its pre-proposal at the April 6, 2018 CAVP coordinating group meeting.

III. Budget

A. Use Table 2 in Appendix A to display projected costs and associated funding sources for Year 1 and Year 5 of program operation. Use Table 3 in 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.)

Table 2 Summary, Assumptions, Methodology
In the last year, the University received a reoccurring appropriation of $4.8 million for faculty salaries to grow programs and faculty expertise. As such, we have budged based on reallocated (or non-expensed) E&G funds. In addition to growing the faculty by five FTE for by year five of the program, additional expenses include startup funds (research kick-starts, non-recurring); professional development; supplies and lab materials; computing supporting; library support; educational assistants (student labor); and lab assistant support broken out over multiple programs.

Table 3 Summary, Assumptions, Methodology
Table 3 is zeroed because no funds will be reallocated in year one. All funds used for the program in year

one come from unallocated E&G resulting from the reoccurring $4.8 million appropriation.

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 2.

The university does not intend to operate this program through continuing education or seek any alternative or differentiated tuition model.

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).

As an engineering and STEM-focused institution, Florida Poly started with a strong resource support for mathematics. Including a focused degree program in engineering mathematics will only serve to strengthen the existing and planned engineering programs at Florida Poly. By drawing new faculty and faculty research in the field, the quality and breadth of mathematics courses and research opportunities that complement our existing offerings will expand.

Since the new degree program in Engineering Math will have existing and new faculty to handle the upper level Math core courses and concentration related courses, this will have no adverse impact on the faculty work load of other engineering departments. Similarly, our engineering math program has self-sufficient resources to conduct curriculum; the reallocation of resources is not necessary which again will have zero impact on other engineering programs.

Overall, we expect to softly populate the program based on a carefully considered enrollment management model. As our student typically do not change majors, a function of a common freshman year giving them time to decide, we like will not see a reduction in total majors in any program, but a very slight reduction in the rate of increase for some programs.

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 proposed program will create opportunities for existing programs and students, but will not create any additional demand that existing programs offer courses to support the program. As a program that starts from a general education-based department, there will be no additional requirements from either a general education or common prerequisite standpoint. Courses created for the program will afford existing engineering programs opportunities for electives or enhanced mathematical foundations to existing curricula. For programs in the departments of Electrical and Computer Engineering (ECE) and Mechanical Engineering (ME) program, students can opt to take specialized courses as their Science (Tech) elective offered by the engineering math program. Example courses include the following: Engineering Math II on Transformations, Regression Analysis with SAS, Advanced Calculus I and II, Applied Partial Differential Equations, Operations Research, Complex Analysis, Mathematical Modeling, and so on. Furthermore, the proposed Engineering Math program will potentially create a research opportunities at the University level via NSF funded REU, IUSE and RUI programs and enhance our

students' participation in Math Club community research and outreach activities.

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.

Faculty of Math, Department Chair of Mathematics and the Division Director of SAM will explore outside resources both financial and in-kind support for the sustainable operation of the proposed new B.S. degree program in Engineering Math. Current collaborators from industries, Mosaic, Harris, Lockheed Martin, NASA, Central Florida Development Council (CFDC), Research (R1) institutions such as University of Central Florida, University of South Florida and the new team of in-kind supporters will be maintained for the support of our Engineering Math program. The course instructors will seek potential funding from Federal, State, Regional and private funding for undergraduate education, curriculum development and research for sustaining the B.S. degree program in Engineering Math.

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

Use information from Tables 1 and 2 in 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.

Benefit to the University: As mathematics is foundational to engineering, adding a mathematics degree program to the university will enhance all program offerings and student experience by drawing on a highly experienced faculty to deliver the program. A faculty strong in program delivery and related research will raise the quality of our existing core math offerings while similarly creating collaborative research opportunities for student and faculty alike.

Benefit to the local community: The program will benefit local industries with which we already have relationships such as Mosaic, Harris, Lockheed Martin, NASA, the Central Florida Development Council (CFDC), FDOT, and SunTrax through internships, qualified graduates, and applied research opportunities.

Benefit to the State: The proposed program fills growing marketplace employment needs and by creating a unique mathematics program in Florida. The program's concentrations in mathematics of medicine and complex systems enable students to obtain strong foundations in math and engineering with exposure to critical areas that demonstrate long-term employment prospects.

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)

The program will not exceed 120 credit hours.

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

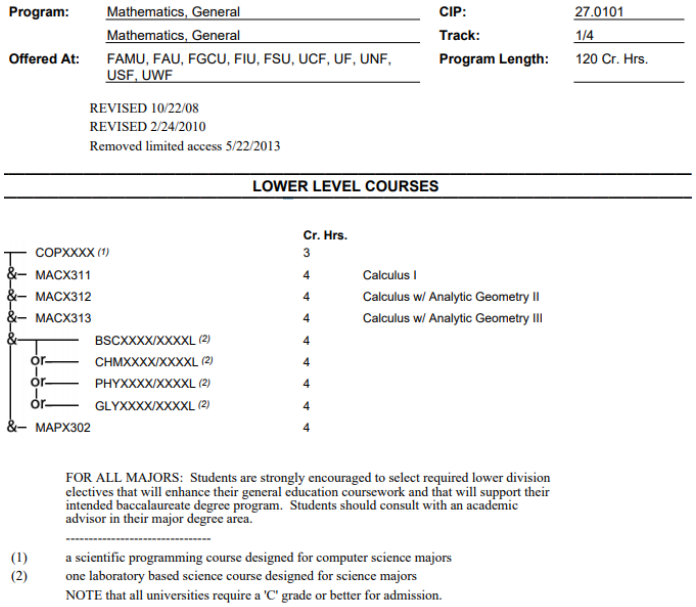
must be approved by the Articulation Coordinating Committee (ACC). This requirement includes those programs designated as "limited access."

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.

Florida Poly has aligned its program with the common prerequisites of other mathematics programs in CIP 27.0101. Program prerequisites include the following courses:

- COP 2271C – Introduction to Computation and Programming (3)
- MAC 2311 – Analytic Geometry and Calculus 1: Credits 4
- MAC 2312 – Analytic Geometry and Calculus 2: Credits 4
- MAC 2313 – Analytic Geometry and Calculus 3: Credits 4
- Natural Science any of the following:
    - BSC 1010/1010L – Biology 1 and Lab: Credits 4 (3+1)
    - CHM 2045/2045L – Chemistry 1 and Lab: Credits 4 (3 + 1)
    - PHY 2048/2048L – Physics 1 and Lab: Credits 4 (3 + 1)
- MAP 2302 – Differential Equations: Credits 3

The program will not require any prerequisites beyond those which are identified in the common prerequisite manual for CIP 27.0101 programs.



Program: Mathematics, General — **CIP:** 27.0101
Mathematics, General — **Track:** 1/4
Offered At: FAMU, FAU, FGCU, FIU, FSU, UCF, UF, UNF, USF, UWF — **Program Length:** 120 Cr. Hrs.

REVISED 10/22/08
REVISED 2/24/2010
Removed limited access 5/22/2013

LOWER LEVEL COURSES

	Cr. Hrs.	
COPXXXX (1)	3	
& MACX311	4	Calculus I
& MACX312	4	Calculus w/ Analytic Geometry II
& MACX313	4	Calculus w/ Analytic Geometry III
& BSCXXXX/XXXXL (2)	4	
or CHMXXXX/XXXXL (2)	4	
or PHYXXXX/XXXXL (2)	4	
or GLYXXXX/XXXXL (2)	4	
& MAPX302	4	

FOR ALL MAJORS: Students are strongly encouraged to select required lower division electives that will enhance their general education coursework and that will support their intended baccalaureate degree program. Students should consult with an academic advisor in their major degree area.

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(1) a scientific programming course designed for computer science majors
(2) one laboratory based science course designed for science majors
NOTE that all universities require a 'C' grade or better for admission.

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 Educational Objectives (PEOs) or "goals" of the engineering mathematics program identify what graduates are expected to attain within a few years of graduation. These are expressed as follows are directly implement Florida Polytechnic University's mission:

1. Graduates of the engineering mathematics program will establish relevant careers in government, industry, or academia through strong technical proficiency, effective collaboration, leadership, and communication skills, and ethical behavior;
2. Graduates Achieve research leadership or management roles in their respective careers;
3. Graduates will successfully complete an advanced degree and/or achieve appropriate licensure, registration, or certifications demonstrating ongoing learning and professional development.

The mission of Florida Polytechnic University is to "serve students and industry through excellence in education, discovery, and application of engineering and applied sciences." Engineering mathematics fits squarely within the STEM mission of the university as a program that blends applied mathematics and engineering foundations. The program's objectives help deliver the University's mission by producing STEM graduates who will be equipped to execute careers and research at an accomplished level. Moreover, the program aligns with the University's strategic goal (4) to grow the number of academic programs in strategic disciplines. The University's plan specifically states that programs will be chosen on the bases of complementing and strengthening existing programs and to serve existing industries and create new ones in the state of Florida. Finally, the program supports the SUS's strategic mission including its goals for supporting strategic priorities for a knowledge economy through STEM programs, undergraduate research, and research in collaboration with other state and private entities.

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.

Florida Poly's Department of Mathematics currently offers all the mathematics general education and over half of the program core courses listed on the proposal. Thus, the foundation to begin offering the program already exists with all Florida Poly students at some point taking multiple courses from the department. Department faculty collaborate with colleagues in computer science, computer and electrical engineering, and data science on research associated with the University's Advanced Mobility Institute (AMI), an institute dedicated to testing and certification methodologies for autonomous vehicles. This interdisciplinary relationship and the opportunities provided by AMI and SunTrax serve as strengths for

the program in multiple ways. First, the research opportunities, focus, and facility will be a draw to highly qualified, prospective faculty. Second, these resources provide unique opportunities for students to apply mathematical principles to engineering problems in real world and research based settings. Finally, the university has a strong internship placement program as internships are a graduation requirement for all of our majors.

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.

Florida Poly's 2017 Work Plan submitted to the Board of Governors (approved by the BOT on June 8, 2017) broadly identifies several STEM and engineering programs for consideration in 2018-2020. Subsequent to this preliminary identification, faculty, staff, and administration collaborated with Hanover Research and conducted internal research to develop a market analysis of potential programs. The planning process follows the process outlined in FPU-5.0001AP New Degree Program Planning and Approval.

Planning Process

Date	Participants	Planning Activity
June – Dec 2017	Provost, staff, department chairs, faculty and Hanover Research.	Market analysis of potential programs, internal assessment of ease of development and implementation from a resource, capacity, and planned growth standpoint.
Jan – April 2018	Dr. Nicoleta Hickman, Division Director of SAM Dr. Don Katugampola, Engineering Math Faculty Coordinator	Broad development of program structure and features, analysis of need and demand, workforce impact, and development of pre-proposal for CAVP.
May - August 2018	Dr. Nicoleta Hickman, Division Director of SAM Dr. Don Katugampola, Engineering Math Faculty Coordinator	Engineering math Plan of Study and Course Level Mapping discussions
August – Dec 2018	Dr. Jared Bunn, Chair of Department of Mathematics Dr. Don Katugampola Faculty of Department of Mathematics Dr. Sesha Srinivasan Dr. Nicoleta Hickman Department Faculty University Curriculum Committee Institutional Research Registrar's Office	Reviewed the status of the Engineering Math program at department level, continued to review and refine curriculum, plan of study and courses, as well as prepare program request materials for UCC and others for review and recommendation.

Events Leading to Implementation

Date	Implementation Activity
June 8, 2017	University Work Plan submitted to BOG
April 6, 2018	Pre-proposal submitted to CAVP coordinating group
May 22, 2018	University's Board of Trustees confers preliminary approval of program
Dec 13, 2018	University Undergraduate Curriculum Committee recommends approval of the program.
Jan 9, 2018	Approvals by Provost and President
Jan 16, 2019	University's Board of Trustees meets to decide whether to approve program.
Jan 31, 2019	Submission of materials to BOG for inclusion in State Degree Inventory
Fall 2019	Formally launch program with incoming admissions class.

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.

The University hosted two visits in October 2018, one from the Engineering Accreditation Commission of ABET and the other from the Computing Accreditation Commission of ABET. Programs reviewed include Computer, Electrical, and Mechanical Engineering (ABET-EAC) and Computer Science (ABET-CAC). No deficiencies were identified for any program (a barrier to achieving accreditation). While some weakness were found with each program, none of the weaknesses involved curricular issues or, more specifically, issues related to mathematics preparation. From this standpoint, the scope and quality of mathematics being offered at Florida Poly is of sufficient quality to support its existing engineering programs signaling a strong foundation for a degree program focused on engineering mathematics.

Recommendations related to existing programs reviewed included revising program educational objectives (goals) to be consistent with the accreditor's expectations; disaggregating assessment data to enable a focused view of students in the program in all courses; and ensuring laboratory access. All programs have already remedied or are in the process of remedying these issues. Formal due process does not end until this summer and decisions regarding each program will be rendered in August 2019.

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 in engineering mathematics has identified six student learning outcomes that articulate what students should be able to demonstrate upon graduation. These outcomes include the broad skill categories of communication, critical thinking, and program content required by the academic learning compact and align with outcomes for general engineering and applied science programs.

Upon graduation, engineering mathematics majors should be able to demonstrate a set of fundamental competencies:

1. Analytical skills and extensive experience with the tactics of problem solving and logical thinking.
2. Ability to design mathematical models, apply mathematical analysis and problem-solving skills in the biological, medicine, physical, or social sciences, and industrial engineering domains.
3. Ability to write clear well-organized and logical mathematical arguments (proofs) and ask pertinent questions and perform suitable quantitative analysis.
4. A deep understanding of at least one more area of specialization within mathematics or its applications and the ability to identify, formulate, abstract, and solve mathematical problems that use tools from algebra, analysis, probability, numerical analysis and differential equations.
5. Facility with computer technology, software, and algorithmic processes necessary in quantitative analysis and mathematical modeling.
6. Communicate mathematical ideas orally and in writing, with precision, clarity and organization, using proper terminology and notation.

Student Learning Outcomes	Academic Learning Compact
1. Analytical skills and extensive experience with the tactics of problem solving and logical thinking.	Critical Thinking
2. Ability to design mathematical models, apply mathematical analysis and problem-solving skills in the biological, medicine, physical, or social sciences, and industrial engineering domains.	Content, Critical Thinking
3. Ability to write clear well-organized and logical mathematical arguments (proofs) and ask pertinent	Communication

	questions and perform suitable quantitative analysis.	
4.	A deep understanding of at least one more area of specialization within mathematics or its applications and the ability to identify, formulate, abstract, and solve mathematical problems that use tools from algebra, analysis, probability, numerical analysis and differential equations.	Content
5.	Facility with computer technology, software, and algorithmic processes necessary in quantitative analysis and mathematical modeling.	Content
6.	Communicate mathematical ideas orally and in writing, with precision, clarity and organization, using proper terminology and notation.	Communication

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

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

Graduation requirements may be found here: http://catalog.floridapoly.edu/content.php?catoid=12&navoid=552#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 following table reflects the standard university template for all Florida Poly programs. Each program includes a professional foundations core, general education, advanced math and science, program content core, electives (if available), concentration course, and finally a capstone sequence. This table reflects the course options for both the mathematics of medicine and biology and complete systems concentrations.

University Undergraduate Program Curriculum Engineering Mathematics					
Approved 4/7/2017 (upd. 07/06/18)					
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**	**Course Credit Options**	**Math-Med & Bio**	**Complex Systems**
I. Professional Foundations Core			**8**	**8**	**8**
		SLS 1106 - Professional Foundations (formerly First Year Experience)	**1**	**1**	**1**
		IDS 4941 - Professional Experience Internship	**0**	**0**	**0**
		IDS 1380 - Introduction to STEM	**3**	**3**	**3**
		EGN 1007C - Concepts and Methods for Engineering and Computer Science (req of Engineering and CS programs only).	**1**	**1**	**1**
		COP 2271C - Introduction to Computation and Programming (required for all programs)	**3**	**3**	**3**
		All but Professional Foundations may be distributed in categories below to allow for appropriate credit hour allocations.			
II. General Education		*State Required Minimum*	**36**	**36**	**36**
	Rules	*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.			
	Section A	**Communication**	**6**	**6**	**6**
		ENC 1101 - English Composition 1: Exp and Arg Writing (W) *	**3**	**3**	**3**
		ENC 2210 - Technical Writing (W)	**3**	**3**	**3**
	Section B	**Humanities**	**3 to 6**	**6**	**6**
		ARH 2000 - Art Appreciation *	3	**3**	**3**
		PHI 2010 - Introduction to Philosophy *	3		
		HUM 2020 - Introduction to the Humanities *	3	**3**	**3**
		HUM 2022 Explorations in the Humanities (Special Topics)	3		
		IDS 2144 Legal, Ethical, and Management Issues in Technology	3		
	Section C	**Social Science**	**3 to 6**	**6**	**6**
		AMH 2010 - American History to 1877	3		
		AMH 2020 - American History Since 1877 (W) ** Satisfies Florida State Civics Requirement*	3	**3**	**3**
		AMH 2930 - History: Special Topics	3		
		ECO 2013 - Principles of Macroeconomics (W) *	3		
		ECO 2023 - Principles of Microeconomics (W)	3	**3**	**3**
		PSY 2012 - General Psychology (W) *			
	Section D	**Mathematics**	**7**	**7**	**7**
		MAC 2311 - Analytic Geometry and Calculus 1 *	4	**4**	**4**
		MAP 2302 - Differential Equations *	3	**3**	**3**
	Section E	**Natural Sciences**	**8**	**8**	**8**
		BSC 1010 - Biology 1 *	3	**3**	**3**
		BSC 1010L - Biology 1 Laboratory *	1	**1**	**1**
		CHM 2045 - Chemistry 1 *	3	**3**	**3**
		CHM 2045L - Chemistry 1 Laboratory *	1	**1**	**1**
	Section F	**Open Inquiry**	**3**	**3**	**3**
		An additional 3 hours of general education coursework must be taken here.			
		PHY 2048L - Physics 1 Laboratory *	1	**1**	
		PHY 2049L - Physics 2 Laboratory	1	**1**	
		PHY 2048 - Physics 1 *	3	**0**	**3**
	***New**	CHM 2046L - Chemistry 2 Laboratory	1	**1**	
II. Program Foundations / Advanced Math & Science			**15**	**14**	**16**
		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 2048 - Physics 1	3	**3**	
		PHY 2049 - Physics 2	3	**3**	**3**
	***New**	CHM 2046 - Chemistry 2	3	**3**	
	***New**	CHM 3218 - Biochemistry Lab	1	**1**	
	***New**	CHM 3217 - Organic Chemistry Lab (1 Sem)	1	**1**	
		COP 2272- Computer Programming I	3		**3**
	***New**	MAP 3253 - Math Scientific Computing	3		**3**
		PHY 2048L - Physics 1 Laboratory	1		**1**
	***New**	MTG 4302 - Elements of Topology I	3		**3**
	***New**	MTG 4303 - Elements of Topology II	3		**3**
	***New**	CHM 3218 - Biochemistry	3	**3**	

III. Program Core		*40 credits represents a minimum, depending on how many credits are included in Category II, above.*	**40**	**41**	**41**
		Pre-Capstone design sequences should be included in this category--may be listed as a subset in catalog to stand out.			
		The following may be counted in this category instead:			
		MAC 2312- Anal. Geo & Calc. 2 w Lab*	4	**4**	**4**
		MAC 2313 - Anal. Geo & Calc. 3 w Lab*	4	**4**	**4**
	***New**	MAP 3403 - Eng. Math I (Math Methods)	3	**3**	**3**
	***New**	MAP 4401 - Eng. Math II (Num. Analysis)	3	**3**	**3**
		MAD 2104 - Discrete Mathematics I	3	**3**	**3**
		MAD 3105 - Discrete Mathematics II	3	**3**	**3**
		STA 3032 - Engineering Stat (Prob & Stat)	3	**3**	**3**
		STA 3162 - Applied Statistics	3	**3**	**3**
		MAA 4102 - Advanced Calculus	3	**3**	**3**
		MAS 3105 - Linear Algebra	3	**3**	**3**
		MAP 4341 - Applied Partial Diff Eqs.	3	**3**	**3**
	***New**	ISC 4930 - Special Topics: Applied Studies	3	**3**	3
		Program Core-track requirements			
	***New**	MAP 4102 - Prob Theory & Stoch Proc I	3		**3**
	***New**	MAP 4484 - Math Biology I	3	**3**	
IV. Concentration		*Concentrations should consist of no more than 12 credits. If other than "Advanced Topics," up to six credits may come from electives or courses in other concentrations.*	**12**	**12**	**12**
	Conc 1	**Mathematical Medicine and Biology**	**12**	**12**	
	***New**	ISC 4420 - Intro to Bioinformatics	3	**3**	
	***New**	MAP 3930 - Special Topics – Applied Math	3	**3**	
	***New**	BME 4422 - The Biophysics of Neural Comp.	3	**3**	
	***New**	MAP 4494 - Math Biology II	3	**3**	
	Conc 2	**Complex systems**			**12**
	***New**	MAP 4413 - Fourier Analysis with Appl.	3		**3**
	***New**	MAP 4314 - Dynamical systems	3		**3**
	***New**	MAP 4202 - Optimization Theory	3		**3**
	***New**	EEL 4822 - Pattern Recognition	3		**3**
V. Electives		*The number of electives may be reduced to fill out the program core or meet institutional or state required general education requirements.*	**3**	***3***	***1***
	***New**	CHM 3217 - Organic Chemistry (One Semester)	3	**3**	
		Physics 2 Laboratory	1		**1**
VI. Capstone		*All programs are required to have a 6 credit senior capstone sequence.*	**6**	**6**	**6**
	***New**	PHY 4910 - Directed Independent Research 1 (Senior Capstone 1)	3	**3**	**3**
	***New**	PHY 4911 - Directed Independent Research 2 (Senior Capstone 2)	3	**3**	**3**
TOTAL HOURS			**120**	**120**	**120**

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

Two tables are presented here, one for each concentration. Both tracks start

ENGINEERING MATHEMATICS MAJOR – Mathematical Medicine and Biology TRACK
PLAN OF STUDY
FRESHMAN YEAR

1st Semester			Cr.	2nd Semester			Cr.
SLS	1106	Acad. & Professional Skills	1	EGN	1007C	Concepts & Methods	1
IDS	1380	Introduction to STEM	3	COP	2271	Intro to Comp. Programing	3
ENC	1101	English Composition 1*	3	ENC	2210	Technical Writing*	3
CHM	2045	Chemistry 1*	3	BSC	1010	Biology 1*	3

CHM	2045L	Chemistry 1 Laboratory*	1	BSC	1010L	Biology 1 Laboratory*	1
MAC	2311	Analytic Geo & Calc 1*	4	MAC	2312	Anal. Geo & Calc. 2* w Lab	4
Total			**15**	**Total**			**15**

SOPHOMORE YEAR

1st Semester			Cr.	2nd Semester			Cr.
PHY	2048	Physics 1*	3	PHY	2049	Physics 2*	3
PHY	2048L	Physics 1 Laboratory*	1	PHY	2049L	Physics 2 Laboratory	1
AMH	2020	Am. History Since 1877	3	ART	2000	Art Appreciation	3
CHM	2046	Chemistry 2*	3	CHM	3217	Organic Chemistry (1 Sem) *	3
CHM	2046L	Chemistry 2 Laboratory*	1	CHM	3217L	Organic Chemistry Lab (1 Sem)*	1
MAC	2313	Anal. Geo. & Calc 3 w Lab	4	MAP	2302	Differential Equations	3
Total			**15**	**Total**			**14**

JUNIOR YEAR

1st Semester			Cr.	2nd Semester			Cr.
EGS	3441	Engineering Stat (Prob & Stat)	3	STA	3162	Applied Statistics	3
MAD	2104	Discrete Mathematics I	3	MAD	3105	Discrete Mathematics II	3
MAP	3305	Eng. Math I (Math Methods)	3	MAD	4305	Eng. Math II (Num. Analysis)	3
MAA	4102	Advanced Calculus	3	MAS	3105	Linear Algebra	3
CHM	3218	Biochemistry	3	MAP	4341	Applied Partial Diff Eqs.	3
CHM	3218L	Biochemistry Lab	1				
IDS	4911	Professional Exp. Internship	0				
Total			**16**	**Total**			**15**

SENIOR I YEAR

1st Semester			Cr.	2nd Semester			Cr.
ISUC	4420	Intro to Bioinformatics	3	BME	4422	The Biophysics of Neural Comp.	3
MAP	3930	Special Topics – Applied Math	3	ISC	4930	Special Topics: Applied Studies	3
MAP	4484	Math Biology I	3	MAP	4494	Math Biology II	3
MAT	4910	Undergraduate Research 1	3	MAT	4911	Undergraduate Research 2	3
ECO	2023	Prin. Of Micro/ Economics	3	HUM	2020	Introduction to Humanities	3
Total			**15**	**Total**			**15**

Total Degree Hours = 120 Credit Hours

ENGINEERING MATHEMATICS MAJOR –COMPLEX SYSTEMS TRACK
PLAN OF STUDY
FRESHMAN YEAR

1st Semester			Cr.	2nd Semester			Cr.
SLS	1106	Acad. & Professional Skills	1	EGN	1007C	Concepts & Methods	1
IDS	1380	Introduction to STEM	3	COP	2271	Intro to Comp. Programing	3
ENC	1101	English Composition 1*	3	ENC	2210	Technical Writing*	3
CHM	2045	Chemistry 1*	3	BSC	1010	Biology 1*	3
CHM	2045L	Chemistry 1 Laboratory*	1	BSC	1010L	Biology 1 Laboratory*	1
MAC	2311	Analytic Geo & Calc 1*	4	MAC	2312	Anal. Geo & Calc. 2 w Lab*	4
Total			**15**	**Total**			**15**

SOPHOMORE YEAR

1st Semester			Cr.	2nd Semester			Cr.
PHY	2048	Physics 1*	3	PHY	2049	Physics 2*	3
PHY	2048L	Physics 1 Laboratory*	1	PHY	2049L	Physics 2 Laboratory	1
MAD	2104	Discrete Mathematics I	3	MAD	3105	Discrete Mathematics II	3
STA	3032	Engineering Stat (Prob&Stat)	3	STA	3162	Applied Statistics	3
MAC	2313	Anal. Geo. & Calc 3 w Lab	4	COP	2272	Computer Programming I	3

				ART	2000	Art Appreciation	3
Total			**14**	**Total**			**16**

JUNIOR YEAR

1st Semester			Cr.	2nd Semester			Cr.
MAP	3403	Eng. Math I (Math Methods)	3	MAP	4401	Eng. Math II (Num. Analysis)	3
MAA	4102	Advanced Calculus	3	MAP	4102	Prob Theory & Stoch Proc I	3
MAP	2302	Differential Equations w Lab	3	MAP	4341	Partial Diff. Eqs.	3
MAS	3105	Linear Algebra	3	MAP	3253	Math Scientific Computing	3
AMH	2020	Am. History Since 1877	3	ECO	2023	Prin. Of Micro Economics	3
IDS	4911	Professional Exp. Internship	0				
Total			**15**	**Total**			**15**

SENIOR I YEAR

1st Semester			Cr.	2nd Semester			Cr.
MTG	4302	Elements of Topology I	3	MTG	4303	Elements of Topology II	3
ISC	4930	Special Topics-Applied Studies	3	MAP	4202	Optimization Theory	3
MAP	4413	Fourier Analysis with Appl.	3	EEL	4822	Pattern Recognition	3
MAP	4314	Dynamical systems	3	HUM	2020	Introduction to Humanities	3
MAT	4910	Undergraduate Research 1	3	MAT	4911	Undergraduate Research 2	3
Total			**15**	**Total**			**15**

Total Degree Hours = 120 Credit Hours

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

Below are the core, elective, and concentration courses required for the program.

CHM 3217 – Organic Chemistry (One Semester)
Credits: 3
Prerequisite: CHM 2046 & CHM 2046L – Chemistry 2 & Chemistry 2 Lab
Co-requisite: CHM 3217L – Organic Chemistry 1 Lab
Course Description: A rigorous one-semester overview of the structure properties and reactions of organic compounds. This is the first half of a two- semester biochemically oriented sequence.

CHM 3217L – Organic Chemistry Laboratory (One Semester)
Credits: 1
Prerequisites: None
Co-requisite: CHM 3217 – Organic Chemistry (One Semester)
Course Description: Students perform basic organic lab techniques. Synthesis, recrystallization, separations, extraction, chromatography, introduction to Nuclear Magnetic Resonance (NMR) and Infrared (IR) Spectroscopy.

MAP 2302C - Differential Equations w Lab
Credits: 3
Prerequisites: MAC 2312 - Analytic Geometry and Calculus 2 (with a minimum grade of C)
Course Description: Topics include first order ordinary differential equations, theory of linear ordinary differential equations solutions of linear and non-linear equations including variation of parameters, undetermined coefficients and Laplace transformations, matrix methods along with applications such as Newton's law of cooling, mixture problems, springs and free fall. This course also helps develop the General education skills of (i) critical thinking (ii) communication, (iii) cultural literacy and (iv) information and technical literacy.

EGS 3441 - Engineering Statistics
Credits: 3

Prerequisites: MAC 2311 minimum grade of a C.
Co-requisite: none
Course Description: The basic concepts in probability and statistics with engineering applications. Topics include probability, discrete and continuous random variables, estimation, hypothesis testing, and linear and multiple regression.

MAD 2104 - Discrete Mathematics I
Credits: 3
Prerequisites: MAC 2312 - Analytic Geometry and Calculus 2
Co-requisite: none
Course Description: This course discusses logic, sets, functions, algorithms and complexity, integers and algorithms, mathematical reasoning and induction, counting principles, permutations and combinations, discrete probability, advanced counting techniques and inclusion-exclusion..

MAP 3305 Engineering Mathematics 1
Credits: 3
Prerequisites: MAC 2254 or MAC 2282 or MAC 2312
Co-requisite: None
Course Description: The purpose of this module is to provide participants with the skills, knowledge and attitudes required to perform fundamental mathematical procedures and processes for solution of engineering problems, particularly the use of calculus, vector analysis and infinite series. The subject aims to show the relevance of mathematics to engineering and applied sciences.

MAA 4102 Introduction to Advanced Calculus for Engineers and Physical Scientists
Credits: 3
Prerequisites: MAC 2313 or MAC 3474, and MAS 4105 or MAS 3114,
Co-requisite: None
Course Description: Theory of real numbers, functions of one variable, sequences, limits, continuity and differentiation; continuity and differentiability of functions of several variables.

CHM 3218 – Biochemistry (One Semester)
Credits: 3
Prerequisite: CHM 3217 (One Semester Organic Chemistry)
Co-requisite: None
Course Description: An introduction to the basic concepts of Biochemistry and Molecular Biology from an Organic Chemistry structural and mechanistic perspective.

CHM 3218 L – Biochemistry Lab (One Semester)
Credits: 1
Prerequisite: CHM 3217 (One Semester Organic Chemistry)
Co-requisite: None
Course Description: An introduction to the basic concepts of Biochemistry and Molecular Biology from an Organic Chemistry structural and mechanistic perspective.

STA 3162C - Applied Statistics
Credits: 3
Prerequisites: STA 3441 or MAC 2311
Co-requisite: None
Course Description: Inferential statistics from an applied point of view. Probability and sampling distributions, confidence intervals and hypothesis testing, ANOVA, correlation, simple and multiple linear regressions.

MAD 3105 Discrete Mathematics II
Credits: 3
Prerequisites: MAD 2104 or MAC 2312

Co-requisite: none
Course Description: The purpose of this course is to develop knowledge and skills in fundamental mathematical topics that are relevant to computing, particularly to the systematic development of software. This course is intended for computer science majors and other science majors with an interest in mathematics. The topics covered in this course include graphs, relations and Boolean Algebra.

MAP 4305 Engineering Mathematics II
Credits: 3
Prerequisites: MAP 3305
Co-requisite: None
Course Description: The purpose of this module is to provide participants with the skills, knowledge and attitudes required to perform fundamental mathematical procedures and processes for solution of engineering problems, particularly the use of calculus, vector analysis and infinite series. The subject aims to show the relevance of mathematics to engineering and applied sciences.

MAS 3105 - Linear Algebra
Credits: 3
Prerequisites: MAC 2313 - Analytic Geometry and Calculus 3
Co-requisite: None
Course Description: This course covers linear equations, matrices, vector spaces, linear transformations, determinants, eigenvalues, and inner product spaces..

MAP 4341- Applied Partial Differential Equations
Credits: 3
Prerequisite: MAP 2302C - Differential Equations w Lab
Co-requisite: None
Course Description This course introduces three main types of partial differential equations: diffusion, elliptic, and hyperbolic. It includes mathematical tools, real-world examples and applications.

ISC 4420 Introduction to Bioinformatics
Credits: 3
Prerequisites: BSC 1010 and COP 2271
Course Description: This is an introduction to the theory and practice of Bioinformatcs and Computational Biology; emphasizing the use of computer databases to store, retrieve and assist in understanding Biological Information. Topics covered will included: 1. DNA Sequence Assembly and Patterns; 2. Protein Modeling and Alignments, 3. Genomics and Proteomics; 4. Expression Array Analysis; And 5. Phylgenetrics and Systematics

MAP 3930 Special Topics –Applied Math
Credits: 3
Prerequisites: Consent of department head and instructor
Course Description: This course investigates a topic of special interest to faculty and students that is outside regular course offerings.

MAP 4484 Mathematical Modeling in Biology I
Credits: 3
Prerequisites: MAP 2302 and MAS 3105
Course Description: Introduction to techniques used in the construction, analysis, and evaluation of mathematical models. Modeling topics include: How fast will an infectious disease spread within a community? What fraction of a population need to be vaccinated in order to eradicate a disease, and what is the best vaccination policy? How stable is a given ecosystem? Students will learn how to frame a scientific question in mathematical terms; how to study the model using mathematical tools and techniques; how to interpret model predictions in the appropriate scientific context. Part 1

PHY 4910 – Undergraduate Research 1

Credits: 3
Prerequisites:
Course Description: Projects in experimental, theoretical or computational Physics conducted in collaboration with Physics faculty. This course requires an oral and written research report by the student.

BME 4422: The Biophysics of Neural Computation
Credits: 3
Prerequisites: MAP 4484 – Mathematical Biology 1
Course Description: This course will discuss the biophysics of neuronal computation for both biological and artificial neural networks. It will provide a detailed introduction to: i) the anatomy/physiology of excitable cells, ii) the major brain architectures and principles, and iii) the most relevant mathematical models for neural computation from single neurons to circuits. Therefore, this course will prepare the students to understand the main principles by means of which our brains work and computers recognize patterns, learn/plan actions, and interact with humans

ISC 4930 Special Topics –Applied Studies
Credits: 3
Prerequisites: Consent of department head and instructor
Course Description: This course investigates a topic of special interest to faculty and students that is outside regular course offerings.

MAP 4494 Mathematical Modeling in Biology II
Credits: 3
Prerequisites: MAP 4484
Course Description: Introduction to techniques used in the construction, analysis, and evaluation of mathematical models. Modeling topics include: How fast will an infectious disease spread within a community? What fraction of a population need to be vaccinated in order to eradicate a disease, and what is the best vaccination policy? How stable is a given ecosystem? Students will learn how to frame a scientific question in mathematical terms; how to study the model using mathematical tools and techniques; how to interpret model predictions in the appropriate scientific context. Part 2

PHY 4911 – Undergraduate Research 2
Credits: 3
Prerequisites: PHY 4910 - Undergraduate Research 1
Co-requisite: None
Course Description: The primary purpose of this course is to provide students with an opportunity for firsthand, supervised research in Physics. Projects may involve inquiry, design, investigation, scholarship, discovery or application in Physics.

MAP 4102 Probability and Stochastic Processes
Credits: 3
Prerequisites: MAP 2302 and MAS 3105
Course Description: Probability Spaces, Discrete and Continuous Random Variables, Conditional Probabilities, and Expectations, Standard Distributions, Poisson Processes, Discrete and continuous Parameter Markov Chains and either Queues, Brownian Motion or Simulation.

MAP 3253- Mathematical Scientific Computation
Credits: 3
Prerequisite: COP 2272C - Computer Programming 1 , MAA 4102 Introduction to Advanced Calculus for Engineers and Physical Scientists 1 and MAP 2302 - Differential Equations w Lab
Co-requisite: 4401 Eng. Math II – Numerical Analysis
Course Description: The mathematical and scientific computation is an interplay between mathematical theory and modern computational tools for applications. Students will attain an advanced knowledge of computer science, specifically programming and will gain a solid foundation in mathematics that will

enable them to model or analyze complicated systems or problems, such as earthquakes, economic models or biological systems.

MTG 4302- Elements of Topology 1
Credits: 3
Prerequisites: MAS 3105-Linear Algebra3205
Course Description: This course will present the basic concepts and examples of general topology. Topology provides a general setting for studying continuous mathematics, and is a foundation for much of pure and applied mathematics. Specific topics presented: basics of set theory and then introduce topological spaces and continuous functions, notions of connectedness, compactness, countability and separation, metric spaces and function spaces, and the notion of completeness.

MAP 4413 - FOURIER SERIES AND TRANSFORMS
Credits: 3
Prerequisites:
Course Description: The goals for the course are to gain a facility with using the Fourier transform, both specific techniques and general principles, and learning to recognize when, why, and how it is used. Topics include: The Fourier transform as a tool for solving physical problems. Fourier series, the Fourier transform of continuous and discrete signals and its properties. The Dirac delta, distributions, and generalized transforms. Convolutions and correlations and applications; probability distributions, sampling theory, filters, and analysis of linear systems. The discrete Fourier transform and the FFT algorithm.

MAP 4314 – Dynamical Systems
Credits: 3
Prerequisites: MAC 2313, MAP 2302, AND MAS 3105
Course Description: In this course you'll gain an introduction to the modern study of dynamical systems, the interdisciplinary field of applied mathematics that studies systems that change over time. Topics to be covered include: phase space, bifurcations, chaos, the butterfly effect, strange attractors, and pattern formation.

MTG 4303 Elements of Topology 2
Credits: 3
Prerequisites: MTG 4302
Course Description: This course will present the basic concepts and examples of general topology. Topology provides a general setting for studying continuous mathematics, and is a foundation for much of pure and applied mathematics. Specific topics presented: basics of set theory and then introduce topological spaces and continuous functions, notions of connectedness, compactness, countability and separation, metric spaces and function spaces, and the notion of completeness. Algebraic topology topics include the fundamental group, the Jordan Curve theorem, and the Seifert-van Kampen theorem.

MAP 4202 Optimization Theory
Credits: 3
Prerequisites: MAP 4102 Probability Theory and Stochastic Process I
Course Description: This course will focus on problem formulation, software technologies and analytical methods for optimization serving as an introduction to a wide variety of optimization problems and techniques including linear and nonlinear programming, dynamic programming, network flows, integer programming, heuristic approaches, Markov chains, game theory, and decision analysis.

EEL 4822 - Pattern Recognition
Credits: 3
Prerequisites: MTG 4930
Course Description: This main goal of this course is to underlie the principles of pattern recognition and the methods of machine intelligence used to develop and deploy pattern recognition applications in the

real world. The algorithms to be presented include feature extraction and selection, clustering, artificial neural networks, support vector machines, rule-based algorithms, fuzzy logic, genetic algorithms, and others. Case studies drawn from actual machine intelligence applications will be used to illustrate how methods such as pattern detection and classification, signal taxonomy, machine vision, anomaly detection, data mining, and data fusion are applied in realistic problem environments.

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 university has developed curriculum advisory boards for each of its programs. These advisory boards consist entirely of industry and educational leaders in the specific fields of the program. For engineering mathematics, a similar advisory board will be developed over the next one to two years. While ABET accreditation does not apply to engineering mathematics, the basic framework for educational objectives, program student learning outcomes, and curricular structure are adhered to as part of the requirement for all Florida Poly programs. Upon the formation of an appropriate advisory board, the PEOs will be reviewed and approved.

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.

There is no equivalent accreditation agency for engineering mathematics.

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 2 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 will be delivered in a traditional format, face-to-face setting, with courses administered on the main campus. In keeping with the University's strategic plan to be offering some level of online delivery by 2023, the program will evaluate its course offerings to determine what best serves the quality outcomes of the program as it considers online delivery. The program does not require any specialized services or require greater than normal financial support to deliver.

IX. Faculty Participation

A. Use Table 4 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).

Presently, the Department of Mathematics has seven full-time faculty (five assistant professors, two instructors) who deliver all coursework. Currently, the department is conducting searches for two faculty of higher rank and anticipates an additional five faculty total by the fifth year. This brings the total FTE to 12 mathematics faculty.

B. Use Table 2 in Appendix A to display the costs and associated funding resources for existing and anticipated full-time faculty (as identified in Table 4 in 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.

All faculty funding comes from E&G. New hires will come from unallocated E&G funds, based on a recent appropriation of $4.8 million to grow programs and faculty.

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

See appendix C.

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.

The typical teaching load for assistant professors is 3/3, with time for research and service to meet the BOG required 12 – 15 credits for FTE productivity. The table below shows SCH production among faculty in the program over the last year. All faculty participate in some level of department or university service. Research productivity is reflected in the CVs provided in Appendix C.

Student Credit Hour Generated by Faculty

Program: Engineering Math	Fall 2017	Spring 2018	AY 2017-2018
Alnaser, Ala' Jamil	333	273	606
Bowers, Abigail	394	324	718
Bunn, Jared	246	273	519
Burbank, Dean	576	596	1,172
Katugampola, Don	332	246	578
Kim, Myles	192	360	552
Norton, Dennis	588	516	1,104
Grand total (sum SCH)	**2,661**	**2,588**	**5,249**
Average SCH for program	**380**	**370**	**750**
Average Per Full Time Faculty	**238**	**243**	**456**

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 Masters and Bachelors programs in Computer, Electrical and Mechanical Engineering. Resources that directly support Florida Poly's current engineering programs will also directly support the proposed Engineering Mathematics program. Current library resources include: Engineering Village (Inspec and Compendex), Elsevier's Science Direct, EBSC Engineering Core eBook collection, IEEE Electronic Library, and ProQuest's SciTech Premium Collection.

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

Advances in Mathematics (1961-present)
General Mathematics (2001-present)
Journal of Applied Mathematics (2001-present)
Journal of Engineering Mathematics (1997-present)
Journal of Mathematical Analysis and Applications (1960-present)
Journal of Mathematics (2008-present)
TWMS Journal of Applied and Engineering Mathematics (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 2 in Appendix A. Please include the signature of the Library Director in Appendix B.

To further support the Mathematical Engineering program, the Library will seek to acquire access to MathSciNet which provides access to over 2 million direct links to original articles in more than 3,000 journals from over 250 publishers. MathSciNet is available at a cost of $14,117.00 annually.

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.

Existing classroom, laboratory, research, and office space within the Innovation, Science, and Technology (IST) building on the main campus is sufficient to handle a total enrollment of approximately 2000 students (by headcount). Plans are currently in progress to expand office space within the IST given the existing buildup of faculty (institutionally) that is planned and in progress for fall 2019 for all programs. The University is currently building an additional classroom and research building, the Applied Research Center, which should be online sometime in academic year 2021 - 2022. The additional 85,000 square foot facility will provide laboratory, classroom, and office space to accommodate multiple programs. Instructional, research, and office programming is presently underway as part of the architectural planning for the building.

However, current on-campus Florida Poly facilities are adequate to implement the proposed classroom lectures and deliver laboratory coursework, research space, and the offices of the anticipated new hire faculty members.

Existing classrooms are all fully equipped with computers, projector equipment, Clarus glass boards for presentation and writing, Panopto lecture capture, and other software. The typical classroom serves 48 students and the typical lab seats 24.

Additionally, there is one teaching and research laboratory available for the new program. The lab space will ensure that all students, faculty, and staff have access to a healthy and safe learning environment. The labs include the abatement of hazardous materials and significant improvements to air quality.

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 2 in Appendix A. Do not include costs for new construction because that information should be provided in response to X (E) below.

The Mathematical Computing Laboratory is located in Room 1057 of the IST which houses a computer lab, meeting and space. The faculty in the department and other departments may also affiliate with the MCL to use its facilities in their research, independent of the current undergraduate projects in the lab.

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 2 in 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.

No additional space will be needed for this degree program.

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

The students and faculty have access to several computation servers including the supercomputer which provide project participants with the opportunity to run larger calculations.

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 2 in Appendix A.

Twenty Computing Devices that cost less than $1,500 will be purchased. They will be used to acquire, store, analyze, process, and publish data and other information electronically, including accessories for printing, transmitting and receiving, or storing electronic information.

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 2 in Appendix A.

No additional equipment will be needed for this degree program.

I. Describe fellowships, scholarships, and graduate assistantships to be allocated to the proposed program through Year 5. Include the projected costs in Table 2 in Appendix A.

There is no special funding associated with this program outside of the scholarships available to all incoming students. Costs as reflected in Appendix A assume the institution’s discount rate as it is planned to reduce over time. For example, instead of revenue based on full tuition and fees, it is based on the current year’s discount rate applied to that cost and subsequently at gradually lower rates over the

five year's calculated.

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.

A degree in engineering mathematics positions students to apply mathematics to complex real-world problems. This combination on mathematical theory and practical engineering will be of great interest to many companies that regularly attend the Florida Poly annual career and internship fair including:

- Harris Corporation
- NAWCTSD
- Nielsen
- JL Marine Systems

APPENDIX A

TABLE 1-A
PROJECTED HEADCOUNT FROM POTENTIAL SOURCES
(Baccalaureate Degree Engineering Mathematics Program)

Source of Students (Non-duplicated headcount in any given year)*	Year 1		Year 2		Year 3		Year 4		Year 5	
	HC	FTE	HC	FTE	HC	FTE	HC	FTE	HC	FTE
Upper-level students who are transferring from other majors within the university**	0	0	0	0	0	0	0	0	0	0
Students who initially entered the university as FTIC students and who are progressing from the lower to the upper level***	12	12	30	30	48	48	64	64	70	70
Florida College System transfers to the upper level***	0	0	0	0	6	3	6	3	6	3
Transfers to the upper level from other Florida colleges and universities***	0	0	0	0	6	3	6	3	6	3
Transfers from out of state colleges and universities***	0	0	0	0	8	4	8	4	8	4
Other (Explain)***	0	0	0	0	0	0	0	0	0	0
Totals	**12**	**12**	**30**	**30**	**68**	**58**	**84**	**74**	**90**	**80**

* 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
PROJECTED COSTS AND FUNDING SOURCES

Instruction & Research Costs (non-cumulative)	Year 1								Year 5						
	Funding Source							Subtotal columns 1+…+7	Funding Source						Subtotal columns 9+…+ 14
	Reallocated Base* (E&G)	Enrollment Growth (E&G)	New Recurring (E&G)	New Non-Recurring (E&G)	Contracts & Grants (C&G)	Philanthropy/ Endowments	Enterprise Auxiliary Funds		Continuing Base** (E&G)	New Enrollment Growth (E&G)	Other*** (E&G)	Contracts & Grants (C&G)	Philanthropy/ Endowments	Enterprise Auxiliary Funds	
Columns	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Faculty Salaries and Benefits	212,013	0	0	0	0	0	0	**$212,013**	931,391	0	0	0	0	0	**$931,391**
A & P Salaries and Benefits	0	0	0	0	0	0	0	**$0**	46,279	0	0	0	0	0	**$46,279**
USPS Salaries and Benefits	0	0	0	0	0	0	0	**$0**	0	0	0	0	0	0	**$0**
Other Personal Services	14,300	0	0	0	0	0	0	**$14,300**	44,284	0	0	0	0	0	**$44,284**
Assistantships & Fellowships	0	0	0	0	0	0	0	**$0**	0	0	0	0	0	0	**$0**
Library	0	0	0	0	0	0	0	**$0**	0	0	0	0	0	0	**$0**
Expenses	21,000	0	0	0	0	0	0	**$21,000**	48,600	0	0	0	0	0	**$48,600**
Operating Capital Outlay	30,000	0	0	0	0	0	0	**$30,000**	70,000	0	0	0	0	0	**$70,000**
Special Categories	41,735	0	0	0	0	0	0	**$41,735**	50,968	0	0	0	0	0	**$50,968**
Total Costs	**$319,048**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$319,048**	**$1,191,522**	**$0**	**$0**	**$0**	**$0**	**$0**	**$1,191,522**

*Identify reallocation sources in Table 3.

**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)	2.00	5.00
A & P (FTE)	0	0.6
USPS (FTE)	0	0

Calculated Cost per Student FTE

	Year 1	Year 5
Total E&G Funding	$319,048	$1,191,522
Annual Student FTE	12	80
E&G Cost per FTE	$26,587	$14,894

Table 2 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 3 – 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 of 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.
Subtotal columns 1+…+7	8	Subtotal of values included in columns 1 through 7.
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.
Subtotal columns 9+…+14	15	Subtotal of values included in columns 9 through 14.

APPENDIX A

TABLE 3
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
Academic Affairs - Faculty/New Program Acct.	0	0	**$0**
Current Mathematics Reoccuring	0	0	
	0	0	
	0	0	
	0	0	
	0	0	
Totals	$0	$0	**$0**

*** If not reallocating funds, please submit a zeroed Table 3**

APPENDIX A

TABLE 4
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	Ala' J. Alnaser, Ph.D.	Asst. Prof.	MYA	Fall 2019	9	0.75	0.75	0.56	9	0.75	0.75	0.56
	Mathematics											
A	Abigail Bowers, Ph.D.	Instructor	MYA	Fall 2019	9	0.75	1.00	0.75	9	0.75	1.00	0.75
	Mathematics											
A	Dean Burbank, M.S.	Asst. Prof.	MYA	Fall 2019	9	0.75	1.00	0.75	9	0.75	1.00	0.75
	Mathematics											
A	Jared Bunn, Ph.D.	Asst. Prof.	MYA	Fall 2019	9	0.75	0.75	0.56	9	0.75	0.75	0.56
	Mathematics											
A	Don Katagumpola, Ph.D.	Asst. Prof.	MYA	Fall 2019	9	0.75	1.00	0.75	9	0.75	1.00	0.75
	Mathematics											
A	Myles Kim, Ph.D.	Asst. Prof.	MYA	Fall 2019	9	0.75	0.75	0.56	9	0.75	0.75	0.56
	Mathematics											
A	Dennis Norton, M.S.	Instructor	MYA	Fall 2019	9	0.75	1.00	0.75	9	0.75	1.00	0.75
	Mathematics											
C	New Hire, Ph.D.	Professor	MYA	Fall 2019	9	0.75	1.00	0.75	9	0.75	1.00	0.75
	Mathematics											
C	New Hire, Ph.D.	Assoc. Prof	MYA	Fall 2019	9	0.75	1.00	0.75	9	0.75	1.00	0.75
	Mathematics											
C	New Hire, Ph.D.	Asst. Prof.	MYA	Fall 2020	0	0.00	0.00	0.00	9	0.75	1.00	0.75
	Mathematics											
C	New Hire, Ph.D.	Asst. Prof.	MYA	Fall 2021	0	0.00	0.00	0.00	9	0.75	1.00	0.75
	Mathematics											
C	New Hire, Ph.D.	Asst. Prof.	MYA	Fall 2021	0	0.00	0.00	0.00	9	0.75	1.00	0.75
	Mathematics											
	Total Person-Years (PY)							**6.19**				**8.44**

Faculty Code		Source of Funding	PY Workload by Budget Classification Year 1	Year 5
A	Existing faculty on a regular line	Current Education & General Revenue	4.69	4.69
B	New faculty to be hired on a vacant line	Current Education & General Revenue	1.50	3.75
C	New faculty to be hired on a new line	New Education & General Revenue	0.00	0.00
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
		Overall Totals for	**Year 1** 6.19	**Year 5** 8.44

APPENDIX B

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

Signature of Equal Opportunity Officer	**Date**
Signature of Library Director	**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: Faculty Curriculum Vitae

CVs are provided for the following faculty currently in the Department of Mathematics:

- Dr. Ala' J. Alnaser, Assistant Professor
- Dr. Abigail Bowers, Assistant Professor
- Dr. Jared Bunn, Assistant Professor, Department Chair
- Dean Burbank, Instructor
- Dr. Don Katugampola, Assistant Professor
- Dr. Myles Kim, Assistant Professor
- Dennis Norton, Instructor

Faculty Bio

Ala' J. Alnaser
Assistant Professor
Department of Mathematics

Contact

- Phone: 863.874.8531
- Email: aalnaser@Floridapoly.edu
- Office mailing address:
  Innovation Science and Technology Building, Room 2012,
  4700 Research Way, Lakeland, FL 33805-8531

Education

PhD in Mathematics, 2009, Kansas State University
MS in Mathematics, 2005, Kansas State University
BS in Mathematics and Statistics, 2002, Jordan University of Science and Technology

Courses taught a Florida Poly in the last 2 semesters

STA 3032 Probability and Statistics
MAS 3114 Computational Linear Algebra
MAP 5436 Applied Math for Engineers

Google Scholar Profile

https://scholar.google.com/citations?hl=en&user=o4oRlzsAAAAJ

Other Social Media Accounts/websites

LinkedIn: www.linkedin.com/in/professor-aj-alnaser-13bb6335
ResearchGate: https://www.researchgate.net/profile/Ala_Alnaser

About

Dr. Ala' Jamil Alnaser brings over fifteen years of experience in academia to his position as Assistant Professor of Mathematics. Previously, he served as an assistant professor of Mathematics at Trine University, Indiana, from Jan. 2010 to May 2015. Where his duties mainly involved teaching and service. He often utilizes instructional technologies that included MyMathLab, WebAssign, MATLAB and Scientific Graphing Calculators.

Dr. Alnaser holds a Ph.D. and master's degree in mathematics from Kansas State University, completing his doctoral dissertation in the area of Algebraic Number Theory and developing new methods for finding upper bounds for Waring's number over the rational integers. His bachelor's degree is in Mathematics and Statistics from Jordan University of Science and Technology. From 2003-2009, he worked as a graduate teaching assistant at Kansas State University, where he taught my courses including College Algebra, Calculus II and III, Linear Algebra and Applied Matrix Theory.

Dr. Alnaser is currently a member of the Advanced Mobility Institute (AMI) at Florida Polytechnic University. The AMI team focus is on research involving testing and verification of Autonomous Vehicles and related technology.

He is a member of the American Mathematical Society.

Expertise

1. Algebraic Number Theory

2. Mathematical Pedagogy
3. Machine Learning, Artificial Neural Networks and advanced analytical techniques
4. Autonomous Vehicles technology
5. Simulations, Scenario Generation for Testing and Verification

Professional Activities

1. A member of The Advanced Mobility Institute.
2. Chair of the text selection committee for Mathematics courses.
3. Chair of the Mathematics Hiring Committee.

Awards and Honors:

1. Robert Andrew and Anne Ewing Smith Excellence in Teaching Award in Arts and Sciences for academic year 2011-2012
2. Hostinsky Outstanding Graduate Teaching Assistant in Academics Award.
3. KSU Presidential Award for Excellence in Undergraduate Teaching Nomination.

Selected Publications

- "Autonomous Vehicles Scenario Testing Framework and Model of Computation"

Ala' J. Alnaser, Mustafa lhan Akbas, Arman Sargolzaei, Rahul Razdan (In Progress)

- "Autonomous Vehicles, An In-Depth Analysis of Major Crashes and Recommended Mitigation Plans"

Saleem Sahawneh, Ala' J Alnaser, Mustafa Ilhan Akbas, Rahul Razdan and Arman Sargolzaei. The Transportation Research Board (TRB) 98th Annual Conference Proceedings (Submitted Aug. 2018)

- "Waring Numbers For Diagonal Congruences"
  Ala Alnaser, Todd Cochrane, Misty Ostergaard and Craig Spencer .

Rocky Mountain Journal of Mathematics (Submitted Aug. 2018)

- "Predicting Hospital Length of Stay using Neural Networks"

Thanos Gentimis, Ala' J. Alnaser, Alex Durante, Kyle Cook, Robert Steele.
International Journal of Big Data Intelligence, Inderscience Publishers (Accepted July 2018)

- "Predicting Hospital Length of Stay using Neural Networks on MIMIC III Data"

Thanos Gentimis, Ala' J. Alnaser, Alex Durante, Kyle Cook, Robert Steele.
IEEE 2017 International Conference on Big Data Intelligence and Computing (IEEE DataCom 2017)

- "Bounds for Waring's Number mod Pm in Number Fields"

Ala Alnaser, Journal of Number Theory 133 (2013), pp. 72-82

- "Waring's Problem In Number Fields"

Ala Alnaser, doctoral dissertation, KSU, Dec. 2009

- "Waring's Number mod m"

Ala Alnaser and Todd Cochrane, Journal of Number Theory (2008), doi:10.1016/j.jnt.2008.03.006.

Faculty Bio Template

Abigail Bowers
Assistant Professor
Mathematics

Contact:

- 863-874-8656
- abowers@floridapoly.edu
- 4700 Research Way (IST-2014)
  Lakeland, FL 33805-8531

Education:

PhD in Mathematical Sciences, 2014, Clemson University
MS in Mathematical Sciences, 2010, Clemson University
BS in Mathematics and History, 2008, Furman University

Courses taught at Florida Poly in the last 2 semesters:
MAC 2311: Analytic Geometry and Calculus I
MAC 2313: Analytic Geometry and Calculus III
MAD 2014: Discrete Mathematics
MAD 3014: Numerical Analysis
MAS 3114: Computational Linear Algebra

Google Scholar Profile:
https://scholar.google.com/citations?user=hHHI66UAAAAJ&hl=en

About:
Dr. Abigail L. Bowers is an Assistant Professor of Mathematics at Florida Polytechnic University. She holds a BS in Mathematics and History from Furman University, and an MS and PhD in Mathematical Sciences from Clemson University. After receiving her doctorate, she spent two years as a Visiting Assistant Professor at Clemson University prior to joining the faculty at Florida Poly.

Expertise:

1. Navier-Stokes Equations
2. Finite Element Method
3. Partial Differential Equations

Selected Publications:

A. Bowers and L. Rebholz, “The Reduced NS-α Model for Incompressible Flow: A Review of Recent Progress" Fluids, 2, 3, 2017. DOI: 10.3390/fluids2030038

A. Bowers, S. Le Borne, and L. Rebholz, “Error analysis and iterative solvers for Navier-Stokes projection methods with standard and sparse grad-div stabilization", Computer Methods in Applied Mechanics and Engineering, 275, 1-19, 2014.
DOI: 10.1016/j.cma.2014.02.021

A. Bowers and L. Rebholz, “Numerical study of a regularization model for incompressible with deconvolution-based adaptive nonlinear filtering", Computer Methods in Applied Mechanics and Engineering, 258, 1-12, 2013. DOI: 10.1016/j.cma.2013.02.003

A. Bowers, “Numerical approximation of a multiscale Leray model for incompressible, viscous flow", Recent Advances in Scientific Computing and Applications: Proceedings of the 8th International Conference on Scientific Computing and Applications, edited by: Jichun Li, Eric Macharro, and Hongtao Yang, AMS Contemporary Mathematics, volume 586, 2013.

A. Bowers, T.-Y. Kim, M. Neda, L. Rebholz, and E. Fried, “The Leray-αβ-deconvolution model: energy analysis and numerical algorithms", Applied Mathematical Modelling, 37(3), 1225-1241, 2013. DOI: 10.1016/j.apm.2012.03.040

A. Bowers, L. Rebholz, A. Takhirov, and C. Trenchea, “Improved accuracy in regularization models of incompressible flow via adaptive nonlinear filtering", International Journal for Numerical Methods in Fluids, 70, 805-828, 2012. DOI: 10.1002/num.20653

A. Bowers and L. Rebholz, “Increasing accuracy and e_ciency in FE computations of the Leray-deconvolution model", Numerical Methods for Partial Differential Equations, 28(2), 720-736, 2012. DOI: 10.1002/fld.2732

A. Bowers, B. Cousins, A. Linke and L. Rebholz, “New connections between finite element formulations of the Navier-Stokes equations", Journal of Computational Physics, 229(24), 2090-2095, 2010. DOI: 10.1016/j.jcp.2010.08.036

Faculty Bio Template

Jared Bunn
Assistant Professor and Chair
Mathematics Department

Contact

- 863.874.8515
- jbunn@floridapoly.edu
- 4700 Research Way (IST-2011)
  Lakeland, FL 33805-8531

Education

Ph.D. in Mathematics, 2011, University of Tennessee-Knoxville
M.S. in Mathematics, 2006, University of Tennessee-Knoxville
B.S. in Mathematics, 2004, University of Tennessee-Martin

Courses taught a Florida Poly in the last 2 semesters

MAC 2311 Analytic Geometry and Calculus 1
MAD 2104 Discrete Mathematics
MAS 3105 Linear Algebra
MAC 2313 Analytic Geometry and Calculus 3

Google Scholar Profile

https://scholar.google.com/citations?user=Z13OCOoAAAAJ&hl=en
Citations: 2
h-index: 1
i10-index: 0

About

Dr. Jared Bunn is an Assistant Professor of Mathematics at Florida Polytechnic University and has been the chair of the Mathematics Department since its inception in January, 2018. He began at Florida Poly in August 2014 and helped pave the way for the university at its onset. Dr. Bunn earned his Ph.D. at the University of Tennessee in Knoxville, where he studied coarse geometry—a subfield of topology. Afterward, Dr. Bunn spent 2 years at Truman College, one of the City Colleges of Chicago as an Instructor of Mathematics. After a brief stint at St. Petersburg College and Eckerd College, Dr. Bunn joined the inaugural faculty at Florida Poly. In his time at Florida Poly, Dr. Bunn has taught 98 credits across 6 different mathematics courses, organized the first academic conference at Florida Poly in the Fall of 2015, which was the annual Mathematics Association of America Suncoast Conference, served as chair of the math faculty hiring committee for 2016 and 2017, and led the math club in organizing the first 2 Integral Bees at Florida Poly.

Expertise:

1. Coarse Geometry
2. Algebraic Topology

Selected Publications:

Bunn, Jared R, "Bounded Geometry and Property A for Nonmetrizable Coarse Spaces. " PhD diss., University of Tennessee, 2011.
https://trace.tennessee.edu/utk_graddiss/953

Faculty Bio Template

Dean Burbank
Instructor
Mathematics

Contact

- 8638748662, Office, 8503813141, Other
- dburbank@floridapoly.edu
- Office mailing address: IST 2017, Innovation Science and Technology Building, Room 123, 4700 Research Way, Lakeland, FL 33805-853

Education

MS, Applied mathematics, University of Alabama, Birmingham
BS, mathematics, St. Bernard College,
Other

Courses taught a Florida Poly in the last 2 semesters
MAC-2311 Calculus 1
MAC-2312 Calculus 2
STA-2023 Elementary statistics

About
Dean Burbank has taught at the college and University level for over 35 years. He taught 26 years at Gulf Coast State College and had the rank of associate professor He taught as an adjunct at Florida State University, Panama City. He has served on various committees including the State Common Course Numbering System and college committees; curriculum, faculty senate, computer committee etc. He also was a grader for AP statistic exams.

Expertise

1. Statistics
2. calculus

Faculty Bio

Don Udita N. Katugampola
Assistant Professor of Mathematics
Department of Mathematical Sciences

Contact

- 863.874.8512
- dkatugampola@floridapoly.edu
- 4700 Research Way (IST-2015)
  Lakeland, FL 33805-8531

Education

PhD in Applied Mathematics, 2011, Southern Illinois University at Carbondale
MS in Mathematics, 2007, Southern Illinois University at Carbondale
BS in Mathematics & Physics, 2002, University of Colombo, Sri Lanka

Courses taught a Florida Poly

MAP 2302 Differential Equations
MAS 3114 Computational Linear Algebra
MAS 3105 Linear Algebra
MAC 2312 Analytic Geometry & Calculus II
MAC 2301 Analytic Geometry & Calculus I

Google Scholar Profile

https://scholar.google.com/citations?user=wyKAE9AAAAAJ&hl=en

Other Social Media Accounts/websites

ResearchGate: https://www.researchgate.net/profile/Udita_Katugampola
LinkedIn: https://www.linkedin.com/in/udita-katugampola-911b35171/

About

Dr. Udita N. Katugampola is an Assistant Professor of Mathematics at Florida Polytechnic University. Before joining Florida Poly we was a faculty member of the Department of Mathematical Sciences at Delaware State University and University of Delaware, respectively. He holds a B.S. in Mathematics from University of Colombo and M.S. and Ph.D. degrees in Applied Mathematics from Southern Illinois University at Carbondale.

His main research areas are fractional calculus and combinatorics and is interested in real-world applications of fractional derivatives along with physical interpretations of those operators. In 2015, while a faculty member at UD, he was awarded a research grant from the U.S. Army Research Office in the amount of $300,000 for his work on fractional derivatives. Dr. Katugampola has several mathematical operators named after him, now known in the literature as "*Katugampola fractional derivatives*". He has more than 15 years of university level teaching experience. While being a graduate student at SIU he served as a deputy leader for the highest caliber mathematics competition, the International Mathematical Olympiad (IMO) several times. He believes that the most rewarding part of teaching mathematics is the self-satisfaction that you receive once students understand the concepts that you teach.

Expertise:

1. Fractional Calculus
2. Porous medium equation
3. Combinatorics
4. Mathematical biology
5. Numerical Analysis

Professional Activities :

1. Editor of the Turkish Journal of Inequalities
2. Reviewer for Applied Mathematics and Computation (Elsevier)
3. Reviewer for Mathematical Methods in the Applied Sciences (Wiley)
4. Reviewer for Journal of Mathematical Physics (AIP)
5.

Research Grants:

U.S. Army Research Office Grant (ARO): $300,000. 2015-2017 for applications of fractional derivatives.

Selected Publications:

U.N. Katugampola. "New approach to a generalized fractional integral" *Applied Mathematics and Computations,* **218**(3), 860-865 (2011).
https://www.sciencedirect.com/science/article/abs/pii/S0096300311004309

U.N. Katugampola. "A New Approach to Generalized Fractional Derivatives" *Bulletin of Mathematical Analysis and Applications*, **6**(4), 1-15 (2014).
http://emis.ams.org/journals/BMAA/repository/docs/BMAA6-4-1.pdf

U.N. Katugampola. "Mellin Transforms of the Generalized Fractional Integrals and Derivatives" *Applied Mathematics and Computation*, **257**, 566-580 (2015).
https://www.sciencedirect.com/science/article/abs/pii/S0096300314017214

U.N. Katugampola. "Correction to ``What is a fractional derivative?" by Ortigueira and Machado [Journal of Computational Physics, Volume 293, 15 July 2015, Pages 4–13]" Journal of Computational Physics, 321, 1255-1257 (2016).
https://www.sciencedirect.com/science/article/pii/S0021999116301978

H. Chen, U.N. Katugampola. "Hermite–Hadamard and Hermite–Hadamard–Fejér type inequalities for generalized fractional integrals" *Journal of Mathematical Analysis and Applications*, **446**(2), 1274-1291(2017).
https://www.sciencedirect.com/science/article/pii/S0022247X16305212

R.M. Evans, U.N. Katugampola, D.A. Edwards. "Applications of fractional calculus in solving Abel-type integral equations: Surface-volume reaction problem" *Computers and Mathematics with Applications*, **76**(6), 1346-1362 (2017).
https://www.sciencedirect.com/science/article/pii/S0898122116306769

G. Farid, U.N. Katugampola, M. Usman. "Ostrowski type fractional integral inequalities for s-Godunova-Levin function via Katugampola fractional integrals," *Open Journal of Mathematical Science*, **1**(1), 97-110 (2018). http://dx.doi.org/10.30538/oms2017.0010

Faculty Bio

Myles M. Kim
Assistant Professor
Math and Stat

Contact

- 863-874-8513
- mkim@floridapoly.edu
- Office mailing address: Innovation Science and Technology Building, Room 2009, 4700 Research Way, Lakeland, FL 33805-8531

Education

Ph.D. in Mechanical Engineering, Brown University, Providence RI, 2004
MS in Mathematics, Brown University, Providence RI, 2000

Courses taught at Florida Poly in the last 2 semesters:
MAC2313 Analytic Geometry and Calculus 3
MAS3105 Linear Algebra
MAP2302 Differential Equations

Google Scholar Profile: https://scholar.google.com/citations?user=mi9mKHQAAAAJ&hl=en

About:
Throughout my career as computation scientist, I have mastered computational methods that are applicable to the combination of mathematical theories of elasticity, fluid dynamics, and reaction-diffusion system in the context of biological model development. At the Florida Polytechnic University(FPU), I have been developing a computational model to explore the mechanical roles of microtubules in response to the anti-cancer treatment and their roles in the cellular functions. Also, here at FPU, I have been working on 3D individual cell-based model which incorporates physical interaction between cells, chemical interactions through secretion/consumption, and individually regulated cell-cycle progression including cell proliferation and cell death. This model is suitable to be used for 3D tissue environment simulations and will provide a framework to build a computational model can capture mechanical and biochemical interaction between tumor cells and stromal cells.

Expertise: areas you've published or studied extensively (2-5 words each, limit 5)

1. Intracellular mechanics modeling
2. Cancer cell cycle modeling
3. Agent based modeling
4. Multicellular modeling
5. Medical device modeling

Selected Publications:

- **M. Kim**, I. Maly, "A Numerical Mechanical Model Integrating Actin Treadmilling and Receptor Recycling to Explain Selective Disengagement of Immune Cells," ***Mathematical Biosciences***, submitted (2018)

- **M. Kim**, "Mechanism of MDCK II cell polarization during the cell division: A computational study", ***Applied Mathematics and Computation*** 317C (2018) pp. 1-11
  https://doi.org/10.1016/j.amc.2017.08.054
- J.W. Wojtkowiak, H.C. Cornell, 4 more authors, **M. Kim,** 11 more authors, R. J. Gillies, "Pyruvate sensitizes pancreatic tumors to a hypoxia activated pro-drug TH-302," ***Cancer Metab***.3(1):2. (2015)
  https://doi.org/10.1186/s40170-014-0026-z
- **M. Kim**, K.A. Rejniak, "Mechanical aspects of microtubule bundling in taxane-treated circulating tumor cells," ***Biophysical Journal*** 2;107(5):1236-46. (2014)
  https://doi.org/10.1016/j.bpj.2014.07.009
- **M. Kim**, D. Reed, and K.A. Rejniak, "The formation of tight tumor clusters affects the efficacy of cell cycle inhibitors: a hybrid model study," ***Journal of Theoretical Biology*** 352 31–50 (2014)
  https://doi.org/10.1016/j.jtbi.2014.02.027
- **M. Kim**, R. A. Gillies, K.A. Rejniak , "Current advances in mathematical modeling of anti-cancer drug penetration into tumor," ***Frontiers in Oncology***, 3: 278 (2013)
  https://doi.org/10.3389/fonc.2013.00278
- **M. Kim,** I.V. Maly. "Deterministic mechanical model of T-killer cell polarization reproduces the wandering of aim between simultaneously engaged targets," ***PLoS Computational. Biology***, 5 (2009)
  https://doi.org/10.1371/journal.pcbi.1000260
- **M. Kim**, S. Baek, S. Jung, K. Cho, "Dynamical Characteristics of Bacteria Clustering by Self-Generated Attractants," ***Computational Biology and Chemistry*** 31 (2007) 328–334.
  https://doi.org/10.1016/j.compbiolchem.2007.07.002
- **M. Kim,** Thomas R. Powers, " Deformation of a helical filament by flow and electric field or magnetic fields," ***Phys. Rev. E*** 71, 021914 (2005).
  https://doi.org/10.1103/PhysRevE.71.021914
- **M. Kim**, J. C. Bird, A. J. Van Parys, K. S. Breuer, T. R. Powers, "A Macroscopic Scale Model of Bacterial Flagellar Bundling," ***Proc. Natl. Acad. Sci. USA*** ,vol.100 no.26 15481–15485 (2003).
  https://doi.org/10.1073/pnas.2633596100

Faculty Bio Template

Dr. Dennis L. Norton
Instructor
Mathematics

Contact

- 863-874-8665
- dnorton@flpoly.org
- Florida Polytechnic University
  Innovation Science and Technology Building, Room 2018, 4700 Research Way,
  Lakeland, FL 33805-8531

Education

PhD-University of Arizona
MS-Loyola Marymount University
BS-California Polytechnic University at Pomona

Courses taught a Florida Poly in the last 2 semesters

Math 1147 PreCalculus
Math 2311 Calculus 1
Math 2312 Calculus 2

Expertise:

1. Geohydrology and Applied Math
2. Finance

Board of Governors, State University System of Florida

Request to Offer a New Degree Program

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

Florida Polytechnic University	**Fall 2019**
University Submitting Proposal	**Proposed Implementation Term**
N/A	**Department of Mechanical & Environmental Engineering**
Name of College(s) or School(s)	**Name of Department(s)/ Division(s)**
Environmental Engineering	**Bachelor of Science in Environmental Engineering**
Academic Specialty or Field	**Complete Name of Degree**
14.1401	
Proposed CIP Code	

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**	**Date**
Signature of Chair, Board of Trustees	**Date**	**Vice President for Academic Affairs**	**Date**

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 in Appendix A. Indicate the program costs for the first and the fifth years of implementation as shown in the appropriate columns in Table 2 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	Projected Enrollment (From Table 1)		Projected Program Costs (From Table 2)				
	HC	FTE	E&G Cost per FTE	E&G Funds	Contract & Grants Funds	Auxiliary/ Philanthropy Funds	Total Cost
Year 1	12	12	$53,523	$642,275	0	0	$642,275
Year 2	34	34					
Year 3	80	70					
Year 4	105	95					
Year 5	116	106	$9,142	$1,060,475	0	0	$1,060,475

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.

(a – c). Level, Emphases, and Credit Hours
Florida Polytechnic University is proposing a Bachelor of Science degree program in Environmental Engineering. The program starts with the common Freshman Year, and then roughly parallels the mechanical engineering curriculum in the second year, establishing strong foundations in mathematics, physics, and chemistry before deepening into core environmental engineering coursework. The program will offer one concentration of 12 credits in the subject of Water and a second 12 credit concentration option in modern techniques in sustainability. The 120 credit program leverages the University's relationship with the Florida Industrial Phosphate Research Institute (FIPR) for research projects throughout the curriculum and culminates in a capstone research sequence taken in the senior year.

(d.) Overall Purpose & Opportunities
Florida Poly is uniquely positioned to offer an Environmental Engineering program that collaborates closely with FIPR, the Florida Industrial and Phosphate Research Institute, to provide long term, real-world projects for project-based learning throughout the curriculum. Environmental Engineering programs are one of the critical engineering degrees offered within a Polytechnic Engineering University and directly in scope with the University's mission to "serve students and industry through excellence in education, discovery, and application of engineering and applied sciences." The program is a logical addition to the curriculum in terms of leveraging existing resources (curriculum, research facilities) and is intended to meet industry and environmental needs particularly in Florida.

According to the Bureau of Labor Statistics, Environmental Engineers use the principles of engineering, soil science, biology, and chemistry to develop solutions to environmental problems. Nationally, employment of environmental engineers is projected to grow 8 percent from 2016 to 2026. However, Hanover Research estimates a much higher growth in the major at Florida SUS institutions: 23% to 26% over the period of 2014 to 2024.

The mining industry with its associated chemical processing and manufacturing represent one of the largest economic drivers in the State of Florida. Without this industry, rural communities are in danger of losing viable economic support. Sound environmental engineering with the inclusion of new technologies can provide new opportunities in these in other communities throughout Florida. The Florida Poly program will include an emphasis on new technologies, using its degree strength in Engineering (Computer, Electrical, and Mechanical) and Computer Science for environmental engineering, including advanced materials, data analytics, robotics, remote and/or advanced sensors, process controls and large system modeling.

Poly students and faculty can become leaders in applying new technology with a vision for sustainability. A specific example of transforming an old economy into a new, sustainable one is the Streamsong development, which is providing new economic growth to an area previously devoted to mining. (Streamsong is a luxury resort and spa featuring three internationally acclaimed links-style courses built to take advantage of the features of a mined landscape.) Poly can also be a leader in researching comprehensive recovery; i.e., developing new processes and technology to recover as much valuable material as possible

from each mining pass.

Florida Poly will play a role in keeping good paying jobs in Florida through teaching (preparing the engineers equipped with knowledge of new technology), research (developing the technologies in collaboration with local industry and academic partners) and service (working with local communities and governments to facilitate healthy, educated relationships with industry to seek win-win solutions).

Of course, the particular issues impacting central Florida are replicated in many areas across the United States and the world. The curriculum and technologies developed for Florida's industrial applications are readily applicable to the Sustainability of modern human society. Florida Poly faculty and graduates will be well-prepared to address current and future needs locally and world-wide.

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 CAVP Academic Program Coordination group on April 6, 2018. No concerns were raised.

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).

Directly Support
Florida Polytechnic University's proposed Bachelor of Science program in Environmental Engineering will directly support the following SUS Strategic Planning 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
    - Productivity Goal: Increase undergraduate participation in research to strengthen the pipeline of researchers pursuing graduate degrees.

The program's proposed senior capstone is a research-intensive experience delivered in collaboration with the FIPR Institute's resources. This differs from other engineering capstones in that it focuses less on design than on deep research needed for advancement in environmental engineering. Such a foundation provides a strong link to desired skills and abilities demanded of graduate programs in Environmental Engineering offered in Florida and beyond.

Indirectly Support

- Teaching and Learning Goal to strengthen quality and reputation of academic programs and universities;
- Scholarship, Research, and Innovation Goals to strengthen the quality and reputation and increase collaboration through external funding and collaboration with private industry.

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:

1. Critical Workforce:
    - Education
    - Health
    - Gap Analysis
2. Economic Development:
    - Global Competitiveness
3. 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 Bachelor of Science in Environmental Engineering (CIP 14.) would be included as a program of strategic emphasis under Economic Development – STEM. The program consists of significant science and engineering coursework that will align with criteria established by ABET for Environmental Engineering programs.

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.

All courses will be offered at Florida Polytechnic University's J.D. Alexander, main campus. Some level of laboratory and research opportunities will be delivered at the Florida Industrial Phosphate Research Institute campus in Bartow, Florida.

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.

As the only state institution in Florida dedicated wholly to STEM education, Florida Polytechnic University is working to build its portfolio of STEM programs at the undergraduate level. The university is seeking to establish a mix of both traditional science and engineering programs along with a smaller selection of specialized programs on the leading edge of technology. As a new, growing institution, environmental engineering is an efficient choice in that it enables the institution to leverage its existing expertise, curricula, and research capacity.

To help in identifying viable traditional and specialized programs to grow the University's portfolio, Florida Poly has worked with Hanover Research to develop a shortlist of programs that demonstrate viability for meeting national, state, and local needs. Based on Hanover's findings and institutional capacity, the university chose to develop an environmental engineering program.

National Need

The Hanover Research study for Environmental Engineering shows employment growth in the field to grow by 6.4% from 2016 – 2026, with total openings nationally at 19,500 for environmental engineering and related jobs.

The Bureau of Labor Statistics shows that rate at 8% over the same period—as fast as the average for all occupations—with median pay at $86,800 as of May 2017.

Table 1. Environmental Engineers: Occupational Outlook Handbook: U.S. Bureau of Labor Statistics

Quick Facts: Environmental Engineers	
2017 Median Pay	$86,800 per year $41.73 per hour
Typical Entry-Level Education	Bachelor's degree
Work Experience in a Related Occupation	None
On-the-job Training	None
Number of Jobs, 2016	53,800
Job Outlook, 2016-26	8% (As fast as average)
Employment Change, 2016-26	4,500

Both Hanover Research and the BLS emphasize that in addition to careers as environmental engineers, individuals with this degree may also find careers in engineering management, and environmental health and safety. Job predictions indicate that growth will be driven by state and municipal concerns over water availability and sustainability.

State & Local Need

While nationally the growth rate is 6.4% - 8% (Hanover, BLS), state employment growth for 2016 -2026 is measured at 18.5% (and regionally at 12.5%). Hanover states that the 451 job posting for environmental engineering professions over the last 18 months exceeds the recent number of graduates from environmental engineering programs, thus showing a state-level needs gap. Top employers in Florida, as identified by Hanover Research, are shown in Table 2.

Table 2. Top Employers in Florida, Hanover Research

Top Employers in Florida

Employers who posted advertisements for engineering physics-related positions during the past 180 days as of September 2018

Employer	Total Ads
SCS Engineers	23
CDM Smith	15
Tetra Tech	14
CH2M	13
Intertek	12
American Society of Civil Engineers	11
Wood	11
AECOM	10
Carollo Engineers	10
GFA International	10

Located midway between Orlando and Tampa, Florida Polytechnic graduates have direct exposure to two major employment markets as well as significant employers in Environmental Engineering in the central Florida region and throughout the state.

Specific Needs Met for Research and Service

Florida Poly is uniquely positioned to offer an Environmental Engineering program that collaborates closely with FIPR, the Florida Industrial and Phosphate Research Institute, to provide long term, real-world projects for project-based learning throughout the curriculum. With the ability to draw on the resources (laboratory facilities, equipment) and industrial and research connections already part of the FIPR Institute, Florida Poly's program will enable students and faculty to meet SUS strategic plan goals related to increased undergraduate participation in research to strengthen the pipeline of researchers pursuing graduate degrees. By bringing the experience and industry support of FIPR to the table, together with the expertise developed by the faculty, Florida Poly can provide a research and project-heavy curriculum that has a wide range of potential for research, industry, and environmental challenges facing central Florida.

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.

According to Hanover Research, Environmental/Environmental Health Engineering degree completions in Florida have grown at a slower rate than regionally or nationally, but Florida tends to produce more graduates in this field than other states in the region. Smaller programs in Florida have a more rapid rate of growth than larger programs. Given that Florida Poly will have one of the only programs at 120 credit hours, we anticipate having to adjust for a strong demand. Overall, Hanover reports that the trend in student demand tends toward growth.

Florida Polytechnic University's admissions staff has informally solicited feedback on its regular recruiting circuit leading up to the fall 2019 class. The number of students expressing interest in majoring in environmental engineering in that period is 7,950, of which 3,956 were female.

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 eight institutions in the SUS with environmental engineering programs (same CIP). These include the University of Florida, University of Central Florida, Florida Gulf Coast University, Florida International University, University of South Florida, Florida State/FAMU, and the newest program at Florida Atlantic University. The University of Miami also offers an environmental engineering program.

Florida Poly has investigated each of these programs as it developed its curriculum with an effort to provide a competitive foundation, but a unique experience. Institutional representatives have worked most closely with colleagues at the University of Florida to design a program that would serve as a feeder for UF's master's degree program in environmental engineering. The program pre-proposal was communicated to the CAVP workgroup's face-to-face meeting on April 6, 2018 where it received no concerns.

D. Use Table 1 in 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 has a carefully considered enrollment management growth plan. As such, the enrollment tables were built with several constraints in mind. These include a strong effort at sustainable program growth within the existing and projected facilities resources, projected enrollment over the next five years, and awareness of potential impacts on existing programs.

Florida Poly will open the program admitting only FTICs (no transfers, except for other programs already underway) for the first two years until program core courses are fully offered. All programs at Florida Poly begin with a common freshman year and most of the courses taught in the sophomore year of the plan of study are already offered and staffed. This enables us to observe student interest and recruit from within the existing admissions pool, if needed, while not straining or under-utilizing, current resources.

We do not anticipate significant changes in major; however, we do anticipate that new programs will siphon

off some of the prospects other programs might have ordinarily anticipated. (We typically have very low numbers of students who change major.) Given that we are looking at relatively small numbers of this and our other proposed programs, that adjustment should not impact any one program too significantly.

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. <u>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</u>.

Goal #1 of Florida Poly's strategic plan 2018 – 2023 is to enroll a high-quality and diverse incoming class. To impact this goal, the University has restructured its admission and financial aid operations to support stronger evidenced-based decision making, including market segmentation, reorganized its staffing model to improve coverage, tactics, and messaging, and changed its admissions process to include a holistic view of prospects through items such as essays and recommendation letters. A principal reason for choosing to environmental engineering, in addition to the student and industry demand, is that it leads all engineering programs nationally in percentage of bachelor's degrees awarded to women.

The program at Florida Poly, while similar in many ways to that at FIU, includes some important differences including a different emphasis on multidisciplinary work with the concentration in environmental technologies. The applied research focus through the FIPR Institute distinguishes Florida Poly's program from FIU's as well.

Moreover, given the small size of Florida Polytechnic University and its limited capacity, the enrollment projections for the program in environmental engineering show little to no impact on Florida International University's program. Finally, FIU expressed no comment or concern related to enrollment impact during Florida Poly's presentation of its pre-proposal at the April 6, 2018 CAVP coordinating group meeting.

III. Budget

A. Use Table 2 in Appendix A to display projected costs and associated funding sources for Year 1 and Year 5 of program operation. Use Table 3 in 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.)

Table 2 Summary, Assumptions, Methodology
In the last year, the University received a reoccurring appropriation of $4.8 million for faculty salaries to grow programs and faculty expertise. As such, we have budged based on reallocated (or non-expensed) E&G funds. In addition to growing the faculty by five FTE for by year five of the program, additional expenses include startup funds (research kick-starts, non-recurring); professional development; supplies and lab materials; computing supporting; library support; educational assistants (student labor); and lab assistant support broken out over multiple programs.

Table 3 Summary, Assumptions, Methodology
Table 3 is zeroed because no funds will be reallocated in year one. All funds used for the program in year one come from unallocated E&G resulting from the reoccurring $4.8 million appropriation.

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 2.

The university does not intend to operate this program through continuing education or seek any alternative or differentiated tuition model.

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 inclusion of an environmental engineering program builds upon and grows the university's existing faculty and resource mix. There will be some adjustment in general education in the area of chemistry as additional coursework is required in this degree not currently required of others. The department is already conducting a search with the project start date for this position of fall 2019. In the first year, the curriculum is common with all other Florida Poly programs resulting in no resource or personnel impact other than a small increase in credit hours delivered supporting Freshman Year courses. The second year of the program includes coursework in common with the mechanical engineering curriculum, enabling the use of existing faculty lines to meet student progression. In the upper divisions, the program will draw heavily from our association with the FIPR Institute for research instruction and laboratory space. The FIPR Institute is presently hiring two positions with half-faculty lines to assist in the development and delivery of the program. Additionally, the university's hiring plan for the program includes 5 positions over the next 5 years (see Appendix A2).

From a negative standpoint, as we work to manage our admissions each year, we anticipate some shift in enrollment patterns across programs, particularly within engineering. It is understandable that, as we add programs but strive to maintain a relatively modest but definitive growth curve in enrollment, that some programs may experience fewer students entering the major than in previous years. On balance, we believe this will be a positive adjustment as it will enable those programs to focus more on retention and instructional developments rather than primarily on population management (e.g. scheduling) as we have done in the earlier phases of the university. Overall, we expect to softly populate the program based on a carefully considered enrollment management model. As our student typically do not change majors, a function of a common freshman year giving them time to decide, we like will not see a reduction in total majors in any program, but a very slight reduction in the rate of increase for some programs.

Florida Poly encourages its faculty and students to be involved in research. The Environmental Engineering program will provide a significant number of new opportunities for undergraduate research. It will also strengthen the ties between the FIPR Institute and academic programs at Florida Poly, which is important to the future of both institutions. It is quite possible that this strengthened relationship will provide increased opportunities for research, student projects, industrial internships and instruction to students in other majors as the FIPR Institute and its industrial partners look to computer science for network security of their network-connected sensors and equipment, for instance, or artificial intelligence applied to land reclamation, or novel sensors developed by electrical engineering students, and so on.

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 addition of another Chemistry course (CHM 1046 and CHM 1046L) is the only impact the program will have resulting from meeting its common prerequisite obligations. There will be no need for courses outside the proposed major that are not already present and delivered in other curricula. Because of the significant amount of content that must be included in the curriculum and the limitation of 120 credit hours, the program has a highly manageable and predictable scheduling timetable.

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.

Florida Polytechnic University's relationship with the FIPR Institute has been critical in the development of this proposal and is intrinsically tied to the program's delivery of curriculum and research foundation. The FIPR Institute serves also as a launch pad for relationships with other universities, private industry, and national laboratories. In addition to the resources and access that the FIPR Institute provides, Florida Poly has strong relationships with small and large companies and industries in the area that support the University's capstone sequence through project concepts and material and equipment funding.

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

Use information from Tables 1 and 2 in 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 program will stand to benefit the university and the community in several ways. First, programs in environmental engineering attract students and, of particular importance for Florida Poly, they attract a diverse population. The program benefits the institution in another way by creating collaborative opportunities with other proposed and existing programs. A more robust natural science curriculum is required as part of this program as well as part of our proposed programs in engineering math and engineering physics. Moreover, the program's concentration in modern technique in sustainability has cross-application not only the proposed program in engineering physics, but to our existing programs in the Department of Electrical and Computer Engineering.

As discussed in "Need and Demand," the workforce prospects for environmental engineering will grow considerably over the next ten years. While there are many environmental engineering programs in Florida, Florida Poly's program offers a unique focus, does it in 120 credits, and capitalizes on an existing state resource that has been underutilized in this capacity, i.e. FIPR Institute.

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)

The program will not exceed 120 credit hours.

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.

Florida Poly has aligned its program with the common prerequisites of other Environmental Engineering programs in the SUS and requires no exceptions or changes. The common pre-requisites are as follows:

- MAC 2311 – Analytic Geometry and Calculus 1: Credits 4
- MAC 2312 – Analytic Geometry and Calculus 2: Credits 4
- MAC 2313 – Analytic Geometry and Calculus 3: Credits 4
- MAP 2302 – Differential Equations: Credits 3
- CHM 2045/2045L – Chemistry 1 and Lab: Credits 4 (3 + 1)
- CHM 2046/2046L – Chemistry 2 and Lab: Credits 4 (3 + 1)
- PHY 2048/2048L – Physics 1 and Lab: Credits 4 (3 + 1)
- PHY 2049/2049L – Physics 2 and Lab: Credits 4 (3 + 1)

Program: Environmental Health Engineering **CIP:** 14.1401
Track: 1
Offered At: FIU **Program Length:** 126 Cr. Hrs.
FGCU, UCF, UF 128

REVISED 2/25/09
Technical course change 10/23/2013

LOWER LEVEL COURSES

	Cr. Hrs.
MACX311	4
or– MACX281	4
& MACX312	4
or– MACX282	4
& MACX313	4
or– MACX283	4
& MAPX302	3
or– MAPX305	3
& CHMX045/X045L	4
or– CHMX045C	4
or– CHSX440/X440L	
& CHMX046/X046L	4
or– CHMX046C	4
& PHYX048/X048L	4
or– PHYX048C	4
or– PHYX043	
& PHYX048L	
& PHYX049/X049L (1)	4
or– PHYX049C	4
or– PHYX044	
& PHYX049L	

FOR ALL MAJORS: Students are strongly encouraged to select required lower division electives that will enhance their general education coursework and that will support their intended baccalaureate degree program. Students should consult with an academic advisor in their major degree area.

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(1) PHYX049L does not count toward the degree at FIU.

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.

No limited access designation is being sought.

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.

The proposed program is neither conceived nor designed as an AS-to-BS capstone.

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 goals of the program in environmental engineering include the following marks of achievement that

students are expected to attain within a few years of graduation:

1. Graduates of the environmental engineering program will establish relevant careers in government, industry, or academia through strong technical proficiency, effective collaboration, leadership, communication skills, and ethical behavior;
2. Graduates Achieve research leadership or management roles in their respective careers;
3. Graduates will successfully complete an advanced degree and/or achieve appropriate licensure, registration, or certifications demonstrating ongoing learning and professional development.

The mission of Florida Polytechnic University is to "serve students and industry through excellence in education, discovery, and application of engineering and applied sciences." Environmental Engineering fits squarely within the mission of the university as a program that blends applied sciences and engineering in an effort to sustainably modify the environment to the benefit of humans and human activity. The program's objectives help deliver the University's mission by producing STEM graduates who will be equipped to execute careers and research at an accomplished level. Moreover, the program aligns with the University's strategic goal (4) to grow the number of academic programs in strategic disciplines. The University's plan specifically states that programs will be chosen on the bases of complementing and strengthening existing programs and to serve existing industries and create new ones in the state of Florida. Finally, the program supports the SUS's strategic mission including its goals for supporting strategic priorities for a knowledge economy through STEM programs, undergraduate research, and research in collaboration with other state and private entities.

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 Florida Industrial and Phosphate Research Institute (FIPR Institute) is a legislatively created state research unit within Florida Polytechnic University. The program in environmental engineering will draw from this resource in several ways including, but not limited to research space, industry, academic, government and NGO relationships, faculty and researcher expertise, facilities, and so on. Since its inception (as the Florida Institute of Phosphate Research) in 1978, the FIPR Institute has grown and developed into a world-class research entity specializing in phosphate-related issues and industrial applied science and engineering. The FIPR Institute is focused on phosphate-related research, but since 2010 has also broadened its research program into non-phosphate topics such as energy and the mining and processing of minerals other than phosphate. The program will further support the FIRP Institute's efforts to continue broadening its program.

The program also leverages existing faculty expertise in mechanical and electrical engineering in both curricular and research capacities. The concentration in modern techniques in sustainability blends course content with these areas and provides fertile collaborative opportunities from faculty from multiple disciplines.

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.

Florida Poly's 2017 Work Plan submitted to the Board of Governors (approved by the BOT on June 8, 2017) identifies environmental engineering as one of the new programs for consideration in 2018-2020. Subsequent to this preliminary identification, faculty, staff, and administration collaborated with Hanover Research to conduct a market analysis of potential programs with, eventually, a specific focus on Environmental Engineering. The planning process follows the process outlined in FPU-5.0001AP New Degree Program

Planning and Approval.

Planning Process

Date	Participants	Planning Activity
June – Dec 2017	Provost, staff, department chairs, faculty and Hanover Research.	Market analysis of potential programs, internal assessment of ease of development and implementation from a resource, capacity, and planned growth standpoint.
Jan – April 2018	Mechanical Engineering Faculty, Graduate Division Director, Provost, Vice Provost, and Director of Florida Industrial and Phosphate Research Institute (FIRPI) and staff.	Broad development of program structure and features, analysis of need and demand, workforce impact, and development of pre-proposal for CAVP.
April – Dec 2018	Mechanical Engineering Faculty, Graduate Division Director, Provost, Vice Provost, and Director of Florida Industrial and Phosphate Research Institute (FIRPI) and staff.	Development of curriculum, courses, and preparation of request to offer program.

Events Leading to Implementation

Date	Implementation Activity
June 8, 2017	University Work Plan submitted to BOG
April 6, 2018	Pre-proposal submitted to CAVP coordinating group
May 22, 2018	University's Board of Trustees confers preliminary approval of program
Dec 13, 2018	University Undergraduate Curriculum Committee recommends approval of the program.
Jan 9, 2019	Approvals by Provost and President
Jan 16, 2019	University's Board of Trustees meets to decide whether to approve program.
Jan 31, 2019	Submission of materials to BOG for inclusion in State Degree Inventory
Fall 2019	Formally launch program with incoming admissions class.

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.

The University hosted two visits in October 2018, one from the Engineering Accreditation Commission of ABET and the other from the Computing Accreditation Commission of ABET. Programs reviewed include Computer, Electrical, and Mechanical Engineering (ABET-EAC) and Computer Science (ABET-CAC). No deficiencies were identified for any program (a barrier to achieving accreditation). Computer and Electrical Engineering incurred a weakness related to Program Educational Objectives (PEOs), which is being remedied during this spring while the program and Commission are still in the due process phase. Similarly, Computer Science had a weakness related to PEOs and one related to disaggregation of assessment results on some of its program outcomes. These weaknesses will be remedied and updated with ABET-CAC as part of the program's due process phase. The Mechanical Engineering program similarly incurred weaknesses associated with its PEOs. Additionally, weaknesses were found in the areas of continuous improvement and curriculum due to the significant recent overhaul of the curriculum and the relatively few graduates who have followed the new curriculum according to plan. Finally, the committee identified a weakness associated with laboratory access resulting from personnel shifts, which are on-track to be remedied this

spring. Realistically, the program can likely remove at least two of these weaknesses while still in due process.

These results reflect the judgment of the visiting committees, and not, except in the case of computer science, the draft statement issued from the Commission. Of the four programs, only Computer Science has received a complete draft statement and has responded within the 30-day timeframe. The program will provide an update of fall semester assessment and PEO changes in March, which will factor into the commission's meetings and decisions this summer. We anticipate the draft statement from ABET-EAC (for the three engineering programs) to arrive in mid to late January 2019.

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's student learning outcomes derive from ABET Criterion 3 for Student Outcomes and align with skills identified in the academic learning compacts as follows.

Student Learning Outcomes	Academic Learning Compact
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	Content
2. 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	Content
3. an ability to communicate effectively with a range of audiences	Communication
4. 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	Critical Thinking
5. 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	Communication
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	Content, Critical Thinking
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	Content

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

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

Graduation requirements may be found here:

http://catalog.floridapoly.edu/content.php?catoid=12&navoid=552#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 Bachelor of Science in Environmental Engineering requires 120 credit hours to complete. The program was designed according to the standards and structure common to all Florida Poly degrees.

University Undergraduate Program Curriculum Template— Environmental Engineering

Approved 4/7/2017 (updated 07/06/18)

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	Env. Eng.
I. Professional Foundations Core			**8**	**5**
		SLS 1106 - Professional Foundations (formerly First Year Experience)	**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 (requirement of Engineering and CS programs only).	**1**	**1**
		COP 2271C - Introduction to Computation and Programming (required for all programs)	**3**	**0**
		All but Professional Foundations may be distributed in categories below to allow for appropriate credit hour allocations.		
II. General Education		*State Required Minimum*	**36**	**37**
	Rules	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.		
	Section A	**Communication**	**6**	**6**
		ENC 1101 - English Composition 1: Expository and Argumentative Writing (W) ♦	**3**	**3**
		ENC 2210 - Technical Writing (W)	**3**	**3**
	Section B	**Humanities**	**3 to 6**	**6**
		ARH 2000 - Art Appreciation ♦	3	**3**
		PHI 2010 - Introduction to Philosophy ♦	3	
		HUM 2020 - Introduction to the Humanities ♦	3	**3**
		HUM 2022 Explorations in the Humanities (Special Topics)	3	
		IDS 2144 Legal, Ethical, and Management Issues in Technology	3	
	Section C	**Social Science**	**3 to 6**	**6**
		AMH 2010 - American History to 1877	3	

		AMH 2020 - American History Since 1877 (W) ♦ Satisfies Florida State Civics Requirement	3	**3**
		AMH 2930 - History: Special Topics	3	
		ECO 2013 - Principles of Macroeconomics (W) ♦	3	3
		ECO 2023 - Principles of Microeconomics (W)	3	
		PSY 2012 - General Psychology (W) ♦		
	Section D	**Mathematics**	**7**	**8**
		MAC 2311 - Analytic Geometry and Calculus 1 ♦	4	**4**
		MAC 2312 - Analytic Geometry and Calculus 2	4	**4**
		MAC 2313 - Analytic Geometry and Calculus 3	4	
		STA 2023 - Statistics 1 ♦	3	
		MAD 2104 - Discrete Mathematics	3	
		MAP 2302 - Differential Equations	3	
		MAC 1147 - Pre-calculus Algebra and Trigonometry	4	
	Section E	**Natural Sciences**	**8**	**8**
		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	
	Section F	**Open Inquiry**	**3**	**3**
		An additional 3 hours of general education coursework must be taken here.		
	***New**	ECO XXXX Engineering Economics	3	**3**
II. Program Foundations / Advanced Math & Science			**15**	**17**
		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."		
		MAC 2313 - Analytic Geometry and Calculus 3	4	**4**
		MAP 2302 - Differential Equation	3	**3**
		STA 3032 - Applied Statistics	3	**3**
		COP 2271C - Introduction to Computation and Programming (required for all programs)	**3**	**3**
		CHM 2046 General Chemistry II	3	**3**
		CHM 2046L General Chemistry II	1	1

III. Program Core			**40**	**42**
		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		***The following may be counted in this category instead:***		
	***New**	ENV 2110 - Intro to Environmental Engineering	**3**	**3**
	***New**	GIS 3043C GIS for Environmental Studies	**2**	**2**
		EGN 3311 - Engineering Mechanics - Statics	**3**	**3**
		PHY 2049 - Physics 2	**3**	**3**
		PHY 2049L - Physics 2 Lab	**1**	**1**
		EGN 2001C - Skills and Design I	**2**	**2**
	***New**	EGN 2250 Thermal & Fluids Engineering I	**3**	**3**
	***New**	ENV 3XXX Applied Environmental Research I	**2**	**2**
	***New**	ENV 3XXX Applied Environmental Research II	**2**	**2**
	***New**	ENV 3XXX - Environmental Chemistry	**3**	**3**
	***New**	ENV 4612C Sustainability in Engineering	**3**	**3**
	***New**	ENV 4XXX - Environmental Toxicology	**3**	**3**
	***New**	ENV 4310 - Hydrology/Hydraulics	**3**	**3**
	***New**	ENV 4101/21 – Fundamentals of Air Pollution Engineering and Control	**3**	**3**
	***New**	ENV 4351 - Solid & Hazardous Waste Management	3	3
	***New**	ENV 4514C - Water & Wastewater Treatment	3	3
IV. Concentration			**12**	**12**
		Concentrations should consist of no more than 12 credits. If other than "Advanced Topics," up to six credits may come from electives or courses in other concentrations.		
	Conc 1	**Water**	**12**	**12**
	***New**	EES 4201 Water Chemistry	3	**3**
	***New**	ENV 4340 Physicochemical Process in Environmental Engineering	3	**3**
	***New**	EES 4102 Wastewater Microbiology	3	**3**
	***New**	ENV 4561 Hydraulic Systems Design	3	**3**
	Conc 2	**Modern Techniques in Sustainability**	**12**	**12**
	***New**	ENV XXXX Green Process Design	3	3
	***New**	ENV XXXX Advanced Instrumentation for Environmental Analysis	3	3
	***New**	ENV XXXX Environmental Sensing	3	3
	***New**	ENV XXXX Environmental Sensor Informatics	3	3
V. Electives		The number of electives may be reduced to fill out the program core or meet institutional or state required general education requirements.	**6**	***3***
	***New**	ENV XXXX Sustainable Nanotechnology	3	3
	***New**	ENV XXXX Environmental Impacts of Power Generation	3	3
	***New**	ENV XXXX Data Analytics for Sustainable Systems	3	3
VI. Capstone			**6**	**4**
		All programs are required to have a 6 credit senior capstone sequence.		
	***New**	ENV 4XXX - Capstone I	2	**2**
	***New**	ENV 4XXX - Capstone II	2	**2**
TOTAL HOURS			**120**	**120**

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

The program's curriculum flowchart shows the recommended plan of study and takes into consideration the state requirement of 9 summer hours as an example of how that requirement may be met. Students do not need to take the 9 hours in the first summer to remain on-track.

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

The descriptions below include core, elective, and concentration courses for the program. As most of the courses are new, the descriptions reflect how they are listed at other programs in the SUS or other similar programs at comparable peer institutions.

GIS 3043C GIS for Environmental Studies 2 credits

UCF GIS 3043C - GIS for Environmental Studies - Geographic Information Systems (GIS) technology for environmental analysis. GIS theory with training using ArcGIS, including environmental analysis and practical examples. Similar to FIU CGN 4321 GIS Applications in Civil and Environmental Engineering. Introduction to the basics of geographic information systems and their applications in civil and environmental engineering, landscape architecture, and other related fields.

ENV 2110 Introduction to Environmental Engineering 3 credits

The application of basic principles and equations dealing with water, air, and solid and hazardous wastes; material and energy balances; and chemical and biochemical cycles. Topics include water resources, water quality and pollution, air quality and pollution, solid and hazardous wastes, and environmental legislation.

EGN 2250 Thermal and Fluids Engineering I 3 credits

Application of control volume balances of mass, momentum, energy and entropy in systems of practical importance to all engineers. Identification of control volumes, properties of pure materials, mass and energy conservation for closed and open systems, second law of thermodynamics, Bernoulli equation, fluid statics, forces and heat transfer in external and internal flows, conduction and radiative heat transfer.

ENV XXXX Applied Environmental Research I 2 credits

Students are involved in engineering projects throughout the university experience and have the opportunity to make meaningful impacts on a local or regional level. In the process, communication and writing skills are developed. Students have increasing responsibilities in the applied research sequence (AER1--> AER2--> Capstone 1 --> Capstone2); students must write technical reports and present results publicly.

EES 5207 Environmental Chemistry 3 credits

UF EES 5207 Survey of principles of chemistry with applications to water, emphasizing properties, composition, redox equilibria, and complexation; environmental organic chemistry; earth's atmosphere with emphasis on chemical composition, gaseous inorganic pollutants and oxides, and photochemical smog.

ENV 4612C Sustainability in Engineering 3 credits

FGCU ENV 4612C Sustainable practices are defined and green engineering principles are directed towards engineering design. Life cycle analyses are used to assess environmental, economic, and societal impacts to evaluate material choices, construction practices, water and waste treatment practices, transportation infrastructure, policy, and planning, agricultural practices, and energy generation and consumption.

EES 6406 Environmental Toxicology 3 credits

UF EES 6405 Effects of environmental toxicants on humans, animals, and the environment. Modified content appropriate for upper level undergraduate students.

ENV XXXX Applied Environmental Research II 2 credits

Students are involved in engineering projects throughout the university experience and have the opportunity to make meaningful impacts on a local or regional level. In the process, communication and writing skills are developed. Students have increasing responsibilities in the applied research sequence (AER1--> AER2--> Capstone 1 --> Capstone2); students must write technical reports and present results publicly.

ENV 4310 Applied Hydrology and Hydraulics 3 credits

Physical processes governing occurrence and distribution of precipitation, infiltration, evaporation, and surface water runoff. Statistical hydrology, unit hydrograph theory, and watershed modeling. Floodplain hydrology and open channel hydraulics. Urban hydrology, hydraulics and design of storm sewers, and design of detention structures for flood control.

ENV 4101/4121 Fundamentals of Air Pollution Engineering/Control Design 3 credits

Combines UF ENV 4101 Elements of Atmospheric Pollution and ENV 4121 Air Pollution Control Design. Sources, effects and regulation of air pollutants. Meteorology and dispersion of pollutants. Sampling and analysis of gaseous and particulate air pollutants. Photochemical air pollution and mobile sources. Principles of particulate and gaseous emission control; design and operation of particulate and gas control equipment to meet federal emission standards.

ENV XXXX Capstone I 2 credits

Open-ended design project in which students work in teams. Oral presentations and written reports cover

alternates considered, design assumptions, cost, safety, and feasibility. This is a communication-intensive course. Prerequisites: Senior status and at least two electives in one concentration.

ENV XXXX Capstone II 2 credits

Open-ended design project in which Senior students lead research teams. Oral presentations and written reports cover alternates considered, design assumptions, cost, safety, and feasibility. This is a communication-intensive course. Prerequisites: Capstone I.

ENV 4351 Solid and Hazardous Waste Management 3 credits

UF ENV 4351 Solid and Hazardous Waste Management - Generation of solid and hazardous wastes. Collection, methods, equipment, costs and disposal. Rules, regulations and management systems for proper control of solid and hazardous wastes. Evaluation of engineering systems to minimize costs and regulatory problems.

ENV 4514C Water and Wastewater Treatment 3 credits

UF ENV 4514C Design of water and wastewater treatment units.

ENG 4760 Engineering Economics 3 credits

The objective is to help engineering students recognize and understand the importance of cost factors that are inherent in all engineering decisions. Development of ability to handle engineering problems that involve economic factors. The course includes economic environment, selections in present economy, value analysis, critical path economy, interest and money-time relationships, depreciation and valuation, capital financing and budgeting, basic methods for undertaking economic studies, risk, uncertainty and sensitivity, selections between alternatives, fixed, increment, and sunk costs, the effects of income taxes in economic studies, replacement studies, minimum cost formulas, economic studies of public projects, economic studies in public utilities. Effects of inflation are considered at each step.

Water Concentration

EES 4201 Water Chemistry 3 credits

UF EES 4201 Kinetics and equilibrium of aqueous chemistry including acid-base, complexation, precipitation and redox equilibria.

ENV 4340 Physicochemical Processes in Environmental Engineering 3 credits

Physical and chemical processes governing water quality in natural and engineered systems with applications to potable water treatment. Topics include reactor dynamics, coagulation and flocculation, sedimentation, filtration, gas transfer, adsorption and ion exchange, and membrane processes. How to measure physicochemical process parameters, emphasizing experimental design, data evaluation, and report writing.

EES 4102 Wastewater Microbiology 3 credits

UF EES 4102 General concepts in microbiology and cell biology with major emphasis on the role of microorganisms in polluted environments.

ENV 4561 Hydraulic Systems Design 3 credits

UF ENV 4561 Hydraulic design of water distribution systems, wastewater collection and disposal systems, and water and wastewater treatment plants.

Modern Techniques in Sustainability Concentration (Options for Courses)

ENV XXXX Green Process Design 3 credits

Includes process analysis, green chemistry, waste prevention, pollution prevention; students are taught to critically analyze process flowsheets to determine critical control points, identify opportunities to prevent waste generation, identify recycling or reuse opportunities, and optimize economics.

ENV XXXX Sustainable Nanotechnology 3 credits

Intentional and unintentional impacts of nanotechnology on the environment.

ENV XXX Advanced Instrumentation for Environmental Analysis 3 credits

Use of modern instrumentation (including imaging, x-ray analysis, etc.) for environmental analysis.

ENV XXXX Data Analytics for Sustainable Systems 3 credits

The analysis of environmental data sets for sustainable design, planning and remediation.

ENV XXXX Environmental Sensing 3 credits

Current and coming technologies for environmental sensing and their use in sustainable design (including robotics, drones, remote sampling and testing, transmission).

ENV XXXX Environmental Sensor Informatics 3 credits

Modern data analysis for the interpretation of large networks of sensors for intelligent environmental monitoring and sustainable management of the environment.

ENV XXXX Environmental Impacts of Power Generation 3 credits

Renewable and non-renewable power generation; environmental impacts at local, regional and global levels; hazardous wastes; and sustainability.

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 university has developed curriculum advisory boards for each of its programs. These advisory boards consist entirely of industry and educational leaders in the specific fields of the program. For environmental engineering, a similar advisory board will be developed over the next one to two years as part of the program's plan to seek ABET accreditation at the earliest appropriate point (upon completion of its first graduate). The program curriculum and learning outcomes were developed explicitly to meet the criteria set forth by ABET for environmental engineering programs. The Program Educational Objectives were developed consistent with the ABET framework for PEOs and will be reviewed and approved upon organization of the program's curriculum advisory board.

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.

The university will seek ABET-EAC accreditation for the program at the earliest possible point (the program must graduate at least one student in the year under which it is being reviewed). The lead society supporting environmental engineering programs is the American Academy of Environmental Engineers and Scientists.

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 2 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 will be delivered in a traditional format, face-to-face setting, with courses administered on the main campus. In some upper-division courses, laboratory and research opportunities will be conducted at the FIPR Institute campus in Bartow, also face-to-face. In keeping with the University's strategic plan to offer some level of online delivery by 2023, the program will evaluate its course offerings to determine if that option best serves the quality outcomes of the program. The program does not require any specialized services or require greater than normal financial support for its delivery.

The University, through the Director of the FIPR Institute has communicated with Dr. Chang-Yu Wu, Department Head for Environmental Engineering at the University of Florida. This conversation included the possibility of collaborative student research projects: some FIPRI projects, some university projects (like technology park development), and others funded by grants proposed in tandem as student research teams participating in FIPR-based projects, regional or industry-driven projects. Discussion also included offering some of Poly's planned, unique courses online for UF students.

IX. Faculty Participation

A. Use Table 4 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).

As a framework for determining the appropriate number of faculty to serve the program, Florida Poly looks to three things: faculty to support the major, to cover classes, and a critical mass to cover the field. Existing faculty supporting the program include two full-time faculty in mechanical engineering with experience relevant to the field, the Director of the Florida Industrial Phosphate Research Institute, and a senior

researcher at FIPR Institute. Over the next five years, the program will add up to five new full-time faculty of rank.

B. Use Table 2 in Appendix A to display the costs and associated funding resources for existing and anticipated full-time faculty (as identified in Table 4 in 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.

All faculty funding comes from E&G. New hires will come from unallocated E&G funds, based on a recent appropriation of $4.8 million to grow programs and faculty.

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

CVs are provided in Appendix C.

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.

Faculty at Florida Poly typically teach a 3/3 load with service and research requirements to round out their full-time appointment. The following table reflects the SCH productivity for the two faculty in mechanical engineering.

Student Credit Hour Generated by Faculty

Program: Environmental Engineering	Fall 2017	Spring 2018	AY 2017-2018
Shedd, Timothy	126	264	390
Soltani, Seyed	240	354	594
Grand total (sum SCH)	**366**	**618**	**984**
Average SCH for program	**183**	**309**	**492**
Average Per Full Time Faculty	**238**	**243**	**456**

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 and 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 Masters and Bachelors programs in Computer, Electrical and Mechanical Engineering. Resources that directly support Florida Poly's current engineering programs will also directly support the proposed Environmental Engineering program. Current library resources include: AGRICOLA, Engineering Village (Inspec and Compendex), Elsevier's Science Direct, EBSC Engineering Core eBook collection, IEEE Electronic Library, and ProQuest's SciTech Premium Collection.

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

Civil Engineering and Environmental Systems (1998-present)
Environmental Engineering Science (2004-present)
Environment Systems & Decisions (1997-present)
Environmental Technology (1980-present)
Journal of Cleaner Production (2012-present)
Journal of Urban and Environmental Engineering (2007-present)
Journal of Environmental Quality
Environmental Geochemistry and Health
Environmental Microbiology
ES&T (Environmental Science and Technology
Industrial Wastewater
Journal of Freshwater Ecology
Journal of the Institute of Environmental Sciences and Technology
Journal of the Air and Waste Management Association
Journal of the Water Pollution Control Federation
Rangeland Ecology and Management
Soil Science Society of America Journal
Water Environment and Technology

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 2 in Appendix A. Please include the signature of the Library Director in Appendix B.

The Florida Poly library will seek to expand access to AGRICOLA (a bibliographic database produced by the National Agricultural Library consisting of journal articles, monographs, proceedings, theses, patents, translations, audiovisual materials and technical reports relating to agriculture and related fields) and establish access to the Agricultural & Environmental Science Database through ProQuest. The Agricultural & Environmental Science database includes AGRICOLA, Environmental Science and pollution management (ESPM) and Environmental impact statements (EIS) and provides full-text titles from scholarly journals, trade and industry journals, magazines, technical reports, conference proceedings, government publications, and more. The Agricultural & Environmental Science Database is available at a cost of $4500 annually.

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.

Existing classroom, laboratory, research, and office space within the Innovation, Science, and Technology (IST) building on the main campus is sufficient to handle a total enrollment of approximately 2000 students (by headcount). Plans are currently in progress to expand office space within the IST given the existing buildup of faculty (institutionally) that is planned and in progress for fall 2019 for all programs. The University is currently building an additional classroom and research building, the Applied Research Center, which should be online for 2021 – 2022 academic year. The additional 85,000 square foot facility will

provide research and teaching laboratories, classrooms, and office space to accommodate multiple programs. Instructional, research, and office programming is presently underway as part of the architectural planning for the building. However, current on-campus Florida Poly facilities are adequate to implement the proposed classroom lectures and deliver laboratory coursework, research space, and the offices of the anticipated new hire faculty members.

Existing classrooms are all fully equipped with computers, projector equipment, Clarus glass boards for presentation and writing, Panopto lecture capture, and other software. The typical classroom serves 48 students and the typical lab seats 24.

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 2 in Appendix A. Do not include costs for new construction because that information should be provided in response to X (E) below.

As noted above, existing space is available to support the increase in new programs, faculty, and students. Classroom space is sufficient through the foreseeable period and office space will have to be expanded, although plans are already in progress. Presently, Florida Poly has two physics labs, biology, and chemistry labs, plus additional wet and dry labs necessary to deliver natural science and engineering curricula. As we move to implement the proposed programs, the University is engaged in a full analysis of laboratory space and cross-utilization to ensure effective delivery of all curricular content. Capital outlay expressed in Table 2 mostly reflects standard consumable supplies and equipment to enable lab instruction operations.

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 2 in 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.

No capital expenditure is required for instructional or research space that is not already part of the University's campus master plan and currently funded. Thus I&R costs are, in part, for ongoing, consumable laboratory expenses as noted above. We have included a modest uptick in indirect costs associated with libraries and student support, although these costs are already a part of our enrollment growth plan.

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

Existing resources are sufficient to open and operate the program through years one and two with additional resources being brought online in year three. Existing laboratory space and equipment meets the needs of the incoming class for the next two years.

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 2 in Appendix A.

Project I&R costs include consideration for equipment to support laboratory needs in chemistry, hydrology, biochemistry and microbiology. A key benefit to launching this program alongside engineering physics that much of the equipment and costs associated with the natural sciences would support the environmental engineering program as well.

Additional laboratory and equipment needs also considered include instruments for astrophysics, applied

physics plasma laboratory, and appropriate radiologic technology. Total operating capital outlay in year five for environmental engineering is budgeted at $90,000.

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 2 in Appendix A.

Additional, special category funding shown on table two reflects non-recurring research startup costs for new faculty.

I. Describe fellowships, scholarships, and graduate assistantships to be allocated to the proposed program through Year 5. Include the projected costs in Table 2 in Appendix A.

There is no special funding associated with this program outside of the scholarships available to all incoming students. Costs as reflected in Appendix A assume the institution's discount rate as it is planned to reduce over time. For example, instead of revenue based on full tuition and fees, it is based on the current year's discount rate applied to that cost and subsequently at gradually lower rates over the five year's calculated.

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 Polytechnic University undergraduates are required to complete an internship as part of their graduation requirements. In the workplace, environmental engineers use the principles of engineering to develop solutions to environmental problems. Internship and employment opportunities will focus on efforts to improve recycling, waste disposal, public health, and pollution control. Companies that have attended our annual Career and Internship Fair and companies that have hired Florida Poly interns who will be interested in developing internship experiences for environmental engineers include:

- City of Lakeland
- City of Winter Haven
- Lakeland Regional Health
- Massey Services
- The Whiting Turner Construction Company

APPENDIX A

TABLE 1-A
PROJECTED HEADCOUNT FROM POTENTIAL SOURCES
(Baccalaureate Degree- Environmental Engineering Program)

Source of Students (Non-duplicated headcount in any given year)*	Year 1		Year 2		Year 3		Year 4		Year 5	
	HC	FTE	HC	FTE	HC	FTE	HC	FTE	HC	FTE
Upper-level students who are transferring from other majors within the university**	0	0	0	0	0	0	0	0	0	0
Students who initially entered the university as FTIC students and who are progressing from the lower to the upper level***	12	12	34	34	60	60	85	85	96	96
Florida College System transfers to the upper level***	0	0	0	0	6	3	6	3	6	3
Transfers to the upper level from other Florida colleges and universities***	0	0	0	0	6	3	6	3	6	3
Transfers from out of state colleges and universities***	0	0	0	0	8	4	8	4	8	4
Other (Explain)***	0	0	0	0	0	0	0	0	0	0
Totals	**12**	**12**	**34**	**34**	**80**	**70**	**105**	**95**	**116**	**106**

* 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
PROJECTED COSTS AND FUNDING SOURCES

Instruction & Research Costs (non-cumulative)	Year 1								Year 5						
	Funding Source							Subtotal columns 1+…+7	Funding Source						Subtotal columns 9+…+14
	Reallocated Base* (E&G)	Enrollment Growth (E&G)	New Recurring (E&G)	New Non-Recurring (E&G)	Contracts & Grants (C&G)	Philanthropy/ Endowments	Enterprise Auxiliary Funds		Continuing Base** (E&G)	New Enrollment Growth (E&G)	Other*** (E&G)	Contracts & Grants (C&G)	Philanthropy/ Endowments	Enterprise Auxiliary Funds	
Columns	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Faculty Salaries and Benefits	434,083	0	0	0	0	0	0	**$434,083**	738,976	0	0	0	0	0	**$738,976**
A & P Salaries and Benefits	0	0	0	0	0	0	0	**$0**	46,279	0	0	0	0	0	**$46,279**
USPS Salaries and Benefits	0	0	0	0	0	0	0	**$0**	0	0	0	0	0	0	**$0**
Other Personal Services	22,500	0	0	0	0	0	0	**$22,500**	51,784	0	0	0	0	0	**$51,784**
Assistantships & Fellowships	0	0	0	0	0	0	0	**$0**	0	0	0	0	0	0	**$0**
Library	0	0	0	0	0	0	0	**$0**	0	0	0	0	0	0	**$0**
Expenses	45,500	0	0	0	0	0	0	**$45,500**	73,100	0	0	0	0	0	**$73,100**
Operating Capital Outlay	90,000	0	0	0	0	0	0	**$90,000**	90,000	0	0	0	0	0	**$90,000**
Special Categories	50,192	0	0	0	0	0	0	**$50,192**	60,336	0	0	0	0	0	**$60,336**
Total Costs	**$642,275**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$642,275**	**$1,060,475**	**$0**	**$0**	**$0**	**$0**	**$0**	**$1,060,475**

*Identify reallocation sources in Table 3.

**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)	3.00	6.00
A & P (FTE)	0	0.6
USPS (FTE)	3	6.5

Calculated Cost per Student FTE

	Year 1	Year 5
Total E&G Funding	$642,275	$1,060,475
Annual Student FTE	12	116
E&G Cost per FTE	$53,523	$9,142

Table 2 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 3 – 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 of 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.
Subtotal columns 1+…+7	8	Subtotal of values included in columns 1 through 7.
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.
Subtotal columns 9+…+14	15	Subtotal of values included in columns 9 through 14.

APPENDIX A

TABLE 3
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
Academic Affairs - Faculty Lines	0	0	**$0**
	0	0	
	0	0	
	0	0	
	0	0	
	0	0	
Totals	$0	$0	**$0**

*** If not reallocating funds, please submit a zeroed Table 3**

APPENDIX A

TABLE 4

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	Tim Shedd, Ph.D.	Asst. Prof.	MYA	Fall 2019	12	1.00	0.25	0.25	12	1.00	0.25	0.25
	Mechanical Engineering											
A	Seyed Soltani, Ph.D.	Professor	MYA	Fall 2019	9	0.75	0.25	0.19	9	0.75	0.25	0.19
	Mechanical Engineering											
A	Brian Birky, Ph.D.	Research	MYA	Fall 2019	12	1.00	0.20	0.20	12	1.00	0.20	0.20
	Health Physics, FIPR Dir.											
A	Patrick Zhang	Research	MYA	Fall 2019	12	1.00	0.20	0.20	12	1.00	0.20	0.20
	Metallurgical Engineering											
C	New Hire, Ph.D.	Professor	MYA	Fall 2019	9	0.75	0.75	0.56	9	0.75	1.00	0.75
	Environmental Engineering											
C	New Hire, Ph.D.	Asst. Prof.	MYA	Fall 2019	9	0.75	0.75	0.56	9	0.75	1.00	0.75
	Environmental Engineering											
C	New Hire, Ph.D.	Assoc. Prof	MYA	Fall 2020	9	0.75	1.00	0.75	9	0.75	1.00	0.75
	Environmental Engineering											
C	New Hire, Ph.D.	Asst. Prof.	MYA	Fall 2021	0	0.00	0.00	0.00	9	0.75	1.00	0.75
	Environmental Engineering											
	New Hire, Ph.D.	Asst. Prof.	MYA	Fall 2021	0	0.00	0.00	0.00	9	0.75	1.00	0.75
	Environmental Engineering											
C	New Hire, Ph.D.	Asst. Prof.	MYA	Fall 2021	0	0.00	0.00	0.00	9	0.75	1.00	0.75
	Environmental Engineering											
	Total Person-Years (PY)							**2.71**				**5.34**

Faculty Code		Source of Funding	PY Workload by Budget Classification Year 1	Year 5
A	Existing faculty on a regular line	Current Education & General Revenue	0.84	0.84
B	New faculty to be hired on a vacant line	Current Education & General Revenue	1.88	4.50
C	New faculty to be hired on a new line	New Education & General Revenue	0.00	0.00
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
		Overall Totals for **Year 1**	**2.71**	**Year 5** **5.34**

APPENDIX B

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

Signature of Equal Opportunity Officer	**Date**
Signature of Library Director	**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: Faculty

The following faculty CVs are included in this appendix:

- Dr. Brian Birky, Executive Director, Florida Industrial and Phosphate Research Institute (FIPR)
- Dr. Tim Shedd, Associated Professor, Mechanical Engineering, and Director of the Graduate Division
- Dr. Seyed Soltani, Assistant Professor, Mechanical Engineering
- Dr. Jinrong "Patrick" Zhang, Research Director, Florida Industrial and Phosphate Research Institute (FIPR)

CURRICULUM VITAE

BRIAN KENT BIRKY

BUSINESS ADDRESS: 855 W. MAIN ST. BARTOW, FL 33830-7718
PHONE: (863) 534-7160
FAX: (863) 534-7165
EMAIL:bbirky@floridapoly.edu

AREAS OF INTEREST

Administration, public and environmental health, STEM education, mining, ore processing, sustainability, comprehensive extraction of resources, and industrial waste minimization.

ACADEMIC TRAINING

University	Location	Degree - Year
Univ. of Florida	Gainesville, FL	Ph.D. in Health Physics – 1997
Univ. of Florida	Gainesville, FL	M.S. in Health Physics – 1990
Univ. of Florida	Gainesville, FL	B.S. in Zoology - 1980

Experience

Position

- Executive Director –Florida Industrial and Phosphate Research Institute (FIPR), Florida Polytechnic University (2013 – present)

Duties

- Management of the Institute, including budget, short and long-term strategic planning, and personnel matters. Design and implement strategies to enhance revenue.
- Oversight of all research and information functions of the Institute.
- Provide technical assistance and information to members of the Florida House, Senate, and the U.S. Congress.
- Act as liaison to domestic and international organizations such as The Fertilizer Institute (TFI), Florida Department of Health – Bureau of Radiation Control (FDOH- BRC), Florida Department of Environmental Protection (FDEP), U.S. Environmental Protection Agency (USEPA), International Atomic Energy Agency (IAEA), OECD – Nuclear Energy Agency (NEA), International Fertilizer Industry Association (IFA), and others. This involves worldwide travel in diverse cultures.

Major Accomplishments

- Secured additional funding for the Institute by directing improvements in the metallurgical and analytical laboratories. Improvements in equipment, procedures, QA/QC, and personnel were implemented by staff. I was then able to negotiate contracts for significant additional funds.
- Fostered collaboration with institutions classified as RU/VH in the Carnegie Classification of Institutions of Higher Education and members of the Association of American Universities. Currently collaborating with 5 qualifying universities (Brown, Rutgers, Purdue, UC Davis, and Iowa State) under a $120 million US Department of Energy project headed by The Ames Laboratory. FIPR also works closely with Oak Ridge National Laboratory on this project.

Position

- Executive Director –Florida Industrial and Phosphate Research Institute (FIPR), University of South Florida Polytechnic (2011 – 2013)

Duties

- The same as the current position described above. Major Accomplishments

- Spearheaded a successful international initiative to increase awareness of evidence- based regulatory practice as an alternative to reliance on overprotective modeled scenarios. This represents a paradigm shift impacting the entire radiation protection community. The evidence-based approach has been formally adopted by the International Atomic Energy Agency (IAEA) and

was introduced into the formal proceedings of the International Radiation Protection Association (IRPA).

Position

- Public & Environmental Health Research Director – FIPR (2000 – 2011). This is a faculty position within the university.

Duties

- Critically review proposals submitted to the Institute by universities or reputable private engineering firms in terms of pertinence to the Institute research priorities, qualifications of research staffs and facilities, adequacy of the methodologies as described, economic feasibility of the proposed processes or devices, likelihood of project success, and appropriateness of project budgets and timetables. Deliver comments designed to improve research methodology or data analysis for projects in all research areas.
- Provide unbiased and factual information about each proposal addressing the Public and Environmental Health research area to the Institute Board of Directors in the form of a Staff Proposal Analysis and a presentation at a public Board meeting.
- Manage funded research contracts by monitoring progress according to the project timeline, reviewing invoices and making payment decisions, and discussing technical and managerial aspects of the projects with investigators. Project oversight includes managing conflicts within a research team, troubleshooting technical problems, and making modifications to the scope or implementation of the research plan as needed.
- Review final research drafts and incorporate comments generated via review by outside experts prior to acceptance as a FIPR Institute publication. Participate in authorship of articles for publication in peer-reviewed journals.
- Organize technical conferences including both logistics and scientific agendas.
- Manage the Institute's Technology Transfer Program with an emphasis on multimedia techniques designed to put research results in the hands of industry personnel and other experts in a position to apply those findings, as well as to translate technical research into non-technical language for a wider audience such as K-12 teachers and students, and interested members of the public.
- Supervise the Institute's IT program and staff. Oversee the Institute's Information Technology (IT) initiative by chairing the Computer Committee that makes recommendations and decisions about network design, hardware and software purchases, and communications.

Major Accomplishments

- Managed a project to gain acceptance of phosphogypsum, which is calcium sulfate that contains a trace amount of naturally occurring radioactive materials, as an item of commerce rather than a de facto waste. The project has been more successful internationally than domestically, with regulatory acceptance of phosphogypsum for a variety of uses such as agriculture and construction. The result is that billions of tons of "waste" with no value will become a "co-product" with commercial value.
- Served on doctoral committees for two students who successfully defended their dissertations. As part of any educational institution, whether in a teaching or research position, it is important to mentor the next generation of scientists. I have also worked with several award-winning science fair competitors in the K-12 school system.

Position

- Senior Health Physicist - Applied Environmental Consulting, Inc. (1996-Present) Duties
- Current duties are restricted to license applications, ALARA reviews, and other radiological license activities for non-phosphate industries, and training in the safe use and relocation of nuclear density gauges across all industries.
- Consulting health physicist specializing in dose assessment from technologically enhanced natural radioactivity, measurement of low-level radioactivity in a wide variety of environmental media, modeling of the atmospheric dispersion of radioactive materials, and review of procedures and protocols for facilities utilizing radionuclides and radiation-emitting devices. Consultant to federal agencies, industries, utilities, as well as engineering and consulting firms.
- A partial listing of previous clients includes Tampa Electric Company (TECO), IMC Agrico, Inc., Cargill Fertilizer, Inc., Sequoyah Fuels Facility, Amglo Kemlite Laboratories, Inc., CH2M Hill, Inc., RGC Mineral Sands, Inc., and Thiele Kaolin, Inc.

Major Accomplishments

- Edited and co-authored the "Handbook of Health Physics and Radiological Health," a compilation of data, charts and descriptions used in the radiation protection and medical fields.
- Managed and authored a comprehensive and benchmark study of Technologically Enhanced Naturally Occurring Radioactive Materials (TENORM) and radiation doses in the Florida phosphate industry.

Position

- Senior Associate - Environmental Radiation Group (1992-2000) Duties
- Consulting health physicist specializing in radiation dose reconstruction, and determination of population distributions around

commercial nuclear and DOE facilities using computer technology. Consultant to federal agencies, industries, utilities, as well as engineering and consulting firms.

- Project leader for Florida Power Corporation, Florida Power & Light Corp., and General Electric Largo Plant - determined the population distribution within sector- segments delineated around power reactor and defense plants using TIGER/LINE and PL-171 data from U.S. Bureau of the Census databases in conjunction with GIS mapping software, and projected future populations using state-specific growth rates.
- A partial listing of clients includes Cargill Fertilizer, Inc., Florida Power and Light Corp., Florida Power Corp., General Electric, and Kevin S. Hannon, Esq.

Major Accomplishments

- Pioneered a new method for determination of populations by compass direction and distance around facilities that could potentially release hazardous materials. The method includes the capability to project future populations and account for uncertainties in the model. The method was coupled with a queuing model to provide evacuation routes and evacuation time estimates for all of Florida's nuclear power plants.

Position

- Graduate Teaching/Research Assistant – University of Florida, Department of Environmental Engineering Sciences (1990-1993)

Duties

- Taught "Radiation Dosimetry" at the graduate level in 1991 and 1993. Topics included quantities and units pertaining to radiation and radioactivity such as activity, specific activity, source strength, fluence, energy fluence, flux, flux density, exposure, absorbed dose, linear energy transfer (LET), quality factor, and dose equivalent with traditional and SI units and special units; external photon irradiation emphasizing source-receptor geometries with derivation of point, line, disk, and extended sources, specific gamma-ray exposure constants, and dose conversions for isotropic and parallel beams incident upon anthropomorphic phantoms in all geometries; external beta irradiation with dose calculations of Loevinger, Moe, and others including the computer code VARSKIN2; interaction of heavy charged particles with tissue; neutron interactions with tissue according to incident energies and relative dose contributions due to elastic and inelastic scattering and capture reactions; KERMA concept and calculations; internal dose methodologies of the ICRP for radiation protection and MIRD for medical physics with computer exercises using MIRDOSE2 and CINDY; derivation and calculation of committed dose equivalent, effective dose equivalent, and committed effective dose equivalent; collective dose to populations; bone dosimetry; accident dosimetry, and microdosimetry.
- Taught specific subjects in "Health Physics" involving: scientific and standard- setting organizations, e.g., the IAEA, ICRP, NCRP, EPA, NRC, DOE, DOT, MHSA, ANSI, NAS, NAS-BEIR, and other international, state, and local agencies; regulatory limits for radiation workers (whole body, partial body, minors, pregnant women/embryo and fetus) and the general public considered individually and collectively; secondary standards and derived limits, e.g., maximum permissible body burden, maximum permissible air and water concentrations, allowable limit on intake, and derived air concentration; dosimetry; dose indices related to the ICRU spherical phantom; Bragg-Gray principle; *in vivo* and *in vitro* bioassay; respiratory protection, i.e., types of equipment, fitting, uses, and protection factors; survey and sampling techniques and devices for detecting and quantifying deposited and suspended alpha, beta, gamma, and neutron-emitting radionuclides; and protocols and procedures for accidents and emergencies, i.e., priorities of action in the event of an emergency, dose limits for planned actions related to an emergency situation, recommended limits for life saving actions, medical management and associated priorities, facility and government response plans, and reporting requirements.
- Project participant with Post, Buckley, Schuh, & Jernigan, Inc. - conducted the dose assessment due to ingestion of radioactivity in foods grown on mined lands by modeling intakes of three classifications of hypothetical individuals using measured activity concentrations in edible portions of plants coupled with FDA dietary consumption quantities for average consumers and published dose conversion factors for unit intakes.
- Project manager of a grant from the Centers for Disease Control and Prevention (CDC) - co-authored the proposal funded by this organization. Served as project manager for all tasks: determination of uncertainties in lung dosimetry modeling, tabulation of and uncertainties in bioaccumulation factors, and GIS techniques and uncertainties.

Major Accomplishments

- Managed a federal research grant and brought the project in on time and under budget.
- Organized an international workshop on an internal dosimetry code for Pacific Northwest National Laboratory.

Position

- Research Technician - U.S. Dept. of Agriculture, Agricultural Research Service (1986- 1988)

Duties

- Research duties in the Genetics Section of the Medical and Veterinary Entomology Laboratory included the isolation and characterization of spontaneous and induced mutations, the induction of chromosomal aberrations using ionizing radiation,

and the study of insect dispersal patterns using radioisotope tracers. Assisted in radiation protection including personnel monitoring, laboratory surveys, source leak testing, and radioactive and hazardous mixed waste disposal. Taught dissection, tissue fixation and staining, slide preparation, and subsequent metaphase meiotic chromosome recognition or polytene chromosome banding pattern sequences to International Atomic Energy Agency (IAEA) students and University of Florida graduate students studying genetics.

Major Accomplishments

- Created a genetic sexing strain of *Aedes taeniorhynchus*. Isolated and mapped a single gene for malathion resistance, developed a resistant strain, and created a genetic translocation to link the resistance gene to male sex. In that way, larvae are treated to retain only the males for a sterile release program, thus saving half the cost of rearing the insects.

Position

- Biological Scientist - Department of Entomology and Nematology, University of Florida (1980-1986)

Duties

- Research duties as a Biological Scientist were similar to those of the preceding job description.

Major Accomplishments

- Isolated and mapped several new mutations in *Stomoxys calcitrans* (a biting fly of commercial interest) and *Anopheles quadrimaculatus* (a potential vector of malaria).

PROFESSIONAL AFFILIATIONS

Plenary Member - Health Physics Society
Member and Past President – Florida Chapter of the Health Physics Society Technical Advisory Group - FL Center for Solid and Hazardous Waste Management Advisory Council - Center for Biological Control, FAMU-CESTA
Technical Consultant – International Atomic Energy Agency
Convener – Radiation Task Force, International Fertilizer Industry Association Scientific reviewer for Elsevier: *Annals of Nuclear Energy*
Scientific reviewer for journal: *Environmental Monitoring and Assessment*
Advisory Council on Radiation Protection, State of Florida

PUBLICATIONS AND PRESENTATIONS

Chih-Hsiang Chien, Alex Theodore, Chang-Yu Wu, Yu-Mei Hsu, and Brian Birky. “Development of a Thoracic Personal Sampler System for Co-Sampling of Sulfuric Acid Mist and Sulfur Dioxide Gas.” 2016 American Association for Aerosol Research (AAAR) Conference. Portland, OR. October 17-21, 2016. Abstract accepted.

Chih-Hsiang Chien, Alex Theodore, Chang-Yu Wu, Yu-Mei Hsu, and Brian Birky. "Upon Correlating Diameters Measured by Optical Particle Counters and Aerodynamic Particle Sizer." Journal of Aerosol Science. Paper accepted.

Birky, B. “Phosphorus and Phosphates” in the Handbook of Industrial Chemistry and Biotechnology, 13th edition. Editor: Tilak Bommaraju. Springer. In press.

Birky, B. “Phosphate Show and Tell” Presentation to Leadership Bartow. March 17, 2016.

Birky, B. “Phosphate Mining and Processing - A Sustainable Practice?” Environmental Engineering Grand Challenges Seminar. Department of Environmental Engineering Sciences, Engineering School of Sustainable Infrastructure & Environment, University of Florida. January 29, 2016.

Birky, B. “Phosphate 101” Presentation to Leadership Polk. January 28, 2016.

Birky, B., Contributor and Co-editor. “Phosphogypsum - Sustainable Management and Use.” A Report for IFA Members. AE “Johnny” Johnston, General Editor. International Fertilizer Industry Association, Paris. January, 2016.

Birky, B. “Innovation in Beneficiation – Value from Low Grade Ores, Tailings, Residues and Wastes.” IAEA Leadership Academy in Sustainable Uranium and Critical Materials from Phosphates and Other Sources. Nanchang, China. August 24-28.

Birky, B. “Constructive Regulation of and Beneficial Linkages between NORM Industries.” IAEA Leadership Academy in Sustainable Uranium and Critical Materials from Phosphates and Other Sources. Nanchang, China. August 24-28.

Chih-Hsiang Chien, Alex Theodore, Chang-Yu Wu, Yu-Mei Hsu, and Brian Birky. “Comparison of the Grimm 11-R Mini Laser Aerosol Spectrometer to the TSI 3321 Aerodynamic Particle Sizer.” Poster. 2015 American Association for Aerosol Research (AAAR) Conference. Minneapolis, Minnesota. October 12-16, 2015.

Birky, B. "Innovation – Dealing with Low Grades and Wastes." Presentation at the IAEA Consultancy Meeting: Preparing a technical report on comprehensive extraction of uranium and associated elements from phosphates. Vienna, Austria. June 8 – 12, 2015.

Chih-Hsiang Chien, Lin Shou, Alex Theodore, Chang-Yu Wu, Yu-Mei Hsu, and Brian Birky. "Development and Validation of a New Personal Sampler for Monitoring Inorganic Acid Mist and Gases." Submitted to American Industrial Hygiene Conference & Exposition (AIHce). May 30 –June 4, 2015.

Nils Haneklaus[1], Rolando Reyes[2], Wendy G. Lim[2], Estrellita U. Tabora[2], Botvinnik L. Palattao[2], Christina Petrache[2], Edmundo P. Vargas[2], Kazuhiko Kunitomi[3], Hirofumi Ohashi[3], Nariaki Sakaba[3], Hiroyuki Sato[3], Minoru Goto[3], Xing Yan[3], Tetsuo Nishihara[3], Harikrishnan Tulsidas[4], Frederik Reitsma[4], Sandor Tarjan[5], Karthikkeyan Sathrugnan[5], Radojko Jacimovic[6], Nahhar Al Khaledi[7], Ewald Schnug[8], Brian K. Birky, Per F. Peterson[1]. "Energy neutral phosphate fertilizer production using high temperature reactors - a Philippine case study. Philippine Journal of Science. June, 2015.

[1]University of California, Department of Nuclear Engineering, 4118 Etcheverry Hall, Berkeley, CA 94720-1730, USA

[2]Department of Science and Technology - Philippine Nuclear Research Institute, Nuclear Materials Research, Commonwealth Avenue, Diliman, Quezon City 1101, Philippines

[3]Japan Atomic Energy Agency, Nuclear Hydrogen and Heat Application Research Center, 4002 Narita-cho, Oarai-machi, Higashi-ibaraki-gun, Ibaraki 311-1393, Japan

[4]International Atomic Energy Agency, Division of Nuclear Power, VIC, PO Box 100, 1400 Vienna, Austria

[5]International Atomic Energy Agency, Terrestrial Environment Laboratory, 2444 Seibersdorf, Austria

[6]Jožef Stefan Institute, Jamova cesta 39, 1000 Ljubljana, Slovenia

[7]Radiation Protection Department, Mubarak Al Kabir Street, PO Box 16087, 35851 Qadeseyah, Kuwait

[8]Braunschweig University of Technology, Department of Life Sciences, Pockelstraße 14, 38106 Braunschweig, Germany

Birky, B. and Albarelli, G. "The Emergence of Phosphogypsum in Global Commerce." Global SynGyp Symposium, Chicago. April 20-21, 2015.

Chih-Hsiang Chien, Lin Shou, Alex Theodore, Chang-Yu Wu, Yu-Mei Hsu, and Brian Birky. "Evaluation of aerosol penetration through a respirable personal parallel impactor." Submitted poster to PPI 2015 Poster Symposium. March 10, 2015.

Chih-Hsiang Chien, Lin Shou, Alex Theodore, Chang-Yu Wu, Yu-Mei Hsu, and Brian Birky. "A Novel Personal Sampler Design for Measuring Inorganic Acid Mist and Gases." Abstract submitted to the Association of Environmental Engineering and Science Professors (AEESP) conference. February 27, 2015.

Chih-Hsiang Chien, Lin Shou, Alex Theodore, Chang-Yu Wu, Yu-Mei Hsu, and Brian Birky. "Development and Validation of a New Personal Sampler for Monitoring Inorganic Acid Mist and Gases." Submitted abstract for 2015 AIHA meeting. September 22, 2014.

Chih-Hsiang Chien, Lin Shou, Alex Theodore, Chang-Yu Wu, Yu-Mei Hsu, and Brian Birky. "A New Personal Sampler for Measuring Inorganic Acid Mist and Gases: the Validation Test." 2014 International Aerosol Conference, Busan, Korea. Aug. 28 – Sep. 2, 2014.

Chih-Hsiang Chien, Lin Shou, Alex Theodore, Chang-Yu Wu, Yu-Mei Hsu, and Brian Birky. "Performance Characterization of a New Personal Sampler for Measuring Inorganic Acid Mist and Gases." 2014 International Aerosol Conference, Busan, Korea. Aug. 28 – Sep. 2, 2014.

Birky, B. and Albarelli, G. "Life Cycle Management of Phosphogypsum Stacks." International Fertiliser Society, London. July 2-3, 2014.

Chih-Hsiang Chien[1], Lin Shou[1], Alex Theodore[1], Chang-Yu Wu[1], Yu-Mei Hsu[2], and Brian Birky. "Validation Testing a New Personal Thoracic Sampler." The Air & Waste Management Association's 107th Annual Conference and Exhibition. June 24-27, 2014.

[1]Department of Environmental Engineering Sciences, Engineering School of Sustainable Infrastructure and Environment, University of Florida, Gainesville, FL, 32611-6450, USA.

[2]Wood Buffalo Environmental Association, Alberta T9K 1Y1, Canada

Zhang, J. and Birky, B. "Uranium and REE Recovery from Florida Phosphates – Looking Back and Going Forward." International Symposium on Uranium Raw Material for the Nuclear Fuel Cycle (URAM), Vienna, Austria. June 23-27, 2014.

N. Haneklaus[a,f], F. Reitsma[a], H. Tulsidas[a], B. Tyobeka[b], E. Schnug[c], H.-J. Allelein[d], B. Birky, P. F. Peterson[e], G. Dyck[a], T. Koshy[a]. "Using high temperature reactors for energy neutral mineral development processes - a proposed IAEA Coordinated Research Project." International Symposium on Uranium Raw Material for the Nuclear Fuel Cycle (URAM), Vienna, Austria. June 23-27, 2014.

[a]International Atomic Energy Agency, Vienna, Austria
[b]National Nuclear Regulator, Centurion, Republic of South Africa
[c]Technical University Braunschweig, Braunschweig, Germany
[d]Forschungszentrum Jülich/RWTH Aachen Jülich, Germany/Aachen, Germany
[e]University of California, Berkeley, CA, United States of America

Birky, B. "Phosphogypsum Valorization and Water Consequences." Presentation to Florida Association of Water Quality Control. June 11, 2014.

Hsing-Wang Li[a], Nima Afshar-Mohajer[a],Chang-Yu Wu[a]*, Jean-Claude J. Bonzongo[a],Vito A. Ilacqua[b], Yongsuk Choi[a], and Brian Birky. "Impacts of Hazardous Air Pollutants Emitted from Phosphate Fertilizer Production Plants on their Ambient Concentration Levels in the Tampa Bay Area." Paper submitted to "Air Quality, Atmosphere & Health." May 2014.

[a]Department of Environmental Engineering Sciences, University of Florida, Gainesville, FL
[b]National Center for Environmental Research, US Environmental Protection Agency, Washington, DC

Birky, B. Convenor and presenter. Presentation: "Overview of Industrial NORM in the USA with Emphasis on the Phosphate Industry." IFA NORM Task Force, Istanbul. September 26-28, 2013.

Lin Shou[a], Danielle Hall[a], Yu-Mei Hsu[b], Alex Theodore[a], Chang-Yu Wu[a], and Brian Birky. "Development of a Personal Sampler for Simultaneous Sampling of Gases and Aerosols." Paper submitted to "Annals of Occupational Hygiene." September 2013.

[a]Department of Environmental Engineering Sciences, University of Florida, Florida, USA
[b]Wood Buffalo Environment Association, Alberta, Canada

Birky, B. and Foxen S. Update of "Radiation in the Phosphate Industry." Set of 3 DVDs divided into 15 Lessons. FIPR Institute. 2013.

International Atomic Energy Agency (IAEA). "Safety Reports Series No. 78 Radiation Protection and Management of NORM Residues in the Phosphate Industry," Vienna, 2013 (B. Birky acknowledged as key contributor).

Birky, B. "Overview of Industrial NORM in the USA with Emphasis on the Phosphate Industry," 7th International Symposium on Naturally Occurring Radioactive Materials (NORM), Beijing, April 2013.

Hilton, J., Birky, B., and Moussaid, M. "Comprehensive Extraction, a Key Requirement for Social Licensing of NORM Industries?," 7th International Symposium on Naturally Occurring Radioactive Materials (NORM), Beijing, April 2013.

Johnson, T. and Birky, B. "Health Physics and Radiological Health - Fourth Edition." Lippincott Williams & Wilkins. December 2011.

Shou, L., Theodore, A., Wu, C.Y., Hsu, Y.M. and Birky, B. "Development and Laboratory Evaluation of a Novel Porous Membrane Denuder," AAAR 30th Annual Conference, Orlando, FL, October 3-7, 2011.

Li, H.W., Afshar-Mohajer, N., Wu, C.Y., and Birky, B. "Impact of Hazardous Air Pollutants Emitted from Phosphate Fertilizer Production Plants on their Ambient Concentration Levels in Tampa Bay Area," AAAR 30th Annual Conference, Orlando, FL, October 3-7, 2011.

Birky, B., International Atomic Energy Agency Technical Meeting: Uranium Production from Phosphate Rocks. "Radiation Safety: considerations and good practices." September 26-30, 2011.

Birky, B., "Natural Radioactivity and Public Health in the Florida Phosphate Mining Region," EPA State of the Science on Phosphate Mining and the Environment, Charlotte Harbor Event Center, Punta Gorda FL, March 29, 2011.

Birky, B., "Radiation in the phosphate mining environment," US Army Corps of Engineers Phosphate Mining Workshop, Lakeland, FL, USA, October 6-7, 2010.

Birky,B.,"Phosphogypsum use in road construction and environmental monitoring," IAEA Technical Meeting, Vienna,

Austria, September 27 – October 1, 2010.

Hilton, J., Moussaid, M. and Birky, B. A Twelve Point Consultation Paper for Strengthening and Sustaining the Professional Radiation Protection Community in Africa. "Capacity-building for the radiation protection dividend," AFRIRPA2010, Nairobi, Kenya, September 13-17, 2010.

Birky, B., "Natural radioactivity in the phosphate industry," Florida Association for Water Quality Control, Naples, FL, USA, June 9, 2010.

Simmons, C., Presented by Birky, B., "Legal aspects of NORM/TENORM regulation in the United States," Invited Presentation, 6th International Symposium on Naturally Occurring Radioactive Material (NORM VI), Marrakech, Morocco, March 22-26, 2010.

Hilton, J., Birky, B., Bouabdelaoui, Y., Johnston, J., Moussaid, M. and Stana R., "Towards an evidence-based score-card for aligning risk management and sustainability goals for essential NORM industries: case study - phosphates," 6th International Symposium on Naturally Occurring Radioactive Material (NORM VI), Marrakech, Morocco, March 22-26, 2010.

Birky, B., Hilton, J., Moussaid, M. and Warren, B., "A NORM-specific approach to education and training needs in NORM industries," 6th International Symposium on Naturally Occurring Radioactive Material (NORM VI), Marrakech, Morocco, March 22- 26, 2010.

Birky, B., "Phosphogypsum use in road construction," 6th International Symposium on Naturally Occurring Radioactive Material (NORM VI), Workshop on Phosphogypsum Management & Uses, Marrakech, Morocco, March 25, 2010.

Birky, B., Hilton, J., "Safety, radiation protection and management of radioactive wastes in the phosphate industry, the three layer conceptual model," 6th International Symposium on Naturally Occurring Radioactive Material (NORM VI), Workshop on Phosphogypsum Management & Uses, Marrakech, Morocco, March 25, 2010.

Birky, B. Phosphate "Summit" Meeting: Sustainable Management of the Global Phosphate Resource, Farmer's Club, London, UK, February 16, 2010.

Birky, B., "Phosphogypsum use in road construction," Phosphogypsum Working Group (PGWG), and co-contributor to "Progress Report (1) from the Steering Committee, November 2009, Including Conclusions from the PG Consultation Meeting," IAEA, Vienna, Austria, November 16-20, 2009

Birky, B., Hilton, J., Moussaid, M., and Stana, R. "Uranium and Phosphorus: A Cooperative Game for Critical Elements in Energy and Food Security," Technical Meeting on Uranium from Unconventional Resources, IAEA, Vienna, 4-6 November 2009.

Birky, B. "Phosphogypsum Use in Roads, Construction, and Landfills," Institute of Process Engineering, Beijing, China, 21 October 2009.

Birky, B. "Phosphate Mining and Natural Radioactivity," Manatee County Citizens Advisory Panel. March 2009.

Hilton, J., Birky, B. and Johnston, J., "The constructive regulation of phosphates and phosphogypsum – A new, evidence-based approach to regulating a NORM industry vital to the global community," Proceedings, IRPA 12, Buenos Aires, Argentina, October 2008.

Birky, B. "Inhalation Dose Assessments in NORM Industries," Invited seminar for professional education credit, IRPA 12, Buenos Aires, Argentina, October 2008.

Birky, B. "Towards a consistent and coherent, "three layer" evidence-based PG regulatory model," Phosphate Industry Group on Use of NORM Residues, IAEA, Vienna, July 2008.

Birky, B. "Phosphogypsum Use in Road Construction in the USA," Phosphate Industry Group on Use of NORM Residues, IAEA, Vienna, 14 July 2008.

Birky, B. "Global Uranium Supply/Demand Projections and the Impact on Florida," Florida Chapter of the Health Physics Society, Spring Meeting 2008.

Hsu, Y. M., Wu, C. Y., Lundgren, D. and Birky, B., "Minimization of Artifacts in Sulfuric Acid Mist Measurement Using NIOSH Method 7903," submitted to *Environ. Sci. Technol.*, February 2008.

Hilton, J. and Birky, B., "Legacy or Liability? The Future of Phosphogypsum," presented at the IBC NORM Waste Conference, London UK, February 26, 2008.

Birky, B. and Hilton, J. "You have to admit, it's getting bigger, getting bigger all the time…," "Stack Free by '53? Safe, Beneficial Uses of Phosphogypsum: Project Update," Lakeland Regional Phosphate Conference, 10 October 2007.

Hsu, Y. M., Wu, C. Y., Lundgren, D. A. and Birky, B. K., "Size Distribution, Chemical Composition and Acidity of Mist Aerosols in Fertilizer Manufacturing Facilities in Florida," *J. Aerosol Sci.*, doi: 10.1016/j.jaerosci.2007.10.008, 39, 127-140, 2007.

Hsu, Y. M., Kolett, J., Wysocki, K., Wu, C. Y., Lundgren, D. A. and Birky, B. K., "Sources of Artifacts in Sulfuric Acid Mist Measurement Using NIOSH Method 7903," *Environ. Sci. Technol.*, doi: 10.1021/es070265e, 41(17), 6205 -6209, 2007.

Kim, K., Wu, C. Y., Birky, B. and Bolch, W., "TENORM Aerosols in the Florida Phosphate Industry - Assessment of Lung Fluid Solubility and Annual Effective Dose to Workers," *Radiation Protection Dosimetry*, doi: 10.1093/rpd/ncl083, 123(1), 41-55, 2007.

Hsu, Y. M., Wu, C. Y., Lundgren, D. and Birky, B. K., "Size-resolved Sulfuric Acid Mist Concentrations at Phosphate Fertilizer Manufacturing Facilities in Florida," *Annals of Occupational Hygiene*, doi: 10.1093/annhyg/mel066, 51(1), 81-89, 2007.

Birky, BK. "Inhalation doses and regulatory policy in wet-acid processing of sedimentary phosphate rock". Proceedings of the NORM V Symposium. March 19-22, 2007. Seville, Spain. Published by the IAEA.

Kim K., Wu C., Birky B., Bolch W. "Effective dose scaling factors for use with uranium series cascade impactor data: A reassessment using the IMBA code". *Health Phys.* 91, 331-337 (2006).

Kim K., Wu C., Birky B., Bolch W. "Influence of particle size distribution on inhalation doses to workers in the Florida phosphate industry". *Health Phys.* 91, 58-67 (2006).

Kim K., Wu C., Birky B., Nall W., Bolch W. "Characterization of radioactive aerosols in Florida phosphate processing facilities." *Aerosol Sci Technol.* 40, 410-421 (2006).

Hsu, Y. M., Wu, C. Y., Lundgren, D., Nall, W. J. and Birky, B. K., "Chemical Characteristics of Aerosol Mists in Phosphate Fertilizer Manufacturing Facilities," *J. Occupational and Environmental Hygiene*, doi: 10.1080/15459620601067209, 4, 17-25, 2006.

Kim KP, Wu CY, Birky BK and Bolch WE. 2005. "Effective dose scaling factors for use with cascade impactor sampling data in TENORM inhalation exposures." *Health Phys.* 89(4) 359-374.

Birky, BK. "TENORM and ALARA in the Florida Phosphate Industry." Proceedings of the 9TH European ALARA Network Workshop on "Occupational Exposure to Natural Radiation." Augsburgh, Germany, October 18-21, 2005.

Kim KP, Bolch WE, Bolch E, Wu CY, Nall W and Birky BK. "Risk assessment of airborne particulates to workers in the phosphate industry." *Health Phys.* 84(6) S170- S171. 2003.

Birky, BK. "Radiation issues associated with phosphogypsum use – an international perspective." Proceedings of the 3rd Global Gypsum Conference 2002. Edited by Robert McCaffrey. PRo Publications International Ltd. Elise House, 6b East Street, Epsom, Surrey, KT17 1HH, UK. Session 2 – Paper 6 (2002).

Birky, B., Tolaymat, T., Warren, B., Bolch, B., Ammons, R., McNally, T., and Nall, J. "Evaluation of Exposure to Technologically Enhanced Naturally Occurring Radioactive Materials (TENORM) in the Phosphate Industry." Florida Institute of Phosphate Research (FIPR) Publication Number 05-046-155, July 1998.

Shleien, B., Slayback, L., and Birky, B.: Eds. Handbook of Health Physics and Radiological Health-Third Edition. Williams & Wilkins, February 1998.

Birky, Brian Kent. Refinement of Operational Health Physics Methodology Using Geographical Information Systems. Doctoral dissertation, Advisory chair: W. Emmett Bolch. University of Florida, 1997.

Bolch, W.E., Stanford, S.E., Huston, T.E., and Birky, B.K. "A Methodology for Uncertainty Analysis: Demonstration with a Simple Pathway Equation." Radiation Protection Management, Vol. 12, No. 1 (January/February 1995), pp. 55-65.

Roessler, C.E., Bolch, W.E., Birky, B.K., and Roessler, G.S. "Dose Estimation and Risk Assessment for Naturally-Occurring Radionuclides in Agricultural Products." Proceedings of Naturally-Occurring Radionuclides in Agricultural Products, a symposium held 24-25 January 1991, Orlando, FL.

Birky, B.K. "Dose Assessment from Radioactivity in Foods Grown on Mined Florida Phosphate Lands." Thesis presented to the Graduate School of the University of Florida, 1990.

Kaiser, P.E., Seawright, J.A., and Birky, B.K. Chromosome Polymorphism in Natural Populations of Anopheles quadrimaculatus Say Species A and B. Genome, 30: 138-146, 1988.

Smittle, B.J., Seawright, J.A., and Birky, B.K. Use of a Commercial Color Sorter to Separate Sexes of Stable Fly (Diptera: Muscidae) Pupae from a Genetic Sexing Strain. J. Econ. Entomol. 79: 877-878, 1986.

Seawright, J.A., Birky, B.K., and Smittle, B.J. Use of a Genetic Technique for Separating the Sexes of the Stable Fly (Diptera: Muscidae). J. Econ. Entomol. 79: 1413- 1417, 1986.

A. Curriculum Vitae

1. Name: Timothy A. Shedd

2. Formal Education:

a. 2001 Ph.D. Mechanical Engineering University of Illinois at Urbana-Champaign

b. 1998 M.S. Mechanical Engineering University of Illinois at Urbana-Champaign

c. 1992 B.S. Electrical Engineering Purdue University at West Lafayette

3. Positions Held

a. 2018 – present Director, Division of Graduate Studies
Florida Polytechnic University, Lakeland, FL

b. 2017 – present Associate Professor
Mechanical Engineering
Florida Polytechnic University, Lakeland, FL

c. 2007 – present Independent Consultant, Expert witness on Intellectual Property

d. 2013 – 2017 Founder, CEO, CTO and chair of the board
Ebullient, Inc., Madison, WI

e. 2012 – 2013 Visiting Professor and Research Fellow,
Universidade de São Paulo – São Carlos, Brazil

f. 2007 – 2016 Associate Professor,
Mechanical Engineering Department,
University of Wisconsin, Madison, WI

g. 2001 - 2007 Assistant Professor,
Mechanical Engineering Department,
University of Wisconsin, Madison, WI

h. 1995 - 2001 Research Assistant,
Mechanical and Industrial Engineering Department,
University of Illinois at Urbana-Champaign

i. 1992 – 1995 Hardware Engineer
Semiconductor Engineering and Advanced Development Groups
Digital Equipment Corporation, Hudson, MA

j. 1988 – 1992 Co-Op Hardware Engineer (5 terms, 24 months total)
Semiconductor Engineering Group,
Digital Equipment Corporation, Hudson, MA

4. Honors & Awards

k. Awards

(i) NSF CAREER Award, 2002 – 2007
(ii) Polygon Mechanical Engineering Instructor of the Year, 2002 – 2003
(iii) Pi Tau Sigma Professor of the Year, 2001 – 2002
(iv) Keynote Speaker, Congresso Centroamericano de Ingenería Mecánica, San José, Costa Rica, August, 2004
(v) ASHRAE New Investigator Award, 2004 – 2006
(vi) *ERCOFTAC Visiting Professor*, The Swiss Federal Institute, Lausanne, Switzerland, December 2003
(vii) SAE Teetor Outstanding Engineering Educator Award, 2005
(viii) Pi Tau Sigma Professor of the Year, 2004 - 2005
(ix) Keynote Speaker, 13th Brazilian Congress of Thermal Sciences and Engineering (ENCIT2010), Uberlândia, MG, Brazil, December 2010.
(x) Second place, Manufacturing division, 2013 Governor's Business Plan Contest
(xi) Fellow, American Society of Heating, Refrigeration and Air-conditioning Engineers, 2016

l. As Advisor and co-author

(i) Advisor of 2003 Schoof's Prize for Creativity winner, Katie Plzak
(ii) Best paper award (with Diego Arias), 2004 SAE Small Engine Technology Conference
(iii) Highlights of 2005 paper (with B. Anderson), *Measurement Science and Technology*
(iv) Highlights of 2009 paper, *Measurement Science and Technology*
(v) Runner-up, Best Paper Award, 2008 SAE Small Engine Technology Conference

(vi) Runner-up, Best Paper Award (with Harder), 2007 European Mask Conference
(vii) Advisor of 2006 Schoof's Prize for Creativity and Tong Prototype First Prize, Angie Franzke
(viii) Best paper award (with Schuetter, et al.), 2006 European Mask Conference

5. Languages

Able to read, write and speak Portuguese.

B. Teaching Activities

Semester	Course **University of Wisconsin - Madison**	Approx. Number of Students
Fall 2001	ME 364 Elementary Heat Transfer	34
Spring 2002	ME 765 Adv. Heat Transfer II	12
Spring 2002	ME 520 Multiphase Flow	35
Fall 2002	ME 361 Thermodynamics	35
Spring 2003	ME 363 Intro. Fluid Mechanics	30
Summer 2003	ME 364 Elementary Heat Transfer	15
Spring 2004	ME 765 Adv. Heat Transfer II	16
Spring 2004	ME 520 Multiphase Flow	45
Fall 2004	ME 364 Elementary Heat Transfer	45
Fall 2004	ME 964 Adv. Fluid Measurements	16
Spring 2005	ME 363 Intro. Fluid Mechanics	45
Fall 2005	ME 363 Intro. Fluid Mechanics	62
Fall 2005	ME 368 Measurements Lab	12
Spring 2006	ME 765 Adv. Heat Transfer II	15
Fall 2006	ME 361 Thermodynamics (2 sections)	168
Spring 2007	ME 520 Multiphase Flow	23
Fall 2007	ME 364 Intro. Heat Transfer	55
Spring 2008	ME 368 Eng. Measurements	155
Fall 2008	ME 368 Eng. Measurements	178
Spring 2009	ME 368 Eng. Measurements	175
Fall 2009	ME 368 Eng. Measurements (lab)	12
Spring 2010	ME 520 Multiphase Flow	22
Spring 2010	ME 765 Adv. Heat Transfer II	7
Fall 2010	ME 368 Eng. Measurements	180
Spring 2011	ME 364 Intro. Heat Transfer	58
Fall 2011	ME 363 Intro. Fluid Mechanics	62
Spring 2012	ME 520 Multiphase Flow	32
Spring 2012	ME 765 Adv. Convection	6
Fall 2012	Instrumentação de Escoamento Multifásico e Análise dos Dados (University of São Paulo – São Carlos, São Paulo, Brazil)	15
Spring 2013	Instrumentação de Escoamento Multifásico e Análise dos Dados (Federal University of Uberlândia, Minas Gerais, Brazil)	12
Fall 2013	ME 351 Senior Design I	16
Spring 2014	ME 352 Senior Design II	16
Spring 2014	ME 520 Multiphase Flow	35
Fall 2014	ME 351 Senior Design I (course coord)	16
Spring 2015	ME 352 Senior Design II (Course coord)	16
	Florida Polytechnic University	

Fall 2017	EML 3015 Fluid Mechanics	16
Fall 2017	EGN 3343 Engineering Thermodynamics	30
Spring 2018	EML 3015 Fluid Mechanics (2 sections)	48
Spring 2018	EGN 3311 Statics	41
Fall 2018	EML 3015 Fluid Mechanics	26
Fall 2018	EGN 3311 Statics	32
Spring 2019	EML 3015 Fluid Mechanics	30

C. Research Activities

1. Research Publications

(All authors are students or researchers in my program except as noted).

a. Published in refereed journals

A summary of Shedd's citations at Google Scholar may be found at http://scholar.google.com/citations?user=7_Qw_d4AAAAJ&hl=en&authuser=1. This analysis shows that Shedd's publications have received **884 citations since 2013 (1807overall)**, with an **h-index of 16** and an i10 factor of 27 since 2013. (Overall: h-index = 22, i10-index = 45)

2018

46. Su, X. and Shedd, T.A. 2018. "Towards working fluid properties and selection of Rankine Cycle based waste heat recovery systems for internal combustion engines – A fundamental analysis," *Applied Thermal Engineering*, **142**, 502-510. https://doi.org/10.1016/j.applthermaleng.2018.07.036

2016

45. She, X. Shedd, T.A., Lindeman, B., Yin, Y., Zhang, X., "Bubble Formation on solid surface with a cavity based on molecular dynamics simulation," *International Journal of Heat and Mass Transfer*, **95**, 278-287.

2015

44. Ashwood, A.C., Vanden Hogen, S.J., Rodarte, M.A., Kopplin, C.R., Rodríguez, D.J., Hurlburt, E.T. and Shedd, T.A., "A Multiphase, Micro-Scale PIV Measurement Technique for Liquid Film Velocity Measurements in Annular Two-Phase Flow," *International Journal of Multiphase Flow*, **68**, pp. 27-39.

2014

43. Kasza, I., Suh, Y., Wollny, D., Clark, R.J., Roopra, A., Colman, R.J., MacDougald, O.A., Shedd, T.A., Nelson, D.W., Yen, M-I., Yen, C-L.E., Alexander, C., "Syndecan-1 is Required to Maintain Intradermal Fat and Prevent Cold Stress," *To Appear in PLoS Genetics, Dec 2014.*

2013

42. R. L. Buchanan and T. A. Shedd, 2013, "Extensive Parametric Study of Heat Transfer to Arrays of Oblique Impinging Jets with Phase Change," *Journal of Heat Transfer, Special Issue on High Heat Flux Cooling of Electronics*, **135**(11), pp. 111017-1-13. *[Citations = 0, Google Scholar]*

41. B. A. Lindeman and T. A. Shedd, 2013, "Comparison of Empirical Correlations and a Two-Equation Predictive Model for Heat Transfer to Arbitrary Arrays of Single-Phase Impinging Jets," *International Journal of Heat and Mass Transfer*, **66**, pp. 772-780. *[Citations = 0, Google Scholar]*

40. B.A. Lindeman, J.M. Anderson and T. A. Shedd, 2013, "Predictive Model for Heat Transfer Performance of Oblique and Normally Impinging Jet Arrays," *International Journal of Heat and Mass Transfer*, **62**, pp. 612-619. *[Citations = 3, Google Scholar]*

39. T. A. Shedd. 2013. "Two-phase Internal Flow: Toward a Theory of Everything." *Heat Transfer Engineering*, **34**(5-6), pp. 420-433. *{Avg. I.F. 2006-2010: 0.811} [Citations = 1, Google Scholar; 149 downloads, Taylor & Francis]*

2011

38. M. Arienti, L. Wang, M. Corn, X. Li, M. C. Soteriou, T. A. Shedd, and M. Herrmann. 2011. "Modeling Wall Film Formation and Breakup Using an Integrated Interface-Tracking/Discrete-Phase Approach." *Journal of Engineering for Gas Turbines and Power* **133**, 031501:1-7. *{Avg. I.F. 2006-2010: 0.502} [Citations = 6, Google Scholar]*

37. D. Schubring and T.A. Shedd, 2010. "A Model for Pressure Loss, Film Thickness and Entrained Fraction for Two-Component Annular Flow," *International Journal of Heat and Fluid Flow*, **32**(3), pp. 730-739. *{Avg. I.F. 2006-*

2010: 1.462} [Citations = 6, Google Scholar; Citations = 6, Scopus]

2010

36. D. Schubring, T.A. Shedd and E.T. Hurlburt, 2010, "Planar Laser-Induced Fluorescence (PLIF) Measurements of Liquid Film Thickness in Annular Flow. Part II: Interpretation and Modeling," *International Journal of Multiphase Flow*, **36**(10), pp. 825-835. *{Avg. I.F. 2006-2010: 1.437} [Citations = 9, Google Scholar]*

35. D. Schubring, A.C. Ashwood, T.A. Shedd and E.T. Hurlburt, 2010, "Planar Laser-Induced Fluorescence (PLIF) Measurements of Liquid Film Thickness in Annular Flow. Part I: Methods and Data," *International Journal of Multiphase Flow*, **36**(10), pp. 815-824. *{Avg. I.F. 2006-2010: 1.437} [Citations = 14, Google Scholar]*

34. D. Schubring, T. A. Shedd and E.T. Hurlburt, 2010. "Studying Disturbance Waves in Vertical Annular Flow with High-Speed Video," *International Journal of Multiphase Flow*, **36**(5), pp. 385-396. *{Avg. I.F. 2006-2010: 1.437} [Citations = 8, Google Scholar]*

2009

33. T. Kiura, T.A. Shedd and B.C. Blaser, "Investigation of Spray Evaporation and Numerical Model Applied for Fuel-injection Small Engines," *SAE International Journal of Engines*, **1**(1), pp. 1402-1409. *[Citations = 3, Google Scholar]*

32. T.A. Shedd, D. Schubring, R.E. Foster, and D.J. Rodriguez, "Two-Zone Analysis of Wavy Two-Phase Flow using Micro-Particle Image Velocimetry (micro-PIV)," *Measurement Science and Technology*, **20**(6), p. 065401 (11 pages). *{Avg. I.F. 2006-2010: 1.338} [Citations = 5, Google Scholar]*

31. D. Schubring and T.A. Shedd, "Critical Friction Factor Modeling of Horizontal Annular Base Film Thickness," *International Journal of Multiphase Flow*, **35**(4), pp. 389-397. *{Avg. I.F. 2006-2010: 1.437} [Citations = 16, Google Scholar]*

30. D. Schubring and T. A. Shedd, "Two-Phase Wavy-Annular Flow in Small Tubes," *International Journal of Heat and Mass Transfer*, **52**(15-6), pp. 1619-1622.
[D. Schubring was a Ph.D. student supervised by Shedd.] {Avg. I.F. 2006-2010: 1.744} [Citations = 5, Google Scholar

29. D. Schubring and T. A. Shedd, "Prediction of the Wall Shear for Horizontal Annular Air-Water Flow," *International Journal of Heat and Mass Transfer*, **52**(1-2), pp. 200-209.
[D. Schubring was a Ph.D. student supervised by Shedd.] {Avg. I.F. 2006-2010: 1.744} [Citations = 10, Google Scholar]

2008

28. P. M. Harder and T. A. Shedd, "Improved model for liquid loss at a dynamic contact line including behaviors of high index fluids," *Journal of Micro/Nanolithograpy, MEMS and MOEMS (JM3)*, **7**(3), p. 033002 (9 pages). *[Citations = 4, Google Scholar]*

27. P. M. Harder, T. A. Shedd and M. Colburn, "Static and Dynamic Wetting Characteristics of Nanopatterned Surfaces," *Journal of Adhesion Science and Technology*, **22**(15), pp. 1931-48.
[P.M. Harder was a M.S.. student supervised by Shedd. Matthew Colburn is a manager of Advanced Lithography within IBM Research. He provided the wafers and the surface analysis. Harder and Shedd contributed 80% total effort to this work. Invited Submission.] {Avg. I.F. 2006-2010: 0.95} [Citations = 7, Google Scholar]

26. D. Schubring and T. A. Shedd, "Wave Behavior in Horizontal Annular Air-Water Flow," *International Journal of Multiphase Flow*, **34**, pp. 636-646.
[D. Schubring was a Ph.D. student supervised by Shedd.] {Avg. I.F. 2006-2010: 1.437} [Citations = 13, Google Scholar]

2007

25. D. A. Arias and T. A. Shedd, "CFD Analysis of Compressible Flow Across a Complex Geometry Venturi," *Journal of Fluids Engineering*, **129**(9), pp. 1193-1202.
[Arias was a Ph.D. student supervised by Shedd on this project.] {Avg. I.F. 2006-2010: 0.554} [Citations = 0, Google Scholar]

24. S. D. Schuetter, T. A. Shedd, G. F. Nellis, 2007, "Prediction of the velocity at which liquid separates from a moving contact line," *Journal of Micro/Nanolithography, MEMS, and MOEMS (JM^3)*, **6**(2), pp. TBD., COVER

ILLUSTRATION
[Schuetter was a research associate supervised by Shedd on this project. G. Nellis was a UW Faculty collaborator. Shedd and Schuetter contributed 90% of the effort to this paper.] [Citations = 4, Google Scholar]

23. S. Freund, A.G. Pautsch, T.A. Shedd, S. Kabelac, 2007, "Local Convection Coefficients in Spray Cooling Systems Measured with Temperature Oscillation IR Thermography," *International Journal of Heat and Mass Transfer*, **50**, pp. 1953-1962.
[Fruend is a Ph.D. student at the Helmut-Schmidt University of the Armed Forces in Hamburg, Germany and Kabelac is his faculty advisor. Pautsch is a Ph.D. student advised by Shedd. All of the work for this paper took place in Shedd's laboratory. Pautsch and Shedd are responsible for 50% of the content of this paper.] {Avg. I.F. 2006-2010: 1.744} [Citations = 29, Google Scholar]

22. T. A. Shedd, "Next Generation Spray Cooling: High Heat Flux Management in Compact Spaces," *Heat Transfer Engineering*, **28**(2), February, 2007.
[*This was an invited submission.*] *{Avg. I.F. 2006-2010: 0.811} [Citations = 39, Google Scholar; 116 downloads, Taylor & Francis]*

2006

21. S. Schuetter, T. Shedd, G. Nellis, A. Romano, R. Dammel, M. Padmanaban, F. Houlihan, A. Krawicz, G. Lin, D. Rahman, S. Chakrapani, M. Neisser C. Van Peski, 2006 "The Effect of Resist Surface Characteristics on Film Pulling Velocity in Immersion Lithography," *Journal of Vacuum Science Technology B: Microelectronics and Nanometer Structures*, **24**(6), pp. 2798-2802.
[Romano, Dammel, Padmanaban, Houlihan, Krawicz, Lin, Rahaman, Chakrapani and Neisser were collaborators at A.Z. Electronic Materials; Van Peski was the project manager at SEMATECH, who sponsored this work. Schuetter was a research associate supervised by Shedd on this project. G. Nellis was a UW Faculty collaborator. Shedd and Schuetter contributed 80% of the effort to this paper.] {Avg. I.F. 2006-2010: 1.438} [Citations = 1, Google Scholar]

20. M. Padmanaban, A. Romano, L. Guanyang, S. Chiu, A. Timko, F. Houlihan, D. Rahman, R. R. Dammel, K. Turnquest, G. Rich, S. D. Schuetter, T. A. Shedd, G. F. Nellis, 2006, "Responding to the challenge: materials design for immersion lithography," *Journal of Photopolymer Science and Technology*, **19**(4), pp. 555-563.
[The first authors on this paper are engineers from AZ Electronic Materials. Shedd and Schuetter, a staff research supervised by Shedd for this project, collaborated with them to obtain 30% of the fundamental data that were presented and used in the analysis in the paper. G. F. Nellis is a faculty collaborator. Schuetter and Shedd contributed 20% of the content of this paper.] {Avg. I.F. 2006-2010: 0.992} [Citations = 6, Google Scholar]

19. D. A. Arias, T. A. Shedd and R. K. Jester, "Theoretical Analysis of Waste Heat Recovery from an Internal Combustion Engine in a Hybrid Vehicle," *Journal of Engines, Transactions of the SAE*, paper 2006-01-1605.
[Arias was a Ph.D. student and Jester a M.S. student advised by Shedd] [Citations = 45, Google Scholar]

18. D. A. Arias and T. A. Shedd, "CFD Analysis of Flow Field and Pressure Losses in Carburetor Venturi," *Journal of Engines, Transactions of the SAE*, paper 2006-32-0113.
[Arias was a Ph.D. student advised by Shedd] [Citations = 0, Google Scholar]

17. A. G. Pautsch and T. A. Shedd, 2006, "Adiabatic and Diabatic Measurements of the Liquid Film Thickness During Spray Cooling with FC-72," *International Journal of Heat and Mass Transfer*, **49,** 2610–-2618.

[A. G. Pautsch was a Ph.D. student supervised by Shedd.] {Avg. I.F. 2006-2010: 1.744} [Citations =36, Google Scholar]

16. S. Schuetter, T. Shedd, K. Doxtator, G. Nellis, R. Engelstad, C. Van Peski, A. Grenville, S.H. Lin, and D.C. Owe-Yang, 2006, "Measurements of the dynamic contact angle for conditions relevant to immersion lithography," *Journal of Microlithography, Microfabrication, and Microsystems*, 5(2), pp. TBD.
[Schuetter was a research associate supervised by Shedd on this project. Doxtator was an undergraduate research assistant supervised by Shedd. G. Nellis was a UW Faculty collaborator and R. Engelstad was the Co-PI on the contract. Van Peski and Grenville were technical monitors from SEMATECH, the funding organization. Lin and Yang were responsible for providing data. Shedd, Schuetter and Doxtator contributed 75% of the effort to this paper.] [Citations = 24, Google Scholar]

15. H. B. Burnett, A. C. Wei, M. S. El-Morsi, T. A. Shedd, G. F. Nellis, C. Van Peski and A. Grenville, 2006, "Modeling and experimental investigation of bubble entrapment for flow over topography during immersion lithography," *Journal of Microlithography, Microfabrication, and Microsystems*, **5**(1), paper

013008.
[Burnett was a M.S. student advised by Shedd. A. C. Wei and M. S. El-Morsi were a Ph.D. student and a post-doctoral researcher, respectively, both supervised by Nellis. G. F. Nellis was a UW faculty collaborator. Van Peski and Grenville were technical monitors at SEMATECH. Shedd and Burnett contributed 50% to this paper.] [Citations = 6, Google Scholar]

2005

14. M. Switkes, M. Rothschild, T. A. Shedd, H. B. Burnett, M. S. Yeung, 2005, "Bubbles in immersion lithography," *Journal of Vacuum Science and Technology B: Microelectronics and Nanometer Structures,* **23**, (6), p 2409-2412.
[This publication resulted from an intensive collaboration between Shedd and researchers at MIT Lincoln Laboratories. M. Switkes and M. Rothschild are research scientists at MIT Lincoln Laboratories. Burnett was a M.S. student advised by Shedd. M.S. Yeung is a professor at Boston University. Shedd and Burnett contributed 30% to this paper.] {Avg. I.F. 2006-2010: 1.438} [Citations = 8, Google Scholar]

13. H. B. Burnett, T. A. Shedd, G. F. Nellis, M. S. El-Morsi, R. Engelstad, S. Garoff, and K. Varanasi, 2005, "Control of the Receding Meniscus in Immersion Lithography," *Journal of Vacuum Science Technology B: Microelectronics and Nanometer Structures,* **23**(6), p. 2611-2616.
[Burnett was a M.S. student advised by Shedd. G. Nellis and R. Engelstad were UW Faculty collaborators. M. El-Morsi was a post-doctoral researcher supervised by Nellis. S. Garoff and K. Varanasi were collaborators from Carnegie Mellon University. Shedd and Burnett contributed 75% to this paper.] {Avg. I.F. 2006-2010: 1.438} [Citations = 17, Google Scholar]

12. H. B. Burnett, T. A. Shedd, G. F. Nellis, C. Van Peski, 2005, "Static and Dynamic Contact Angles of Water on Photoresist," *Journal of Vacuum Science Technology B: Microelectronics and Nanometer Structures,* **23**(6), p. 2721-2727.
[Burnett was a M.S. student advised by Shedd. G. Nellis was a UW Faculty collaborator. Van Peski was a technical monitor from SEMATECH who assisted with the experiment design and fabrication. Shedd and Burnett contributed 75% to this paper.] {Avg. I.F. 2006-2010: 1.438} [Citations = 11, Google Scholar]

11. T. A. Shedd and B. W. Anderson, 2005, "Automated Wall Temperature Measurement Using Thermoreflectance," *Measurement Science and Technology,* **16**, pp. 2483-2488.
[B. Anderson was an undergraduate research student supervised by Shedd. Selected as one of 26 ***Highlights of 2005*** *papers by the editorial board of Measurement Science and Technology.] {Avg. I.F. 2006-2010: 1.338} [Citations = 2, Google Scholar]*

10. T. A. Shedd, 2005, "Estimating the rate of dissolution of free and attached nitrogen bubbles in water," *Journal of Microlithography, Microfabrication, and Microsystems,* **4**(3), pp. 33004-1-8. *[Citations = 10, Google Scholar]*

9. D. A. Arias and T. A. Shedd, 2005, "Steady and dynamic models of fuel and air flow in carburetors for small engines," *Journal of Fluids Engineering,* **127**(4), p 778-786.
[Arias was a Ph.D. student advised by Shedd] {Avg. I.F. 2006-2010: 0.554} [Citations = 0, Google Scholar]

8. A. G. Pautsch and T. A. Shedd, 2005, "Spray Impingement Cooling with Single- and Multiple-Nozzle Arrays. Part I: Heat Transfer Data," *International Journal of Heat and Mass Transfer*, **48**, pp. 3167-3175.
[A. G. Pautsch was a M.S. student supervised by Shedd.] {Avg. I.F. 2006-2010: 1.744} [Citations = 97, Google Scholar]

7. T. A. Shedd and A. G. Pautsch, 2005, "Spray Impingement Cooling with Single- and Multiple-Nozzle Arrays. Part II: Visualization and Empirical Models," *International Journal of Heat and Mass Transfer*, **48**, pp. 3176-3184.
[A. G. Pautsch was a M.S. student supervised by Shedd.] {Avg. I.F. 2006-2010: 1.744} [Citations = 72, Google Scholar]

2004

6. D. A. Arias and T. A. Shedd, 2004, "Numerical and Experimental Study of Fuel and Air Flow in Carburetors for Small Engines," *Journal of Engines*, Paper No. 2004-32-0053.
[Received ***Best Paper Award*** *at the SAE-JSAE Small Engines Technology Conference, Gratz, Austria, September 2004. Arias was a Ph.D. student advised by Shedd.] [Citations = 6, Google Scholar]*

5. D. J. Rodríguez and T. A. Shedd, 2004, "Entrainment of Gas in the Liquid Film of Horizontal, Annular, Two-Phase Flow," *International Journal of Multiphase Flow*, **30**, pp. 565-583.

[Rodríguez was a Ph.D. student supervised by Shedd.] {Avg. I.F. 2006-2010: 1.437} [Citations = 16, Google Scholar]

4. T. A. Shedd and T. A. Newell, 2004, "Characteristics of the Liquid Film, Dryout and Pressure Drop in Horizontal Annular Flow," *Journal of Fluids Engineering*, **126**(5), pp. 807-817.
[Newell was Shedd's Ph.D. advisor. This work is a result of Shedd's Ph.D. research with additional data from Shedd's work at the UW.] {Avg. I.F. 2006-2010: 0.554}[Citations = 20, Google Scholar]

2003

3. T. A. Shedd and T. A. Newell, 2003, "Visualization of Two-Phase Flow Through Microgrooved Tubes for Understanding Enhanced Heat Transfer," *International Journal of Heat and Mass Transfer*, **46**, pp. 4169-4177.
[Newell was Shedd's Ph.D. advisor. This work is a result of Shedd's Ph.D. research.] {Avg. I.F. 2006-2010: 1.744} [Citations = 12, Google Scholar]

2. T. A. Shedd, T. A. Newell and P. K. Lee, 2003, "The Effects of the Number and Angle of Microgrooves on the Liquid Film in Horizontal Annular Two-Phase Flow," *International Journal of Heat and Mass Transfer*, **46**, pp. 4179-4189.
[P. K. Lee was an undergraduate researcher supervised by Shedd. Newell was Shedd's Ph.D. advisor. This work is a result of Shedd's Ph.D. research.] {Avg. I.F. 2006-2010: 1.744} [Citations = 5, Google Scholar]

1998

1. T. A. Shedd and T. A. Newell, 1998, "Automated Optical Liquid Film Thickness Measurement Method," *Review of Scientific Instruments*, **69**(12), pp. 4205 – 4213. *{Avg. I.F. 2006-2010: 1.557} [Citations = 65, Google Scholar]*

b. Papers Submitted to Refereed Journals (not yet accepted)

c. Monographs or Jointly Authored Books

d. Book Chapters

2. P. M. Harder, T. A. Shedd and M. Colburn, "Static and Dynamic Wetting Characteristics of Nanopatterned Surfaces," *Superhydrophobic Surfaces*, ed. A. Carré and K.L. Mittal, Brill Publishers, p. 91-110, 2009.

1. T. A. Shedd, editor, 2005, 2009 "Multiphase Flow", in the *2005 ASHRAE Fundamentals Handbook for Heating, Refrigeration and Air-conditioning Engineers*.

e. Invited book chapters

f. Patents Issued

12. T. A. Shedd, "High Efficiency Thermal Management System," U.S. Patent Issuing, June 26, 2018
11. T.A. Shedd, B.A. Lindeman, "Method of cooling series-connected heat sink modules," U.S. Patent 9,901,013, Issued February 20, 2018.
10. T.A. Shedd, B.A. Lindeman, "Redundant heat sink module," U.S. Patent 9,901,008, Issued February 20, 2018.
9. T.A. Shedd, B.B. Liu, K.M. Ripley, T.P. Taylor, "Heat exchanger with interconnected fluid transfer members," U.S. Patent 9,891,002, Issued February 13, 2018.
8. T.A. Shedd, B.A. Lindeman, "Flexible two-phase cooling system," U.S. Patent 9,854,715, Issued December 26, 2017.
7. T.A. Shedd, "Method of absorbing sensible and latent heat with series-connected heat sinks," U.S. Patent 9,854,714, Issued December 26, 2017.
6. T.A. Shedd, B.A. Lindeman, R.A. Buchanan, "Microprocessor assembly adapted for liquid cooling," U.S. Patent 9,852,963, Issued December 26, 2017.
5. T.A. Shedd, B.A. Lindeman "Heat sink module," U.S. Patent 9,848,509, Issued December 19, 2017.
4. T.A. Shedd, "Method of operating a cooling apparatus to provide stable two-phase flow," U.S. Patent 9,832,913, Issued November 28, 2017.
3. T. A. Shedd and A. G. Pautsch, "Full Coverage Spray and Drainage System and Method for Orientation-Independent Removal of High Heat Flux," U.S. Patent 8,550,372, Issued October 8, 2013.
2. A. G. Pautsch and T. A. Shedd, "Multi-Mode Liquid Cooling System And Method," U.S. Patent No. 7,522,417, issued April 21, 2009.
1. T. A. Shedd, W. Staats and T. L. Hendricks, "Engine Carburetion," U.S. Patent No. 7,472,894, issued January 6,

2009.

Seyed A. Soltani
4700 Research Way
Lakeland FL 33805
Phone: (863)874-8605
ssoltani@floridapoly.edu

AREAS OF RESEARCH

Polymer Composite Manufacturing, Nanocomposites, Composite Repair and Recycling, Material Characterization, Life Cycle Assessment, and Healthcare Sustainability.

EDUCATION

Ph.D. Mechanical Engineering 2010
Wichita State University, Wichita, KS

M.B.A. General Management 2005
Sharif University of Technology, Tehran, Iran

B.Sc. Mechanical Engineering 2002
Sharif University of Technology, Tehran, Iran

WORK EXPERIENCE

Assistant Professor Since August 2016
Mechanical Engineering Department, Florida Polytechnic University, Lakeland, FL

Visiting Research Faculty May 2016- August 2016
Department of Aeronautics & Astronautics, Air Force Institute of Technology, Dayton, OH

Visiting Assistant Professor August 2014- May 2016
Department of Mechanical and Manufacturing Engineering, Miami University, Oxford, OH

Post-Doctoral Fellow February 2011-August 2014
College of Engineering, Wichita State University, Wichita, KS

Graduate Research Assistant/Research Associate August 2005- January 2011
Department of Mechanical Engineering, Wichita State University, Wichita, KS

JOURNAL PUBLICATIONS

1. B. Zhang, S. A. Soltani, L. N. Le, R. Asmatulu, (2017) **"Fabrication and Assessment of a Thin Flexible Surface Coating Made of Pristine Graphene for Lightning Strike Protection"**, Materials Science and Engineering: B, 216, 31-40.
2. A. Esmaeili, J. M. Twomey, M. R. Overcash, S. A. Soltani, C. McGuire, K. Ali, (2018) **"Environmental Impact Reduction as a New Dimension for Quality Measurement of Healthcare Services: The Case of Magnetic Resonance Imaging"**, International Journal of Health Care Quality Assurance, 31, 910-922.
3. N. Rahmani, B. Willard, K. Lease, E. Legesse, S. A. Soltani, S. Keshavanarayana, (2015) **"The Effect of Post Cure Temperature on Fiber/Matrix Adhesion of T650/Cycom 5320-1 Using the Micro-Droplet Technique"**, Polymer Testing, 46: 14-20.
4. B. Zhang, R. Asmatulu, S. A. Soltani, L. N. Le, S.S.A. Kumar, (2014) **"Mechanical and Thermal Properties of Hierarchical Composites Enhanced by Pristine Graphene and Graphene Oxide Nanoinclusions"**, Journal of Applied Polymer Science, 131: 40826.
5. S. A. Soltani, M. R. Overcash, J. M. Twomey, M. A. Esmaeili, B. Yildirim, (2015) **"Hospital Patient-Care and Outside-the-Hospital Energy Profiles for Hemodialysis Services: Report of Two Cases"**, Journal of Industrial Ecology, 19: 504–513.
6. A. Esmaeili, J. M. Twomey, M. R. Overcash, S. A. Soltani, C. McGuire, K. Ali, (2015) **"Scope for Energy Improvement for Hospital Imaging Services in the USA"**, Journal of Health Services Research & Policy, 20: 67-73.
7. H. Koushyar, S. Alavi-Soltani, B. Minaie, M. Violette, (2012) **"Effects of Variation in Autoclave Pressure, Temperature, and Vacuum-Application Time on Porosity and Mechanical Properties of a Carbon Fiber/Epoxy Composite"**, Journal of Composite materials, 46: 1985–2004.
8. S. Alavi-Soltani, S. Sabzevari, H. Koushyar, B. Minaie, (2012) **"Thermal, Rheological, and Mechanical Properties of a Polymer Composite Cured at Different Isothermal Cure Temperatures"**, Journal of Composite materials, 46: 575-587.
9. S. Sabzevari, S. Alavi-Soltani, B. Minaie, (2011) **"New Method for Estimating the Extent of**

Curing of Thermosetting Prepregs", Journal of Applied Polymer Science, 121: 883– 891.

10. S. Sabzevari, S. Alavi-Soltani, B. Minaie, (2011) **"Effect of Thermoplastic Toughening Agent on Glass Transition Temperature and Cure Kinetics of an Epoxy Prepreg"**, Journal of Thermal Analysis and Calorimetry, 106:905–911.

CONFERENCE PUBLICATIONS

1. S. A. Soltani, S. Keshavanarayana, M.T. Krishnamaraja, H. Vali, J. Mavo, (2018) **"Effect of nonwoven fabric type, facesheet ply angle, and core thickness on distortion of out-of-autoclave flat sandwich panel"**, SAMPE Conference, Long Beach, CA.
2. B. Zhang, S. A. Soltani, L. N. Le, R. Asmatulu, (2016) **"Electromagnetic Interference Shielding Effectiveness of Prepreg Laminates Enhanced with Graphene and ITO Coatings Studied over VLF to VHF Frequency bands"**, CAMX Fall Conference, Anaheim, CA.
3. B. Zhang, S. A. Soltani, L. N. Le, R. Asmatulu, (2016) **"Modeling Mechanical Properties of Hierarchical Composites Enhanced by Graphene Nanoscale Inclusions"**, CAMX Fall Conference, Anaheim, CA.
4. S. A. Soltani, S. Keshavanarayana, M. T. Krishnamaraja, A. Bhasin, (2015) **"Distortion of Curved Sandwich Panels Made of Honeycomb Core and Carbon-Fiber Epoxy Prepreg Facesheets"**, CAMX Fall Conference, Dallas, TX.
5. B. Zhang, S. A. Soltani, R. Asmatulu, (2015) **"Modeling Mechanical Properties of Hierarchical Composites Enhanced by Graphene Nanoscale Inclusions"**, CAMX Fall Conference, Dallas, TX.
6. S. A. Soltani, S. Razinobakht, R. Asmatulu, (2014) **"Isothermal Curing Kinetics of Non-Functionalized Carbon Black/Epoxy Nanocomposites Using Differential Scanning Calorimetry"**, CAMX Fall Conference, Orlando, FL.
7. S. S. A. Kumar, S. A. Soltani, R. Asmatulu, (2014) **"Highly Conductive Graphene Thin Films for Improved Electrical Properties of Carbon Fiber Reinforced Composites"**, CAMX Fall Conference, Orlando, FL.
8. B. Zhang, S. A. Soltani, R. Asmatulu, (2014) **"Graphene and Its Nanocomposites: a Review"**, CAMX Fall Conference, Orlando, FL.
9. S. A. Soltani, G. Le, R. Asmatulu, (2014) **"Mechanical Properties of Out-Of-Autoclave Non-Crimp Fabric Epoxy Composites for Manufacturing Plant Elevations"**, ASME International Mechanical Engineering Congress & Exposition, Montreal, Canada.
10. S. A. Soltani, S. Keshavanarayana, (2014) **"Development of Time-Temperature Viscosity Diagram for Effective Cure Monitoring of Thermosetting Composite Materials"**, International SAMPE Symposium and Exhibition, Seattle, WA.
11. S. A. Soltani, S. Keshavanarayana, M. T. Krishnamaraja, A. Bhasin, (2014) **"Study of Honeycomb Core Shear-Compression Properties during Autoclave Processing"**, International SAMPE Symposium and Exhibition, Seattle, WA.
12. S. A. Soltani, H. Vali, A. Bhasin, D. Vo, T. Nguyen, A. K. Rao, K. Suryakanth, S. Khadka, S. Keshavanarayana, (2014) **"Effect of Nonwoven Fabric Type and Stacking Sequence on Distortion of Flat Panels Made of Out –of –Autoclave Carbon-Fiber Epoxy Prepreg"**, International SAMPE Symposium and Exhibition, Seattle, WA.
13. S. Soltani, S. Keshavanarayana, M. Krishnamaraja, A. Bhasin, A. Sriyarathne, (2013) **"Effect of Post-Curing Temperature Variation on Mechanical Properties of Adhesively Bonded Composite Laminates"**, SAMPE Fall Technical Conference and Exhibition, Wichita, KS.
14. S. Soltani, S. Keshavanarayana, A. Bhasin, M. Krishnamaraja, (2013) **"Effect of Fabric Weave Type on Distortion of Flat Panels Made of Out –Of –Autoclave Carbon-Fiber Epoxy Prepreg"**, SAMPE Fall Technical Conference and Exhibition, Wichita, KS.
15. S. Soltani, S. Keshavanarayana, E. Legesse, (2013) **"Experimental Data and Modeling of Cure Kinetics for an Out-Of-Autoclave Carbon-Fiber Epoxy Prepreg Cured at Different Staged Cure Cycles"**, SAMPE Fall Technical Conference and Exhibition, Wichita, KS.
16. W. Khan, S. Soltani, E. Asmatulu, R. Asmatulu, (2013) **"Aircraft Recycling: a Review of Current Issues and Perspectives"**, SAMPE Fall Technical Conference and Exhibition, Wichita, KS.
17. S. Soltani, M. Overcash, J. Twomey, (2013) **"Unit Process Life Cycle Inventory for Autoclave Curing of Epoxy Composites"**, SAMPE Fall Technical Conference and Exhibition, Wichita, KS.
18. J. Twomey, M. Overcash, S. Soltani, (2012) **"Life Cycle for Engineering the Healthcare Service Delivery of Imaging"**, 19th CIRP International Conference on Life Cycle Engineering, Berkeley,

CA.

19. S. Walker, S. Alavi-Soltani, T. Vo, B. Minaie, (2011) **"Correlation between Cure State and Room Temperature Short Beam Shear Strength of an Out-Of-Autoclave Prepreg Composite"**, International SAMPE Symposium and Exhibition, Long Beach, CA.
20. T. Vo, S. Alavi-Soltani, S. Walker, R. Das, B. Minaie, (2011) **"Effect of Post Cure Temperature Variation on Compressive Properties of an Out-Of-Autoclave Prepreg Composite"**, International SAMPE Symposium and Exhibition, Long Beach, CA.
21. S. Sabzevari, S. Alavi-Soltani, H. Koushyar, B. Minaie, (2010) **"Relationship Among Chemical Conversion, Glass Transition Temperature, and Mechanical Properties of Epoxy Matrix Composites"**, International SAMPE Symposium and Exhibition, Seattle, WA.
22. H. Koushyar, S. Alavi-Soltani, S. Sabzevari, B. Minaie, (2010) **"Effect of Isothermal Cure Temperature and Environmental Condition on the Short Beam Shear Strength and Failure Mechanism of a Carbon/Epoxy Composite"**, International SAMPE Symposium and Exhibition, Seattle, WA.
23. S. Sabzevari, S. Alavi-Soltani, H. Koushyar, B. Minaie, (2009) **"Modification of Time-Temperature-Transformation Diagram to Obtain a Comprehensive Cure Map for Polymer Composites"**, SAMPE Fall Technical Conference and Exhibition, Wichita, KS.
24. C. Gernaat, S. Alavi-Soltani, B. Minaie, J. Welch, (2009) **"Correlation between Viscoelastic and Mechanical Properties for an Out-Of-Autoclave Polymer Composite"**, SAMPE Fall Technical Conference and Exhibition, Wichita, KS.
25. S. Alavi-Soltani, A. Mousavi, S. Sabzevari, B. Minaie, (2009) **"Material State Modeling during Combined Ramp and Isothermal Cure Cycles for Polymer Composites Using Shear Rheometry and Thermal Analysis"**, International SAMPE Symposium and Exhibition, Baltimore, MD.
26. S. Alavi-Soltani, S. Sabzevari, A. Mousavi, B. Minaie, (2009) **"Modeling of Gelation and Vitrification Points for Polymer Composites Using Shear Rheometry"**, International SAMPE Symposium and Exhibition, Baltimore, MD.
27. P. Kashani, S. Alavi-Soltani, F. Ghods, B. Minaie, (2008) **"Development of Time- Temperature Transformation Diagram during Cure of Polymer Composites Using Shear Rheometry and Thermal Analysis"**, SAMPE Fall Technical Conference and Exhibition, Memphis, TN.
28. P. Kashani, F. Ghods, S. Alavi-Soltani, A. Rodriguez,B. Minaie, (2008) **"Material State Measurements during Cure of a Commercial Carbon Fiber/Epoxy Prepreg Using an Encapsulated Sample Rheometer and Differential Scanning Calorimetry"**, International SAMPE Symposium and Exhibition, Long Beach, CA.
29. S. Alavi-Soltani, T.S. Ravigururajan, M. Rezac, (2006) **"Thermal Issues in Lithium-ion Batteries"**, ASME International Mechanical Engineering Congress and Exposition, Chicago, IL.

TEACHING EXPERIENCE

Instructor — Since Spring 2017

Strength of Materials

Mechanical Engineering Department, Florida Polytechnic University, Lakeland, FL
Taught mechanics of materials to junior-level undergraduate students.

Instructor — Since August 2017

Finite Element Method in Mechanical Engineering

Mechanical Engineering Department, Florida Polytechnic University, Lakeland, FL
Taught FEA analysis principles and simulations using Ansys APDL to senior-level undergraduate students.

Instructor — Since August 2017

Mechanical Lab Design

Mechanical Engineering Department, Florida Polytechnic University, Lakeland, FL
Taught principles of mechanical design with LabVIEW programming applications to junior-level undergraduate students.

Instructor — January 2017-April 2017

Collaborative Simulation

Mechanical Engineering Department, Florida Polytechnic University, Lakeland, FL
Taught finite element simulation using Ansys Workbench to senior-level undergraduate students.

Instructor — May 2017-July 2017

Statics

Mechanical Engineering Department, Florida Polytechnic University, Lakeland, FL

Taught statics to sophomore-level undergraduate students.

Instructor August 2016-December 2016

Materials for Sustainability

Mechanical Engineering Department, Florida Polytechnic University, Lakeland, FL

Taught Life Cycle Analysis principles and applications using Gabi software package to senior-level undergraduate students.

Instructor August 2016-December 2016

Engineering & Technology Special Topics

Mechanical Engineering Department, Florida Polytechnic University, Lakeland, FL

Taught finite element simulation using Ansys Workbench to senior/junior-level undergraduate students.

Instructor January 2017-April 2017

Introduction to Engineering Design

Mechanical Engineering Department, Florida Polytechnic University, Lakeland, FL

Taught principles of engineering design to freshmen students.

Instructor August 2016-December 2016

Introduction to Engineering

Mechanical Engineering Department, Florida Polytechnic University, Lakeland, FL

Taught principles of engineering to freshmen students.

Instructor August 2014-May 2016

Numerical Methods for Engineers

Department of Mechanical and Manufacturing Engineering, Miami University, Oxford, OH

Taught numerical methods using MATLAB and finite element method using ABAQUS to more than 100 undergraduate students in each semester.

Instructor August 2011-December 2013

Composites Manufacturing

Department of Industrial and Manufacturing Engineering, Wichita State University, Wichita, KS

Taught fundamentals of composites manufacturing to graduate/undergraduate students. Developed the hands-on lab for the course.

Instructor January 2013-May 2013

Manufacturing Methods and Materials II

Department of Industrial and Manufacturing Engineering, Wichita State University, Wichita, KS

Taught fundamentals of manufacturing, i.e. bulk forming and machining of metals, sheet metal forming, and casting to junior-level undergraduate students.

Curriculum Vitae

JINRONG "PATRICK" ZHANG

FIPR Institute
Florida Polytechnic University
(863) 333-0807
jzhang@floridapoly.edu
149 Shannon Oaks Drive
Lakeland, FL 33813
(863) 644-7714
Pzhang29@gmail.edu

EDUCATIONAL BACKGROUND:

B. S. Metallurgy, Northeastern University, Shenyang, China (12/81).
M.S. Metallurgical Engineering, Chinese Academy of Science, Beijing, China (10/84)
Ph.D. Metallurgical Engineering, University of Nevada, Reno (12/91).

PROFESSIONAL EXPERIENCE:

RESEARCH DIRECTOR – BENEFICIATION AND MINING
Florida Industrial and Phosphate Research Institute, Bartow, FL, (4/93-present). Responsible for soliciting and evaluating research proposals as well as managing projects on phosphate beneficiation and mining. Identified R&D needs in these areas and developed programs to address the needs. Conducted numerous grant projects.

RESEARCH ENGINEER
KC&A, Reno, Nevada (5/91-5/92). Established the company's research capability in mineral flotation, high-temperature metallurgy and mineral bio-processing. Secured research grants from mining companies for developing novel processes. Managed contractual research projects.

Institute of Chemical Metallurgy, Chinese Academy of Science, Beijing (6/84-8/86). One of the key persons for the success of a $1.8 million industrial pilot test project for producing phosphorus from low-grade phosphate minerals.

RESEARCH ASSISTANT
Mackay School of Mines, Univ. of Nevada, Reno (9/88-12/91). Enhanced the competitiveness of the school in research in waste treatment, difficult-to-process gold ores, and photo-chemical destruction of contaminants. Earned high regards for both research and academic performance.

University of Utah. Conducted a study on the degradation of cyanide in pure minerals and soils, with significant budget savings.

ACADEMIC ACTIVITIES:
- Guest Professor – Wuhan Institute of Technology (since 2015)
- Guest Professor – Northeastern University (since 2003)
- Guest Professor – China University of Geosciences (since 2013)
- Member – Society for Mining, Metallurgy and Exploration (since 1987)
- Conference Chair – International Conference on Phosphate Beneficiation (since 1997)
- Technical Chair – International Conference on Sustainable Development of Phosphate Resources (since 2017)
- Editorial Board – Minerals Processing and Extractive Metallurgy Review (since 2000)
- Author – Mineral Processing Handbook, SME publication
- Author – Industrial Mineral Processing Handbook, SME publication
- Editor – Beneficiation of Phosphates, editions II-VII, SME publication
- Member – Scientific Committee for International Symposium on Innovation and Technology in the Phosphate Industry
- Member – Organization Committee, First International Conference on Sustainable Development of Rare

Earths Minerals (2012)
- Co-Chair – Beijing International Symposium on Phosphogypsum Utilization (2010)
- United Nations Expert – International Atomic Energy Agency, Extraction of uranium and rare earth elements from phosphate

Research Projects Conducted as the P.I.:

- Recovery of Rare Earths and Uranium from Phosphate Processing Streams, Phase 2 ($1,000,000)
- Recovery of Rare Earths and Uranium from Phosphate Processing Streams, Phase 1 ($970,000)
- Removal of Dolomite from Florida Phosphate Pebbles Using Packed Column Jig ($308,000)
- Magnesium Removal from Phosphate by Controlled Acid Leaching ($230,000)
- Improving the Dolomite Flotation Technology for Florida Phosphate Pebbles: Removing the Last Hurdle to Commercialization ($340,000)
- Recovery of Rare Earths and Uranium from Phosphate Processing ($100,000)
- Recovery of Rare Earth Elements from Florida Phosphate ($20,000)
- Optimizing Single-Collector Flotation of Florida Phosphates ($82,200)
- An Investigation of Flotation Reagents ($303,120)
- Bio-Processing of Phosphate Minerals ($30,000)
- Pilot-Scale Evaluation of Two New Processing Flowsheets for Florida Siliceous Phosphates ($440,000)
- A Screening Study on Phosphate Depressants for Beneficiating Florida Phosphate Ores ($159,340)
- Updating the Information on Phosphatic Clays ($30,000)
- Study on the Recovery of Phosphate from Florida Phosphate Clay ($134,340)
- Development of Reagent Schemes for Reducing MgO Content in the Flotation Concentrate for Processing Florida's High-Dolomite Phosphate Deposits ($76,000)
- Optimizing Cut Size for Single-Collector Flotation of Florida Phosphate ($62,000)
- Simultaneous Dewatering of Phosphatic Clays and Recovery of Phosphate ($173358).

Grants total: $4,319,000.

Research Contracts Managed:

- Recovery of Sulfuric and Phosphoric Acids from Phosphogypsum Process Water by Electrodialysis
- REE Enrichment from Phosphate Tailings Through Bio-Leaching Followed by Ion Flotation: An Exploratory Research Project
- Development and Demonstration of X-ray Tomography for On-Line Analysis
- Extraction and Recovery of Rare Earth Elements and Heavy Metals from Phosphogypsum Stack Water and Stack Leachate Using Chelok© Polymer
- Beneficiation of Dolomitic Phosphate Pebble by Triboelectrostatic Belt Separation
- Treatment of Chemical Processing Pond Water and Precipitation of Phosphorus using Nclear
- Leaching Study for Select Process and Non-Process Waters Relative to Future Disposal through a Deep Injection Well
- Novel Technologies to Convert Dolomite Phosphate Rock into High Efficiency Slow Release Fertilizers
- Pilot Plant Demonstration of Sand-Clay-Overburden Mix for Accelerated Reclamation
- The Extraction and Recovery of Rare Earth Elements from Phosphate Using PX-107 and Chelok® Polymers
- Isolation and Characterization of RE Mineral Particles in Florida Phosphate Rock by DE Rapid Scan Radiography and HRXMT.
- Remote Real-time Industrialized Analyzer of Phosphate Rock.
- Innovative RTS Technology for Efficient Separation of Dolomite from Phosphate.
- Waste Clay as a Green Building Material.
- Field Demonstration/ Evaluation of A Rapid Clay Dewatering and Consolidation Process Using Other Wastes (FIPR/DIPR Process) to Minimize Clay Settling Ponds; Phase II: Determination of Technical and Economic Feasibility.
- New Mobile Pre-processing Equipment for Florida Phosphate Mining.
- Development of an E-Tutorial Module for Design of Optimum Sampling Plans: 1. Dry Powders.
- Removal of Dolomite from Phosphate Pebble Concentrate by Enhanced Jigging.

- Development and Pilot-Scale Demonstration of Deep Cone Paste Thickener for Phosphatic Clay Disposal - Phase II.

- Enhanced Removal of Dolomite from Phosphate Pebble Concentrate by CO2 Generation.
- Feed Characteristics of Fatty Acid Flotation of Florida Phosphates.
- Pilot-Scale Testing and Demonstration of Picobubble Enhanced Flotation of Phosphate for Increased Recovery and Reduced Reagent Consumption.
- Field Demonstration/Evaluation of a Rapid Clay Dewatering and Consolidation Process Using Other Wastes (FIPR/DIPR Process) to Minimize Clay Settling Ponds.
- Field / Evaluation of a Rapid Dewatering and Consolidation Process using other Waste (FIPR/DIPR)-Supplemental to Minimize Clay Settling Ponds.
- Field Demonstration/ Evaluation of A Rapid Clay Dewatering and Consolidation Process Using Other Wastes (FIPR/DIPR Process) to Minimize Clay Settling Ponds; Phase II: Determination of Technical and Economic Feasibility.
- Field / Evaluation of a Rapid Dewatering and Consolidation Process Using Other Wastes. Continuous Quartz Separation from Concentrated Phosphate Slurry Via Air-Sparged Centrifugal Disk Flotation.
- Utilization of Phosphatic Clay Waste in Concrete.
- Development and Pilot-Scale Demonstration of Deep Cone Paste Thickening Process for Phosphatic Clay Disposal.
- Development and Pilot-Scale Demonstration of Deep Cone Paste Thickening Process for Phosphatic Clay Disposal.
- Using Phosphate Mining Tailings and Waste Materials as Synthetic Flux for the Production of High Strength Shaped Aggregate.
- Commercial Products from Phosphatic Clays: A Pre-Feasibility Study.
- Removal of MgO from Phosphate Pebble by Flotation - Phase 2.
- Development of Innovative Processes for Enhanced Recovery of Coarse Phosphate.
- Pilot Plant Demonstration of Anionic Rougher-Cleaner Flotation on Florida Phosphate.
- Optimizing the Formulation for Dolomite Collector PA-31 Using Raw Materials from the US.
- Pneumatic Transport, Triboelectric Beneficiation for the Florida Phosphate Industry.
- Controller Implementation to Improve Phosphate Recovery at PCS Phosphate Swift Creek Mine.
- A Study of Amine Flotation of Rougher Concentrate in a Column Cell.
- Pilot Plant Evaluation of Amine Flotation for Intermediate Pebble (IP) Beneficiation.
- Effects of Rock Impurities from Production Data.
- Removal of MgO from Phosphate Pebble by Flotation.
- A Selective Collector for Phosphate Flotation.
- New Technology for Clay Removal.
- In-Plant Testing of the HydroFloat Separator for Coarse Phosphate Recovery.
- A Pilot Scale Demonstration of the FIPR Flotation Process for Florida High MgO Pebble.
- Rapid Clay Dewatering/Phase II: Field-Scale Tests.
- Development of New Beneficiation Technology for Florida Dolomitic Phosphate Resources.
- Crusting of Phosphatic Clay Ponds due to Desiccation - Laboratory and Field Studies.
- Removal of Dolomite/Clays from Pebble Phosphate Rock by Attrition Scrubbing, Pilot Plant Tests.
- Optimizing, Adaptive Process Control for Phosphate Flotation.
- Rapid Clay Dewatering/Phase I: Small-Scale Tests.
- On the Beneficiation of High-dolomitic Pebbles: Exploring the Use of High-pressure Roll Mill for the Liberation of Phosphate Pellets from Dolomite.
- Improved Phosphate Flotation with Non-ionic Polymers.
- Bubble Generation, Design, Modeling, and Optimization of Novel Flotation Columns for Phosphate Beneficiation.
- Evaluation of a Novel Contact Column Cell for Fine Phosphate Recovery.
- Bacteria as Flotation Reagents for the Flotation of a Dolomitic Phosphate Rock.
- Fate and Consequences to the Environment of Reagents Associated with Rock Phosphate Processing.
- Modeling of the Phosphate Beneficiation Process as a Forerunner to Adaptive Control.
- Removal of Dolomite from Phosphate Rock by Attrition Scrubbing.
- Air-Sparged Hydrocyclone Flotation Technology for Efficiency Recovery of Florida Phosphate Minerals.
- Alternate Sources and Uses of Water for Amine Flotation (Phase I).
- Evaluation of Dolomite Separation Techniques.

- Evaluation of FIPR/DIPR Process As A Reclamation Technique Phase I.

Selected Publications and Presentations:

Patrick Zhang, et al., 2019, "Promising Options for Solving the Dolomite Problem of the Florida Phosphate Resources —a Brief Review", Mining, Metallurgy & Exploration, DOI : 10.1007/s42461-018-0038-2.

Ghazaleh Allaedini and Patrick Zhang, 2018, "Treatment of phosphoric acid sludge for rare earths recovery II: effect of sonication and flocculant solution temperature on settling rate". Separation Science and Technology, DOI: 10.1080/01496395.2018.1536715.

Haijun Liang, Patrick Zhang, Zhen Jin and David W. DePaoli, 2018. "Rare Earth and Phosphorus Leaching from a Flotation Tailings of Florida Phosphate Rock", Minerals, 8, 416; doi:10.3390/min8090416.

Shengxi Wu, Liangshi Wanga, Patrick Zhang, Hassan El-Shall, Brij Moudgil, Xiaowei Huang, Longsheng Zhao, Lifeng Zhangd, Zongyu Feng, 2018, "Simultaneous recovery of rare earths and uranium from wet process phosphoric acid using solvent extraction with D2EHPA, Hydrometallurgy, Vol. 175, pp. 146-153.

Jinru Lin, Wei Sun, Jacques Desmarais, Ning Chen, Renfei Feng, Patrick Zhang, Dien Li, Arthur Lieu, John S. Tse, Yuanming Pan, 2018, Uptake and speciation of uranium in synthetic gypsum (CaSO4•2H2O): Applications to radioactive mine tailings, Journal of Environmental Radioactivity, Vol. 181, pp. 8-17.

Liang, H.; Zhang, P.; Jin, Z.; DePaoli, D., 2017. "Rare-earth Leaching from Florida Phosphate Rock in Wet-process Phosphoric Acid Production". Minerals & Metallurgical Processing, Vol. 34, No. 3., pp.146-153

Zhang, P.; Liang, H.; Jin, Z.; DePaoli, D., 2017. "The Ultimate Mineral Processing Challenge: Recovery of Rare Earths, Phosphorus and Uranium from Florida Phosphatic Clay." Minerals & Metallurgical Processing, Vol. 34, No. 4., pp. 183-188.

Liang, H.; Zhang, P.; Jin, Z.; DePaoli, D., 2017. "Rare Earths Recovery and Gypsum Upgrade from Florida Phosphogypsum." Minerals & Metallurgical Processing, Vol. 34, No. 4., pp. 201-206.

Shengxi Wu, Liangshi Wang, Longsheng Zhao, Patrick Zhang, and Hassan El-Shall, 2018. "Recovery of Rare Earth Elements in Hydrometallurgical Processes of Phosphate Rock- A Critical Review." Chemical Engineering Journal, Vol. 335, pp. 774–800.

Zhang, P. at al., editors, 2016. <Beneficiation of Phosphates: Comprehensive Extraction, Technology Innovations, Advanced Reagents>. Society for Mining, Metallurgy & Exploration, Englewood, CO.

Zhang, P. 2016. Removal and Recovery of MgO from Phosphate Rock by Acid Leaching, in Beneficiation of Phosphates: Comprehensive Extraction, Technology Innovations, Advanced Reagents, pp. 29-39. Patrick Zhang, Jan Miller, Ewan Wingate, Laurindo Leal Filho, editors. Society for Mining, Metallurgy & Exploration, Englewood, CO.

Zhang, P., Zheng, S., Song, W., Miller, J., 2016. Reducing MgO Content in Florida Phosphate Concentrate, in Beneficiation of Phosphates: Comprehensive Extraction, Technology Innovations, Advanced Reagents, pp. 105-113, Patrick Zhang, Jan Miller, Ewan Wingate, Laurindo Leal Filho, editors. Society for Mining, Metallurgy & Exploration, Englewood, CO.

Feng, C., Song, S, Zhang, P., Liu, Y., 2016. Improvement of Dolomite Collector on High-Dolomite Phosphate Pebble from Florida, in Beneficiation of Phosphates: Comprehensive Extraction, Technology Innovations, Advanced Reagents, pp. 157-162, Patrick Zhang, Jan Miller, Ewan Wingate, Laurindo Leal Filho, editors. Society for Mining, Metallurgy & Exploration, Englewood, CO.

Wu, Y., Zhang, D., Yang, X., Xiao, W., Yang, M., Zhang, P., 2016. Gravitational Separation Behavior of Low-Grade Collophanite Ore in a Packed Column Jig, in Beneficiation of Phosphates: Comprehensive Extraction, Technology Innovations, Advanced Reagents, pp. 225-231, Patrick Zhang, Jan Miller, Ewan Wingate, Laurindo Leal Filho, editors. Society for Mining, Metallurgy & Exploration, Englewood, CO.

Mei Yang, M., Xiao,W., Yang, X., Zhang, P., 2016. Processing Mineralogy Study on Lead and Zinc Oxide Ore in Sichuan. Metals, 6(93): 2-7.

Al-Thyabat, S and Zhang, P., 2015. REE extraction from phosphoric acid, phosphoric acid sludge, and phosphogypsum, Mineral Processing and Extractive Metallurgy. Volume 124, Issue 3 (September 2015), pp. 143-150.

Al-Thyabat, S. and Zhang, P., In-line extraction of REE from dehydrate (DH) and hemihydrate (HDH) wet processes. Hydrometallurgy, 153:30-37 (2015).

Wending Xiao, Xiang Yang, and Patrick Zhang, 2015 Study of process mineralogy for hydrometallurgical extraction of vanadium and aluminum from bone coal, Mineral and Metallurgical Processing Journal, Vol. 32 No. 3, pp 155-160.

Patrick Zhang and Curtis Griffin, 2015, Process Technology, Test Results, Plant Integration for the Removal of Mg from High Dolomite Phosphate Rock, presented at Phosphates 2015, an international conference on phosphate, Tampa, Florida, March 25-27, 2015.

Zhang, P., Stana, R., El-Shall, H., and Moudgil, B., 2014. A Review of Industrial Innovations in Phosphate Processing. Mineral processing and extractive metallurgy : 100 years of innovation, Corby G Anderson; Robert C Dunne; John L Uhrie, editors, Englewood, Colorado : Published by Society for Mining, Metallurgy & Exploration Inc.

Patrick Zhang, Robert Snow, Wenyi Song, Xiaoqing Ma, and Shibo Zheng, 2014, Evaluation of Phosphate Depressants in the Phosphate/Dolomite System, Presented at the International Mineral Processing Congress 2014, Santiago, Chile, October 20-24

P Zhang, 2014. Comprehensive Recovery and Sustainable Development of Phosphate Resources
Procedia Engineering 83 (2014): 37 – 51

Patrick Zhang and Brian Birky, Uranium and REE Recovery from Florida Phosphates – Looking Back and Going Forward", presented at the International Symposium on Uranium Raw Material for the Nuclear Fuel Cycle: Exploration, Mining, Production, Supply and Demand, Economics and Environmental Issues, June 23–27, 2014, Vienna.

P. Zhang, S. Zheng, W. Sun, and X. Ma, 2014, "Reducing MgO Content in Florida Phosphate Concentrate", Presented at the 2014 SME Annual Meeting, Salt Lake City, UT.

P. Zhang, 2013, "Prescribing the Right 'Sleeping Pills' for the Phosphogypsym Stack Managers, Presented at the 2013 Annual Regional Phosphate Conference, October 9-10, Lakeland, FL.

P. Zhang, 2013, "Comprehensive Recovery of Valuable Elements from Phosphate". Presented at the 7th International Conference on Rare Earth Development and Application, Ganzhou, China
August 10-13.

P. Zhang, 2013, "Comprehensive Recovery and Sustainable Development of Phosphate Resources", Keynote speech at 2nd International Symposium on Innovation and Technology in the Phosphate Industry (SIMPHOS 2013), Agadir, Morocco, May 6-11.

P. Zhang, 2013, "Comprehensive Recovery of Valuable Elements from Phosphate", Presented at 7th International Conference on Rare Earths Development and Application", Ganzhou, China, August 10-13.

P. Zhang, 2013, "Comprehensive Recovery and Sustainable Development of Phosphate Resources", Keynote speech at 2nd International Symposium on Innovation and Technology in the Phosphate Industry (SIMPHOS 2013), Agadir, Morocco, May6-11.

P. Zhang, 2013. "Wet-Process Phosphoric Acid Production: Technologies and Comprehensive Resource Recovery". Presented at the United Nations – IAEA Expert Review Meeting on Uranium Production from Phosphate Rocks. IAEA Headquarters, Vienna, March 25-28, 2013

P. Zhang, R. Stana, H. El-shall, and B. Moudgil, 2013. "A Review of Industrial Innovations in Phosphate Processing". Presented at the 2013 SME Annual Meeting, Denver, CO, February 24-27, 2013.

P. Zhang, 2013. "Uranium Recovery from Phosphoric Acid", Lecture at the United Nations-IAEA International Training Course: Performance Optimization in Uranium and REE Production from Phosphate Rocks, Tunis & Gabes, February 11-15, 2013.

P. Zhang, 2013. "Rare Earth Elements (REE) in Florida Phosphate: Characterization and Recovery Approaches", Lecture at the United Nations-IAEA International Training Course: Performance Optimization in Uranium and REE Production from Phosphate Rocks, Tunis & Gabes, February 11-15, 2013.

P. Zhang, 2013. "Sustainable Development of Phosphate Resources: Challenges & Opportunities". Lecture at the United Nations-IAEA International Training Course: Performance Optimization in Uranium and REE Production from Phosphate Rocks, Tunis & Gabes, February 11-15, 2013.
P. Zhang, J. Miller and H. El-Shall, editors, 2012, «Beneficiation of Phosphates: New Thought, New Technology, New Development», Society for Mining, Metallurgy, and Exploration, Inc., Englewood, Colorado, 2012.

P. Zhang and R. Stana, 2012, "Phosphogypsum Management and Utilization: A Review of Research and Industry Practice", in «Beneficiation of Phosphates: New Thought, New Technology, New Development», Society for Mining, Metallurgy, and Exploration, Inc., Englewood, Colorado, pp. 309-322.

J.D. Miller, C.L. Lin, I. Ahmed, X. Wang, and P. Zhang, "Advanced Instrumentation for Mineral Liberation Analysis and Use in the Phosphate Industry", in «Beneficiation of Phosphates: New Thought, New Technology, New Development», Society for Mining, Metallurgy, and Exploration, Inc., Englewood, Colorado, pp. 167-176.

Y. Han, L. Liu, Z. Yuan and Z. Wang, P. Zhang, 2012, "Characteristics Comparison of Low-grade Hematite Products in High Pressure Grinding Roller and Jaw Crusher," Minerals & Metallurgical Processing Journal, Vol. 29 (5).

P. Zhang, 2012, "Recent Technological Breakthroughs in Phosphate Processing," Mineral & Metallurgical Processing Journal. Vol. 29 (1), pp. 36-46.

P. Zhang. 2012. "Recovery of Critical Elements from Florida Phosphate: Phase I. Characterization of Rare Earth Elements". Presented at The 1st International Conference: Rare Earth Minerals/Metals –Sustainable Technologies for the Future.
August 12-17, California, USA.

P. Zhang, 2012. "Rare Earth Elements in Florida Phosphate." Presented at the Regional Workshop on Uranium Resources Assessment and Recovery from Phosphate and Rare Earth Element Ores. June 17-21. Cairo, Egypt.

P. Zhang, 2012. "Uranium Recovery from Phosphoric Acid: The Florida Experiences" Presented at the Regional Workshop on Uranium Resources Assessment and Recovery from Phosphate and Rare Earth Element Ores. June 17-21. Cairo, Egypt.

P. Zhang, 2012. "Sustainable, Comprehensive Utilization of Phosphate Resources" Presented at the Regional Workshop on Uranium Resources Assessment and Recovery from Phosphate and Rare Earth Element Ores. June 17-21. Cairo, Egypt.

P. Zhang. 2012. "Rare Earth Extraction: Update and Flow Sheet Opportunities". Presented at the International Atomic Energy Agency Technical Meeting: Uranium Production from Phosphate Rocks. April 16-20, Vienna, Austria.

P. Zhang, 2011. "Recent Technology Breakthroughs in Phosphate Processing." Keynote speech at the 1st International Symposium on Innovation and Technology in the Phosphate Industry (SYMPHOS 2011), Marrakech, Morocco, May 9-13, 2011.

D. Tao, M. Fan, B.K. Parekh, Y. Zao, and P. Zhang, 2010, Pilot-scale Demonstration of Deep ConeTM Paste Thickening Process for Phosphatic Clay/Sand Disposal, Separation Science and Technology, Volume 45, Issue, pages 1418 – 1425.

P. Zhang, 2010, Phosphogypsum Management and Utilization: A Review of Research and Industry Practices, Presented at the 23rd AFA International Fertilizer Technical / HSE Conference & Exhibition, June 29-July 1, 2010, Tunis, Tunisia.

P. Zhang et al., Editors, «Beneficiation of Phosphates: Technology Advance and Adoption», Society for Mining, Metallurgy, and Exploration, Inc., Littleton, Colorado, 2010.

D. Tao, M. Fan, B.K. Parekh, R. Honaker, and P. Zhang, 2010. Pilot-Scale Demonstration of Deep Cone Paste Thickening Process for Phosphatic Clay/Sand Disposal, in «Beneficiation of Phosphates: Technology Advance and Adoption», P. Zhang et al., Editors, Society for Mining, Metallurgy, and Exploration, Inc., Littleton, Colorado, pp. 81-94.

D. Tao, G. Chen, B.K. Parekh, R. Honaker, and P. Zhang, 2010. Laboratory Studies on Flocculation of Phosphatic Clay/Sand as a Forerunner to Phosphate Tailings Disposal Using the Deep Cone Paste Technology – Part I. Screening of Anionic and Cationic Polymers, in «Beneficiation of Phosphates: Technology Advance and Adoption», P. Zhang et al., Editors, Society for Mining, Metallurgy, and Exploration, Inc., Littleton, Colorado, pp. 95-116.

H. El-Shall, J. Hazen, P. Zhang, M.F. Raslan, L. Bromwell, and L. Seale, A Novel Technique for Water Recovery and Land Reclamation Using Phosphatic Clay and Sand Tailings, in «Beneficiation of Phosphates: Technology Advance and Adoption», P. Zhang et al., Editors, Society for Mining, Metallurgy, and Exploration, Inc., Littleton, Colorado, pp. 67-79, 2010.

D. Tao, G. Chen, B.K. Parekh, R. Honaker, and P. Zhang, Laboratory Studies on Flocculation of Phosphatic Clay/Sand as a Forerunner to Phosphate Tailings Disposal Using the Deep Cone Paste Technology – Part II. Rheological Characterization, in «Beneficiation of Phosphates: Technology Advance and Adoption», P. Zhang et al., Editors, Society for Mining, Metallurgy, and Exploration, Inc., Littleton, Colorado, pp. 117-132, 2010.

P. Zhang and R. Snow, Evaluation of Phosphate Depressants in the Phosphate/Silica System, Minerals and Metallurgical Processing, 26(2), pp. 101-104, 2009.

P. Zhang and R. Snow, Studies of Anionic Reagents for Phosphate Flotation, Minerals and Metallurgical Processing, 26(2), pp. 65-73, 2009.

P. Zhang, Technique for Water Recovery and Land Reclamation during Mining Phosphate Deposits, Presented at Beneficiation of Phosphates V, February 17-22, 2008, Rio, Brazil.

P. Zhang, An Innovative Process for Fine Tailings Dewatering and Disposal, presented at The New Technologies International Conference in Non-Ferrous Metal Mineral Processing & Metallurgical Engineering, November 23-24, 2007, Guilin, China.
P. Zhang et al., Flotation Chemistry and Technology of Nonsulfide Minerals, «Froth Flotation: A Century of Innovation», Editors: Maurice C. Fuerstenau, Graeme Jameson, Roe-Hoan Yoon, Society for Mining, Metallurgy, and Exploration, Inc., Littleton, Colorado, 2007.

P. Zhang, The Phosphate Chapter, «Industrial Minerals & Rocks (Book), 7th Edition», Editors: Jessica Elzea Kogel, Nikhil C. Trivedi, James M. Barker, Stanley T. Krukowski, Society for Mining, Metallurgy, and Exploration, Inc., Littleton, Colorado, 2006.

P. Zhang, 2006, "Beneficiation of Phosphates: A Global Perspective", Presented at COVAPHOS II, Marrakech, Morocco, November 9-11, 2006.

P. Zhang et al., editors, 2006, Beneficiation of Phosphates: Technology and Sustainability, SME Publication, October 2006. «Beneficiation of Phosphates: New Thought, New Technology, New development»

R. Snow and P. Zhang, "Challenging the Crago 'Double Float' Process IV: Selectivity Enhancement in All-Anionic Flotation of Florida Phosphates", «Beneficiation of Phosphates: Technology and Sustainability», pp.113-122, SME Publication, October 2006.

R. Snow, P. Zhang and M. Bogan, "Study of Pure Fatty Acid Compounds in Phosphate Flotation", «Beneficiation of Phosphates: Technology and Sustainability», pp. 123-131, SME Publication, October 2006.

F. Sotillo, Patrick Zhang, and Robert Snow, "Updating the Knowledge of Amine Flotation In Phosphate Processing: II. Effect of Particle Size", «Beneficiation of Phosphates: Technology and Sustainability», 103-111, SME Publication, October 2006

P. Zhang, "Phosphatic Clay Disposal, Treatment and Utilization in Florida: A Review of Industry Practices and Research", ECI Conference: Beneficiation of Phosphate IV, Miami, Florida, December 5-10, 2004.

P. Zhang and H. El-Shall, Treatment and Utilization of Wastes from the Phosphate Industry, US-Egypt Workshop on Advances in Science and Technology of Treatment and Utilization of Industrial Wastes, June 6-10, 2004, Cairo, Egypt

J. Zhang et al., "Froth Modification for Reduced Fuel Oil Usage for Phosphate Flotation", International Journal of Mineral Processing, 74 (1-4), 19 November 2004, pp. 91-99.

H. El-Shall, P. Zhang, N. Abdel Khalek and S. El-Mofty, "Beneficiation Technology of Phosphates: Challenges and Solutions", Minerals & Metallurgical Processing, Vol. 21, No. 1, February, 2004.

P. Clifford, P.Zhang and H. El-Shall, "Metallurgical Research Needs Related to Phosphate", SME Annual Meeting, Denver, Colorado, February 23-25, 2004.

P. Zhang et al., "Improving Phosphate Flotation with New Chemistry, Smart Flowsheet and Novel Equipment", SME Annual Meeting, Denver, Colorado, February 23-25, 2004.

R. Snow and P. Zhang, "Surface Modification for Improved Phosphate Flotation", J. of Colloid and Interface Science, No. 256, Number 1, pp. 132-136, December 2002.

P. Zhang et al., Editors, «Beneficiation of Phosphates: Fundamentals and Technology», SME Publication, 2002, Littleton, CO.

Jinrong "Patrick" Zhang, Francisco Sotillo, and Robert Snow, "Updating the Knowledge of Amine Flotation in Phosphate Processing. I. Selectivity", in «Beneficiation of Phosphates: Fundamentals and Technology», pp. 79-85. SME Publication, 2002, Littleton, CO.

J. Zhang, Robert Snow and Yingxue Yu, "Challenging the Crago Double Float Process III. Beneficiation of Siliceous Phosphate Using The FIPR/SAPR Process", in «Beneficiation of Phosphates: Fundamentals and Technology», pp. 175-185. SME, 2002, Littleton, CO.

J. Zhang et al., "Froth Modification for Reduced Fuel Oil Usage for Phosphate Flotation", Engineering Foundation Conference: Froth Flotation Dissolved Air Flotation/Bridging the Gap", Lake Tahoe, May 20-25, 2001.

J. Zhang and R. Snow, "Surface Modification for Improved Phosphate Flotation", SIS Symposium, May 2000, Gainesville, Florida.

J. Zhang, "The Increasing Role of Solid/Liquid Separation in Phosphate Minerals Processing", AFS Annual Meeting, Tampa, Florida, may 1-5, 2001.

J. Zhang et al., "Phosphate Minerals Processing Using the Reverse Crago Process: The Final Update and Closing Thoughts", AIChe Conference, Washington D.C., May 2000.

P. Zhang et al., Editors, «Beneficiation of Phosphates: Advance in Research and Practice», SME Publication, 1999.

J. Zhang et al., "Reducing Fuel Oil Usage For Phosphate Flotation", Annual Phosphate Conference, Lakeland, FL, October, 1999.

J. Zhang, “Phosphate Minerals Processing: Reminiscence On Two Decades’ FIPR Research”, AIChe Annual Meeting, New Orleans, April, 1999.

J. Zhang et al., "Fine Toning the Reverse Crago Flotation Process for Siliceous Phosphate on Pilot Scale”, SME Annual Meeting, Denver, CO, March 1-3, 1999.

Y. Yu and J. Zhang, "Reverse Crago Process for Siliceous Phosphates", U.S. Patent 5,865,318, February 2, 1999.

J. Zhang et al., "Challenging the Crago Double Float Process. An Update", Industrial Minerals, Processing for Profits Conference, New Orleans, April 20, 1997.

J. Zhang et al., "Challenging the Crago Double Float Process. II. Amine-Fatty Acid Flotation of Siliceous Phosphates", Minerals Engineering, 10(9): 983-94, 1996.

J. Zhang et al., "Challenging the Crago Double Float Process. I. All Cationic Flotation of Siliceous Phosphates", Phosphate Conference, Lakeland, Florida, October 1995.

J. Zhang, "What Do We Know About Amine Flotation?", SME Florida Chapter Meeting, Bartow, Florida, January 5, 1996.

J. Zhang M. Bogan, "Recovery of Phosphate form Florida Beneficiation Slimes. I. Re-Identifying the Problem", Minerals Engineering, 8(4/5), 523-534, 1995.

J. Zhang "Phosphate Beneficiation -Challenges and Opportunities", TMS Annual Meeting, Las Vegas, Nevada, March, 1995.

J. Zhang "Phosphate Beneficiation - A Statistical Analysis", Phosphate Workshop, Lakeland, Florida, April, 1994.

J. Zhang "A Technical Review on Phosphate Beneficiation", Phosphate Conference, Lakeland, Florida, October, 1993.

J. Zhang, 1993 "Phosphate Beneficiation-Trends of the 90's", «Beneficiation of Phosphates: Theory and Practice», pp. 399-425, 1993, SME Publication, Littleton, CO.

J. Zhang et al., 1993, "Recovery of Gold and Silver From a Sulphidic Ore I. Cyanide and Chloride Leaching After Chlorination Roasting", in «Hydrometallurgy: Fundamentals, Technology and Innovation», pp. 311-326. Society for Mining, Metallurgy, and Exploration, Inc., printed by Cushing-Malloy, Inc., Ann Arbor, Michigan.

AGENDA ITEM: V.

Florida Polytechnic University
Board of Trustees Meeting
January 16, 2019

Subject: Collective Bargaining Agreement

Proposed Committee Action

Recommend approval of Collective Bargaining Agreement between the Board of Trustees and the Florida Polytechnic University chapter of United Faculty of Florida.

Background Information

Dr. Terry Parker will provide background on process and highlight the key details of the Collective Bargaining Agreement. The agreed upon articles are the result of months of negotiation over issues including appointment and promotion, performance evaluation, salary, benefits, and other working conditions. Faculty vote will be complete at close of business January 15, 2019. If ratified, the administration and faculty, through UFF, have come to an agreement on the subjects contained within the agreement and recommend approval by the University's Board of Trustees.

Supporting Documentation: Proposed Collective Bargaining Agreement

Prepared by: Dr. Terry Parker, Executive Vice President and Provost

Slides from the December 2018 regarding the collective bargaining agreement

Current Status of Collective Bargaining: December 5, 2018

- **Collective Bargaining Agreement will be:**
  - **Approximately thirty-one articles**
- **Current status, 20 articles with tentative agreement:**
  - **Eight articles are "transactional"**
    - ***Ground Rules, Preamble, Recognition, Consultation, Payroll Deduction, Access to Documents, Maintenance of Benefits, FPU Regulations and Policies***
  - **Three articles are important but "straightforward"**
    - ***Benefits, Intellectual Property, Travel***
  - **One article sets a significant standard for benefits**
    - ***Leaves: puts in place parental leave, we will have to match this on the staff side***
  - **Four articles with importance to faculty**
    - ***Assignment of Responsibilities, Performance Evaluation, Professional and Sabbatical Leave, Academic Freedom***

Current status of Collective Bargaining: December 5, 2018

- **Three articles are important to management of the institution (tentative agreement)**
  - **Management Rights, Discharge and Discipline, Office Space- Equipment- and Safety Conditions**
- **Two articles are actively being discussed**
  - **Nondiscrimination, Layoff**
- **We are waiting for a response on six other articles**
  - **Misc. Provisions, Severability, Amendment and Duration, Totality of Agreement, Definitions, Other Employee Rights**

Current status of Collective Bargaining: December 5, 2018

- **Salary (tentative agreement)**
  - **Presuming a review of "Meets Expectations" or higher, increase of 2% up to 3.5%, provides for "other increases" to help manage salaries more carefully, promotion is formulaic set at 9% or 90% of median salary, whichever is greater**
  - **Salary article is for FY2018-19 only, future years negotiated annually**

Current status of Collective Bargaining: December 5, 2018

- **Appointments, Promotion – the critical article (description as proposed by FPU Administration)**
  - **The most important article, includes process by which individuals are reappointed and/or promoted**
  - **Core Principles:**
    - ***Employment stability through multi-year appointments***
    - ***Reappointment and/or promotion on basis of significant faculty review and recommendation***
    - ***Limitation of Assistant Professor term***
    - ***Reviews with termination provide one year terminal notice***
  - **Significant Factor:**
    - ***Faculty hired before fall 2017 are on annually renewed two year appointments***
    - ***Contract includes language that transitions them to three year appointments based on a formal review***

FLORIDA POLYTECHNIC UNIVERSITY

COLLECTIVE BARGAINING AGREEMENT

BETWEEN

THE FLORIDA POLYTECHNIC UNIVERSITY BOARD OF TRUSTEES

AND

UNITED FACULTY OF FLORIDA

2018-2021

TABLE OF CONTENTS

PREAMBLE

The intent of the parties hereto in carrying out their responsibilities to negotiate the terms and conditions of employment of members of the bargaining unit is to promote the quality and effectiveness of education at Florida Polytechnic University (hereinafter the University) and to maintain high standards of academic excellence in all phases of instruction, research, and service. The parties concur that these objectives are facilitated by amicable adjustment of matters of mutual interest. The parties concur that these objectives are facilitated by amicable adjustment of matters of mutual interest. It is recognized by the parties that mutual benefits are to be derived from continual improvement in Florida Polytechnic University, and that participation of employees in the formulation of policies under which they provide their services is educationally sound.

While the United Faculty of Florida (hereinafter UFF), as the certified bargaining agent, retains the exclusive right to negotiate and reach agreement on terms and conditions of employment for the members of the bargaining unit, and the University retains its rights, under law, to manage and direct Florida Polytechnic University, the parties recognize the desirability of a collegial governance system for faculty and professional employees in areas of academic concern. It is desirable that the collegial system of shared governance be maintained and strengthened throughout Florida Polytechnic University so that employees will have a mechanism and procedure, independent of the collective bargaining process, for making recommendations to appropriate administrative officials.

This Preamble serves only as a statement of intent and policy, and is not subject to any grievance or complaint procedures.

ARTICLE 1
RECOGNITION

1.1 Bargaining Unit. The Board of Trustees hereby recognizes the United Faculty of Florida as the exclusive representative, solely for the purpose of collective bargaining with respect to wages, hours and other terms and conditions of employment as specifically set forth in this Agreement, for all full time, in unit members in the bargaining unit described in Order Number 16E-274 dated October 27, 2016, Certification number 1898, issued by the Public Relations Commission, and amended on June 5, 2018 in Order Number 18E-137. (See Appendix A)

ARTICLE 2
CONSULTATION

2.1 Consultation with President. The University President or the President's representative(s) and the UFF Poly Chapter representatives may periodically meet to discuss matters pertinent to the implementation or administration of this Agreement, University actions affecting terms and conditions of employment, or any other mutually agreed upon matters. Such meetings shall normally occur once per semester (Fall, Spring) at either party's request. The meeting should occur within thirty (30) days once the request is made.

2.2 Agendas. A written agenda shall be submitted by the requesting party to the other party no less than five (5) days before the scheduled date of the meeting. Additional matters for discussion may be placed on the agenda at the discretion of the other party.

2.3 Additional Consultations. Other consultations may occur if mutually agreed upon.

2.4 Purpose. Consultations may be used to resolve problems regarding the implementation and administration of the Agreement. The parties understand and agree that such meetings shall not constitute or shall not be used for the purpose of collective bargaining, discussing specific grievances, or modifying, adding to, or deleting any provision of this Agreement.

ARTICLE 3
MANAGEMENT RIGHTS

3.1 Public Employer's Rights. It is the right of the public employer to determine unilaterally the purpose of each of its constituent agencies, set standards of services to be offered to the public, and exercise control and discretion over its organization and operations. It is also the right of the public employer to direct its employees, take disciplinary action for proper cause, and believe its exercise of such rights, shall not preclude employees or their representatives from raising grievances, should decisions on the above matters have the practical consequence of violating the terms and conditions of any collective bargaining agreement in force.

(a) According to Florida Statutes 447.209, and the express agreement of the parties, the University maintains all management rights, including but not limited to the following examples:

1. To perform those duties and exercise those responsibilities which are assigned and/or required by the University pursuant to applicable federal and state law, regulations, or other appropriate authority.

2. To determine and adopt the policies and programs, standards, rules and regulations determined by the University to be necessary for the operation and/or improvement of the University, and to select, manage and direct management, administrative, supervisory and other personnel.

3. To set methods, means of operations and standards of services to be offered by the University, and to contract such operations/services to the extent deemed practical and feasible by the University in its discretion.

4. To decide the number, location, design, and maintenance of the University's facilities, buildings, supplies and equipment. To relocate, remodel, or otherwise revise University operations and facilities as may be deemed necessary to the University. To have oversight and ultimate authority on laboratory equipment.

5. To determine qualifications of all employees in the University. To select, examine, hire, classify, train, layoff, assign, schedule, retain, transfer, promote, direct and manage all employees of the University consistent with the existing provisions of law and this Agreement.

6. To select supervisory and managerial personnel from the working forces strictly based on management's determination of individual ability, based on examination, performance evaluation, special skills, classification, and other related elements at the discretion of the University consistent with this Agreement.

7. To discharge, demote, fine, or suspend any employee of the University, and to take other disciplinary action against such employee, or to relieve such employee from employment.

8. To increase, reduce, change, modify or alter the size and composition of the workforce.

9. To determine the number of employees to be employed in the University.

10. To determine the mandatory training that will be offered to employees and require participation in such training from its employees.

11. The University has the sole authority to determine and re-determine the purpose and mission of the University.

12. The University has the sole, exclusive right to direct the managerial, supervisory and administrative personnel, and any other persons not covered by this Agreement, to perform any task in connection with the operation of the University, whether or not normally performed by the employees within the bargaining unit.

13. The selection process and assignment of personnel outside of the bargaining unit is the sole responsibility of management and shall not be subject to the grievance and arbitration procedures provided in this Agreement.

(b) It is expressly understood by and between the parties to this Agreement that the University shall not be deemed to have waived or modified any of the rights reserved to the University under this article by not exercising said rights in a particular matter or in a particular manner.

(c) Nothing contained in this Agreement shall abrogate the rights, duties and responsibilities of the University, as provided by law.

(d) Nothing in this Agreement shall limit the University in the exercise of its managerial functions. It is agreed that these enumerations of management prerogatives shall not be deemed to exclude other prerogatives of management not specifically enumerated. The University can exercise only those managerial functions that do not violate or abridge this Agreement.

(e) All other rights to manage the University and the operations, functions, and purposes thereof, which are not recited in or expressly limited by this Agreement, are reserved exclusively to the University.

ARTICLE 4
UFF PRIVILEGES

4.1 Use of Facilities and Services. Subject to the rules, regulations and policies of the Board and the University, the UFF shall have the right to use the University's facilities for meetings on the same basis as they are available to Affiliated Organizations. (See FPU-1.003 Use of University Facilities and Properties, amended on Dec. 6, 2017.) The UFF will not be charged for facility space usage or associated processing fees.

4.2 Faculty Assembly Meetings. The UFF shall have the right to address the Faculty Assembly when properly recognized by the Chair for the purpose of making announcements regarding collective bargaining or any item on the Faculty Assembly's agenda that affects the wages, hours, or other terms and conditions of employment of bargaining unit members. Such recognition shall occur in the same manner for the UFF as it does for other organizations (i.e. Student Government Association) seeking to address the Faculty Assembly for the purpose of making public comments.

4.3 Other Meetings. UFF may invite Employees to UFF events such as lunches, picnics, gatherings, dinners, and other events as determined by the UFF.

4.4 New Employees. UFF shall receive notification three times per year (prior to the opening of the fall semester, prior to the opening of the spring semester, and immediately at the conclusion of the spring semester) of new employee hires including rank and academic year salary. UFF shall be given the opportunity to speak annually at the fall faculty orientation for ten minutes.

4.5 Bulletin Boards. UFF shall have the right to post notices to employees of activities and matters of concern to employees on non-electronic bulletin boards located in areas as mutually agreed upon by UFF and the University. UFF is responsible for removing such postings when appropriate, but in no event shall the postings be left up for more than thirty (30) days. All materials placed on the designated bulletin boards shall bear the date of posting and may be removed by the University after having been posted for a period of thirty (30) days. In addition, such bulletin boards may not be used for election campaigns for public office or exclusive collective bargaining representation.

4.6 Communication. UFF shall have the right to send communications to their members or prospective members at their University email accounts for communications relevant to UFF's status as a collective bargaining agent. The University has no obligation to provide UFF or its agents with a University email account or to create or provide UFF with access to various University email lists.

4.7 Employee Information List. On a semester basis the University shall provide UFF with an electronic list (spreadsheet) of employees including the following information: first name, last name, work email address, work mailing address and phone number, position title, college/department/unit/program, payroll deduction status, salary, date of hire, date of last promotion.

4.8 UFF Activities. Faculty members or Instructors, designated as elected officers, bargaining team members, or grievance representatives may participate in the following representational activities:

(a) Attend investigations or grievance meetings to represent employees;

(b) Engage in collective bargaining while serving on union negotiating team, and;

(c) Conduct ratification or contract education as necessary to implement this agreement or re-openers;

as long as such activities do not interfere with class/lab time, office hours, or any mandatory University or Department activities or training.

ARTICLE 5
ACADEMIC FREEDOM & RESPONSIBILITY

5.1 Policy. It is the policy of the University and the UFF to maintain, encourage, and protect academic freedom. Academic freedom is essential to the University. It includes both freedom of thought and expression, and it applies to teaching, research/creative activities, and professional, public, and University service. Academic freedom is accompanied by corresponding faculty and administration responsibilities, arising from the nature of the educational process.

In order to ensure an atmosphere of academic freedom within the University neither the University administration nor its representatives shall violate any faculty member's academic freedom or penalize a faculty member for the legitimate exercise of academic freedom, either in the performance of University duties or activities outside the University. Moreover, the University recognizes that internal and external forces may seek at times to restrict academic freedom, and the University shall protect and promote academic freedom.

5.2 Academic Freedom. Faculty members shall be free to discuss topics relevant to the course's subject matter in the classroom, to explore all avenues of scholarship, research, and creative expression, to speak freely on all matters of university governance without fear of University censorship, retaliation, or discipline.

(a) Teaching and Research/Creative Activities. Faculty members shall have the freedom to:

1. Present and discuss, frankly and forthrightly, academic subjects, including controversial material relevant to the academic course being taught.

2. Select instructional materials consistent with university regulations and policies and define course content within general department guidelines, course schedules, and course delivery modalities, and holding consistent academic standards regarding the student learning outcomes as set by the curriculum. In situations where there are multiple sections of the same course, department faculty have the responsibility to select a uniform text book as a group. In the event the department faculty are unable to do so, or desire to utilize differing textbooks, prior authorization from the Provost or designee is required. Special topics classes are excluded from this requirement.

3. Determine grades. Grading standards must reflect general department guidelines, and must be substantially similar for multi-section courses. The grade a current faculty member has determined for a student's performance shall not be changed without the full-time faculty member's consent, except by the current University academic appeals process.

4. Freely engage in scholarly, research, and creative activity, and publish the results.

(b) Service. Service includes, but is not limited to, participation in governance processes of the University, which is a fundamental aspect of academic freedom. Faculty members shall have freedom to present ideas and discuss, frankly and in a forthright manner, academic policy, University governance, or other matters pertaining to the University.

(c) As to matters outside the area of the faculty member's scholarly interest, the faculty member has the right to enjoy the same freedoms as other individuals, including political rights and privileges, without fear of institutional censorship or discipline.

(d) All rights and responsibilities provided in this Article shall extend to all bargaining unit members, regardless of whether their primary assignments include teaching and research.

5.3 Academic Responsibility of Faculty Members. Academic freedom is accompanied by corresponding faculty responsibilities. Academic responsibility implies the competent performance of academic duties and obligations and the commitment to support the responsible exercise of academic freedom by others. Members of the faculty have a responsibility to:

(a) Observe and uphold ethical standards in the pursuit and communication of scientific and scholarly knowledge as well as in their teaching and service duties;

(b) Refrain from using the classroom to promote a personal, political, or other agenda that is not related to the instructional activity of the class;

(c) Provide course-level instruction designed to achieve that course's student learning outcomes, support applicable program competencies, and, to the degree relevant, prepare students for subsequent courses in the applicable program's plan of study;

(d) Treat students, staff, and colleagues fairly and civilly in discharging one's duties as teacher, researcher, and intellectual mentor, in a manner consistent with the provisions of this Agreement and University regulations and policy;

(e) Avoid any exploitation of other people for private advantage and treat them in a manner consistent with the provisions of this Agreement and University regulations and policy;

(f) Respect the integrity of the evaluation process, including the privacy rights of students under law, and evaluate students, staff, and colleagues fairly according to the criteria and procedures specified in the evaluation process;

(g) Represent one self as a spokesperson for the University only when specifically authorized to do so;

(h) Participate, as appropriate, in the system of shared academic governance, especially at the department/unit level;

(i) Observe the published University regulations, provided the regulations do not contravene this Agreement, academic freedom, or the faculty member's right to criticize or seek revision of those duties, laws, regulations, policies, or procedures.

(j) Refrain from engaging in a pattern of behavior that disrupts or obstructs the orderly and effective functioning of the department, college, or University. This section shall not be construed or used to inhibit vigorous and tough-minded academic disagreements which are a vital aspect of academic freedom or the right to free expression and thought, on or off campus. A pattern of disruptive or obstructive behavior must be supported by documentation. Academic freedom is accompanied by corresponding responsibilities, including the duty to exercise appropriate restraint and to show appropriate respect for the right of others to hold differing opinions. Consequently, while academic disagreements are part of the orderly functioning of a university, appropriate constructive cooperation is also critical to the faculty member's effective performance as a member of the academy.

5.4 Academic Responsibility of the Board and the University Administration. Academic freedom is accompanied by corresponding responsibilities of the Board and the University Administration. Academic responsibility implies the competent performance of duties and obligations and a commitment to actively foster within the University a climate favorable to the responsible exercise of academic freedom. Therefore, it is the responsibility of the Board and the University Administration to:

(a) Maintain, encourage, protect and promote the faculty's academic freedom so that it is not compromised by harassment, censorship, reprisals, or prohibited discrimination.

(b) Ensure that the faculty's academic freedom, to include freedom of thought and expression as guaranteed under the First Amendment of the Constitution of the United States of America, is not stifled or compromised.

(c) Treat faculty members, students, and staff in a manner consistent with the provisions of this Agreement.

(d) Respect the integrity of the evaluation process, including the privacy rights under law, and fairly evaluate faculty according to the criteria and procedures specified in the evaluation process.

(e) Respect and adhere to the principles of shared governance.

(f) Observe the published University regulations, provided that the regulations do not contravene academic freedom, which includes the faculty member's right to responsibly criticize and seek revision of the regulations.

(g) Refrain from engaging in behavior that directly undermines academic freedom, and freedom of thought and expression as described in this regulation or otherwise disrupt or obstruct the orderly and effective functioning of the department, college, or University.

(h) Prohibit unauthorized persons from entering or interrupting a faculty member's classroom or laboratory, except with prior permission from the responsible faculty member or during legitimate emergencies. The University shall support the authority of each faculty member to have unauthorized persons removed from the faculty member's classroom/laboratory. This provision shall not apply to administrators who are responsible for evaluating the faculty member. At the faculty member's request, University Administration shall take appropriate action to enforce this provision.

(i) Prohibit disruptive behavior, including: (1) behavior that involves violence against faculty, staff or students; (2) threat(s) or instigation of violence; (3) malicious vandalism; (4) possession of weapons of any type; (5) willful disregard of legitimate directions; (6) continued use of abusive language or gestures; (7) or other behavior that is unruly, disruptive, harassing, or abusive so that it seriously interferes with the faculty member's ability to effectively communicate with other students in the class or with the ability of the student's classmates to learn, or with the normal and orderly conducting of the University's business. The University shall support the authority of each faculty member to have disruptive persons removed from the faculty member's classroom/laboratory or the campus.

1. Upon receiving a report of disruptive behavior, the University shall act promptly to investigate and resolve the matter. Faculty may request that a disruptive individual be barred from returning to the classroom. If the University declines such a request, the University shall take appropriate alternative action that ensures against a recurrence of the disruptive behavior and shall inform the faculty member.

2. A faculty member shall not be disciplined for taking reasonable action in self-defense or in defense of others.

ARTICLE 6
APPOINTMENT & PROMOTION

6.1 General Principles

(a) The University and UFF recognize that Florida Polytechnic University is a new institution, and as such, both parties accept that flexibility is required as we develop an excellent faculty through the process of appointment and promotion. The University and UFF share the desire to improve the quality of the University in all areas, but particularly in the execution of teaching, research, and service by the faculty. This article balances a recognition of the University's unique history, newness, and current situation with a shared desire for continuous improvement.

(b) The University and UFF further recognize that promotions are an important method by which the University recognizes excellence and rewards its employees' contributions to advancing the mission of the University. Promotion decisions are not determined by any sole factor and are based upon a careful and rigorous assessment that relies upon faculty and administrative review of a faculty member's demonstrated teaching, scholarship, research and service contributions at the University, the assessment of the faculty member's continued positive contribution to their department and the University, as well as the faculty member's potential for continued appropriate contributions and growth. Elements critical to the promotion process include, but may not be limited to, a faculty member's annual performance evaluations, a significant and careful review of credentials by a set of faculty that hold at least the rank sought by the candidate, an external set of recommendations appropriate for that faculty member by subject matter experts in the candidate's field, and administrative review.

(c) Every candidate for a promotion will be fairly evaluated and the integrity of the evaluation process will be maintained to the highest degree.

(d) Non-reappointments shall not be made in an arbitrary or capricious manner.

6.2 Appointment and Reappointment Terms.

(a) Terms for appointments and reappointments are as follows:

1. Assistant Librarian and Wellness Counselor

   a. Terms will be determined, and negotiated with the UFF, prior to the date of hire.

2. Instructor

   a. Initial term: two (2) years

   b. Reappointment term: two (2) years. The University will provide instructors with its reappointment decision at least one (1) year prior to the end of the instructor's current contract.

c. Reappointment decisions must be considered by the division director (or chair if no director is present), the Provost, and the Vice Provost of assessment and instruction. Said consideration will be based on the faculty member's performance reviews since their last reappointment or, if they have not yet been reappointed since their initial appointment, faculty dossier, and other supporting materials. If supporting materials are used as part of the review, the candidate will be informed of this information, and provided a minimum of five (5) days to respond to the information.

d. Upon request, the Provost will provide a written justification for his/her decision.

3. Assistant Professor

   a. Initial term: three (3) years

   b. Reappointment term: three (3) years

   c. May only be reappointed once and must apply for promotion no later than at the completion of six, fall to spring, academic years. However, if hired prior to June 1, 2017, such faculty must apply for promotion to Associate Professor no later than the last year of their three-year reappointment term.

   d. The University may permit a faculty member to delay promotion review by granting a maximum one (1) year extension at this rank due to a valid request for FMLA or other appropriate leave. Additional extensions beyond the extra year are not permitted.

4. Associate Professor

   a. Initial term: three years, unless the University determines that an initial term of four (4) or five (5) years is warranted. The reason for a longer initial term shall be provided to the union upon request.

   b. Reappointment term: three (3) years (shortened review) or six (6) years (full review)

   c. Promotion term: Faculty members promoted from Assistant to Associate Professor shall receive an appointment term of six (6) years

5. Full Professor

   a. Initial term: six (6) years, unless the University determines that it is in its best interest to offer an initial contract with a shortened duration.

   b. Reappointment term: six (6) years when based upon a "full" review; three (3) years when based upon a "shortened" review

   c. Promotion term: Faculty members promoted from Associate Professor to Full Professor shall receive an appointment term of six (6) years

(b) Exception for Professors Employed Prior to June 1, 2017. A professor employed at the University prior to June 1, 2017, and continuously employed thereafter, who has not been promoted while at the University, will have their "shortened" review conducted in the spring of 2019, 2020 or 2021.

1. Professors must request inclusion in the shortened review pool. The University shall notify faculty in a timely manner that they must request inclusion.

2. Up to fifteen (15) professors may elect to be reviewed in the first round of shortened reviews in the spring of 2019, and eighteen (18) professors may elect to be reviewed in the spring of 2020. The remaining faculty that request a review will be reviewed in the spring of 2021.

3. If more than fifteen (15) professors elect to be reviewed in the first round, or eighteen (18) professors in the second round, elect to be reviewed, the reviews will be granted in reverse order of seniority by rank (Full Professors reviewed first) and regular order by employment seniority.

4. If less than eighteen (18) faculty elect to be reviewed in the second round (2020), the University will select candidates in reverse order of seniority by rank (Full Professors first) and regular order by employment seniority (employees that have the greatest longevity of employment are reviewed first).

5. The Provost may elect to allow another maximum of six (6) individuals to be reviewed in each round of reviews based on a request from the individual and their director, or chair if the director is not present.

6. Until a professor has received a three (3) year appointment based on a shortened review, or alternatively, has been promoted, such professor is only eligible for a contract that is at most two (2) years in duration. During this time period, the University retains the right non-reappoint such professors for substantiated poor performance. A single performance evaluation finding that is "Needs Improvement" shall not be considered substantiated poor performance.

(c) If a professor has participated in a review and is not provided with a reappointment, the professor shall be entitled to one (1) additional year of employment, with no right to continued employment. If a professor chooses not to participate in a reappointment review, or in the case of an Assistant Professor, chooses not to participate in the promotion process, the professor's employment shall end on the last date of the professor's existing contract.

6.3 Appointment Expiration and Reappointment Notice. Faculty appointments expire on the date set forth in the faculty member's employment contract. Prior to the expiration of a faculty member's appointment, the University will provide a letter to the faculty member notifying them of the expiration of their appointment. If the University intends to offer a faculty member reappointment, the University will inform the faculty member by August 15th of the year before the faculty member's existing employment contract expires.

6.4 Faculty Reappointment Review for Professors.

(a) Shortened Review

1. Assistant Professors shall receive a shortened review during the spring semester of the final year of their initial appointment (or in the case of those hired before June 1, 2017, the schedule noted above is followed), except Assistant Professors applying for promotion to Associate Professor.

2. Associate Professors hired after July 2017 shall receive a shortened review during the spring semester of the final year of their initial appointment only.

3. Assistant and Associate Professors hired on or before July 2017 shall receive a shortened review as provided in 6.1(b) above.

4. The shortened review will also be used for the initial review of Full Professors hired for an initial term of less than six (6) years.

(b) Full Review

1. All Full Professors hired for an initial term of six (6) years shall receive a full review during the spring semester (process begins in the fall) of the final year of their initial appointment term and every six (6) years thereafter.

2. All Associate Professors shall receive a full review during the spring semester (process begins in the fall) of the final year of a six-year appointment term or a non-initial three-year term

3. An Associate Professor seeking a promotion shall normally have any such promotion considered during the full review process.

4. All Assistant Professors must receive a full review in order to be promoted to Associate Professor.

6.5 Reappointment and Promotion Criteria for Professors. The awarding of reappointment or promotion shall be based on written criteria, which is established by the University and tailored by each department in accordance to this Article.

(a) University Criteria. The University will provide general criteria for the granting of promotion or reappointment to each department. Promotion and reappointment criteria shall consider the performance of the work that the professor has been assigned (as reflected in FARE forms), criteria for each rank as set forth in the 2018-2019 Faculty Handbook, and the faculty member's responsibilities as a member of the University and department community. The general criteria are recognized broadly in three (3) categories as follows:

1. Instruction, including regular classroom and laboratory teaching, classroom development, effective development/application of new instructional methods, directing thesis or dissertation committees, and other instructional activities;

2. Research or other creative activities relevant to the department mission, including scholarly publications, support and advising of graduate students; and

3. Service to professional societies and contributions to the University and department.

These criteria shall include, but are not limited to, a demonstrated record of scholarly activity, teaching, and as appropriate, course and/or curriculum development commensurate with the University's mission and relevant academic discipline(s), evidence of a positive and growing reputation in his/her chosen sub-field within the department's mission, and promise of continued successful performance.

(b) Department Clarifications of University Criteria. The department clarifications shall flexibly define department criteria based upon the broader University criteria and:

1. Be consistent with university requirements and faculty duty assignments;

2. Be detailed enough that a reasonable professor should be informed about the performance or accomplishment expectations necessary to earn reappointment or promotion, assuming that the accomplishments are of sufficient quality, quantity and consistency; and

3. Identify some representative examples of the achievements or performance characteristics which, if the requirement or distinction were met, are appropriate comparisons for reappointment or promotion.

(c) Criteria and Discipline-specific Clarification Review Process. Criteria and department-specific clarifications shall be approved according to the following:

1. The University shall establish the criteria on an annual basis, and provide it to each department's Division Director, or Chairperson if no Division Director is present. Following receipt by the department, the Committee shall convene to tailor the criteria to the department disciplines in accordance with the procedures outlined herein. The Committee shall complete its review and finalize the department clarifications within fifteen (15) days of receiving the University's criteria.

2. Department Faculty Vote. Within ten (10) days of the Committee finalizing the department clarifications, the department faculty shall conduct a confidential and anonymous vote on said clarifications. Faculty that are in their terminal year of employment (as a result of non-reappointment or layoff), visiting faculty, and instructors do not vote on the clarifications.

   a. If a majority of a department's professors vote in favor of the proposed department clarifications, the department clarifications are forwarded to the Provost for review and approval.

   b. If a majority of a department's professors do not vote in favor of the proposed department clarifications, the Committee (as outlined in Section 6.5(d)) shall reconsider the proposed clarifications prior to conducting a second vote. The Committee shall have five (5) days to reconsider the proposed clarifications and hold a second vote within five (5) days of finalizing the second round of department clarifications. If the second vote is also unsuccessful, the proposed clarifications shall be forwarded to the Provost for approval, noting the lack of department faculty support.

c. If a vote does not occur within five (5) days of the Committee finalizing the department clarifications, the department clarifications shall be forwarded to the Provost for review, noting that no vote occurred.

3. Provost Review. Within ten (10) days of receipt, the Provost shall review the proposed department clarifications to ensure compliance with this Agreement, the mission and goals of the University, and with University standards as established in the 2018-2019 Faculty Handbook. The Provost will either approve the proposed department clarifications, or return them to the Committee for reconsideration. In the event the Provost returns the proposed department clarifications to the Committee for reconsideration, he/she shall provide objections to any such provision in writing.

4. Committee Reconsideration. The Committee shall reconsider the Provost's written objections and within ten (10) days after receiving them, shall resubmit the proposed written clarifications to the Provost, incorporating all, some, or none of the objections, along with a written explanation and justification for the resubmitted language.

5. Provost Reconsideration. The Provost shall reconsider the department clarifications and issue final revisions or approvals within seven (7) days after receiving the revised department clarifications.

(d) Department Committee.

1. The Vice-Provost of Assessment and Instruction (or designee), Department Chairperson (or if Division/Department Director is present, Division director, or designee) of each respective department, and two (2) faculty members from the department (at least one holding the most senior rank in the department, subject to the limitation below) shall form the "Committee." Department faculty shall select their representative faculty members on an annual basis during the first week of the fall semester (except for Spring 2019, when the Committee shall be formed as early as possible in the semester). Faculty members that received a notice of non-reappointment or notice of layoff, instructors, and visiting faculty are not eligible to serve on the Committee or participate in the Committee selection process (this includes individuals that contest their non-renewal status).

2. The Provost shall provide a framework and formally charge said Committee to develop and maintain written clarifications of the University's reappointment and promotion criteria in terms tailored to the department's discipline(s) and assigned duties, and consistent with University standards as established in the 2018-2019 Faculty Handbook.

(e) The criteria shall be available in the department and in the Provost's office or upon request from the Department Chairperson. All such criteria shall also be provided to UFF upon written request.

6.6 Promotion Categories and Eligibility Criteria. Subject to the requirements set forth herein, faculty holding the rank of Assistant Professor, and Associate Professor shall be eligible to apply for promotion to the next higher rank.

(a) Individuals that seek promotion from Associate Professor to Full Professor, must declare their intent to seek promotion in writing to their Division Director if present, chair if no director is present, and the Provost no later than August 1 before the academic year in which they will seek promotion.

(b) Minimum Qualifications. Professors must serve at least five (5) academic years at their current rank in order to qualify for promotional consideration to a higher rank. At least two (2) of the five (5) immediately preceding academic years must be served at the University. The University may provide exceptions to these minimum qualifications upon request of a professor and approval of their Chair, Director (when a Director is present), and the Provost or designee.

(c) If the University previously promoted the candidate, the promotion assessment shall be based on the candidate's performance since the candidate's last promotion.

(d) If the University has not previously promoted the candidate, the promotion assessment is cumulative and must include consideration of the candidate's achievements prior to employment at the University. However, the candidate's promotion assessment must also establish that the candidate has continued to progress and achieve in the categories and criteria used for reappointment and/or promotion while employed at the University.

6.7 Changes in Criteria for Reappointment and Promotion for Professors.

(a) Following the Provost's approval of the criteria, the University may modify the approved University criteria for reappointment and promotion so long as the UFF has been notified of the proposed changes and offered an opportunity to discuss such changes in consultation with the President or designee.

(b) Changes to discipline-specific departmental clarifications of the University criteria shall be developed and approved according to the process outlined above.

6.8 Reappointment and/or Promotion Procedure for Professors. The below procedure shall be followed for all reviews related to reappointment and promotions, with exceptions noted below regarding "Shortened" reviews.

(a) The University will provide notification to eligible professors prior to the semester that their reappointment and/or promotion review starts, with the exception of reviews conducted in Spring 2019. Such notification will provide the professors with information relevant to the applicable reappointment/promotion process including instructions, information, and deadlines.

(b) Professors shall provide the University with their Packet by the deadline set forth in the notice referenced herein.

(c) If a professor does not receive a promotion following consideration, the professor may not reapply for promotion until after the completion of two (2) additional academic years. This clause shall not unreasonably deny a professor their terminal promotion consideration to Associate Professor.

(d) The candidate being considered for promotion may withdraw from consideration provided that the withdrawal is made before the UEC begins its consideration of the candidate. Such withdrawal shall be without prejudice and will not render the candidate ineligible for the next promotional cycle.

(e) The University shall provide the Packet (as described in Section 6.9) to the PAEP for review. For reviews of Associate and Assistant Professors, the PAEP shall consist of faculty of a higher rank than the Candidate within the Candidate's division, or if no division is present, within the Candidate's department. The Division Director, if present, or if there is not a division, the Department Chair chairs the PAEP if he or she holds the appropriate faculty appointment rank. If the Division Director or Department Chair does not hold the appropriate rank, the Provost will appoint a chair for the PAEP. There must be a minimum of three (3) qualified (appropriately ranked) individuals serving on the PAEP. If the number of individuals available to serve on the PAEP is less than three (3), the Provost and PAEP Chair will each select a faculty member of appropriate rank from another unit at the University to serve on the PAEP. If the PAEP includes no members from the candidate's department, the PAEP will request input from the department chair before finalizing their recommendation. If the chair is the candidate and no member from the chair's department is a member of the PAEP, the Provost or designee shall select a member of the chair's department to provide input to the PAEP before the PAEP finalizes their recommendation.

The PAEP will prepare and provide a report and recommendation to the UEC during a full review, or if during the "shortened review" process, directly to the Provost.

(f) University Evaluation Committee ("UEC"). The UEC is not utilized as part of the shortened review evaluation process. The UEC is formed from those holding Full Professor rank from a nomination pool provided by the Faculty Representative Council; however, if there are less than five qualified individuals at the University, all such qualified individuals shall be deemed in the nomination pool. Individuals that are in their terminal year of employment (as a result of non-reappointment or layoff) are not eligible to serve on the UEC or PAEP. Term duration will be staggered to have a "normal" term of 3 years in length and with overlap in UEC membership so that committee memory is maintained. In years where an individual is up for reappointment review, he or she may not participate in the UEC. If less than three (3) individuals are eligible to staff the UEC, the UEC will be chaired by the Provost with all eligible faculty serving as members. When the University includes fewer than 10 individuals with rank Full Professor, the UEC will be between three and five individuals at the discretion of the administration. With 10 to 20 Full Professors on staff, the UEC will be between five and seven individuals at the discretion of the administration, with more than twenty (20) Full Professors, the committee will include seven members. The UEC must operate in executive session and in total confidentiality.

When reviewing a Full Professor, and that faculty member's unit does not have a minimum of four (4) individuals with the rank of Full Professor, the UEC will be the sole reviewing committee for that faculty member.

The UEC will prepare a report and recommendation, and provide both the PAEP (if it was done) and UEC reports and recommendations to the Provost. If the Provost chairs the UEC, the Provost will not make a recommendation, but will supply a candidate's Packet, and both the UEC and PAEP reports to the President for a final decision.

(g) Provost's Review and Recommendation. After a careful review of the PAEP's and UEC's reports and recommendations, the Provost shall make a positive or negative recommendation as to the Candidate's reappointment or promotion. The Provost's recommendation, if positive, is provided to the President, and if negative, the decision and written justification are provided to the Candidate. Negative recommendations from the Provost are terminal, but are appealable to the President.

(h) President's Review and Authority. The President shall have the sole authority to grant a Candidate's reappointment or promotion. The granting of reappointment or promotion should be based on the University's criteria and criteria produced by the Candidate's unit or department, the reports and recommendations of the PAEP and UEC, any documents relied upon by the PAEP and UEC in creating said reports, and the recommendation of the Provost.

(i) If the President's final decision on reappointment and promotion is negative, the Candidate may request within ten (10) days a written justification of the decision. Upon such a request, the President or representative shall, within twenty (20) days, provide such a written justification to the Candidate.

6.9 Reappointment and/or Promotion Packet for Professors. The Reappointment and/or Promotion Review Packet ("Packet"), utilized in the procedure set forth in Section 6.8, shall include, at a minimum, the following:

(a) Candidate Prepared Dossier. A Candidate for reappointment or promotion prepares a dossier for consideration. This dossier must include a personal statement from the Candidate, elements that show the Candidate's demonstrated abilities and competencies in teaching, service, and research, including but not limited to all evaluation materials from prior years of employment at the University. Intentional or significant misrepresentations contained in the Candidate's dossier shall serve as cause for termination. The Provost shall develop the format and guidelines for the Candidate Prepared Dossier and send them to the Faculty Representative Council ("FRC") for review and comment. The FRC shall, within fourteen (14) days of receipt, review the format and guidelines and recommend approval or changes to the Provost. Should the FRC recommend changes, the Provost shall, within ten (10) days, either accept the changes or give a written justification for not accepting the changes. Candidate Prepared Dossier must follow the final format as finalized by the Provost and faculty are solely responsible for the content within, and production of, the dossier.

(b) Reference Letters. Reference letters are required for promotion reviews and may be requested for "full" reviews by either the candidate or the division director (or chair if no director is present). Reference letters are confidential and will be requested using a template that instructs the external reviewer on the individual being evaluated, the materials supplied, and any special considerations, including the University's history, teaching expectations, and research infrastructure. This template will be developed according to and as part of the process laid out in Section 6.8 – Reappointment and/or Promotion Procedure for Professors. The Candidate "nominates" up to four (4) individuals to provide reference letters. The Division Director, or if the academic unit does not belong to a division, Department Chair, in conjunction with the Program Area Evaluation Panel ("PAEP") formally requests all external reference letters, which shall include at a minimum two individuals nominated by the Candidate, and a minimum of two letters from individuals not nominated by the Candidate. A single negative reference may not be the sole basis for not reappointing a candidate or for not promoting a candidate. A minimum of four (4) reference letters must be requested. The confidential reference letters shall be included for review with Candidate's dossier and any supplemental materials. A list of the names of all individuals asked to provide a review and whether any declined to provide this review, and reason given, if any, will also be included. Promotion and reappointment decisions shall not be based solely on the reference letters received.

(c) PAEP and UEC Supplemental Information. Both the PAEP and the UEC may acquire and provide supplemental materials and/or other information as they see fit. If supplemental materials and/or other information is used as part of the review, the candidate will be informed of the use of this information, and provided a minimum of five (5) days to respond to the information.

6.10 Promotion Date. Promotions for professors that are granted shall be effective on August 15th following the decision date. An individual may use their new title effective after written notification of their promotion.

6.11 Grievability. The University's decision to not offer reappointment or promotion to an employee shall not be considered as disciplinary action. The decision to not offer reappointment or promotion is grievable according to Article 11 - Grievance and Arbitration Procedure, as an employee may contest the decision because of an alleged violation of a specific term of the Agreement or because of an alleged violation of the employee's constitutional rights. The remedy for any grievance filed under this provision, if successful, shall not include an award of reappointment or promotion. Such grievances must be filed within thirty (30) days of the Candidate's receipt of the promotion or reappointment decision. The PAEP and UEC reports shall be available for arbitration proceedings upon request.

ARTICLE 7
ASSIGNMENT OF RESPONSIBILITIES

6.12 Policy. The University and UFF agree that the assignment of responsibilities to faculty members is one of the mechanisms by which the University establishes its priorities, carries out its mission, and creates opportunities to increase the quality and integrity of its academic programs.

6.13 Faculty Assignment. Teaching, research, and service are integral parts of a faculty member's assignment. Instructors are not assigned research.

The University and UFF recognize that there are legitimate differences in faculty development needs within the academic and university community, in interests and areas of expertise among faculty members, in conventions among academic disciplines, in academic program needs, and in the needs of units employing faculty members. A prescriptive, rigid, and uniform formula that inflexibly dictates annual workloads for individual faculty is not conducive to responding to these differences. This Agreement is intended to provide assignment flexibility, allowing for shifts in the emphasis placed on various duties throughout a faculty member's career.

The University and UFF recognize that it is a part of the faculty member's professional responsibility to carry out a majority of their duties on campus. Examples of duties and activities which occur on campus during normal business hours, and may require attendance in-person, include, but are not limited to, regularly scheduled instructional activities, scheduled office hours, departmental or University-wide meetings (ex. All Hands), and training sessions. Attendance in campus meetings by telephone is typically not an appropriate solution to executing a faculty member's duties. The University and UFF further recognize that other duties may be more appropriately performed in a manner and place (i.e. off-campus location), as determined by the faculty member. Regardless, a faculty member shall not choose to work off campus in a manner that materially affects their ability to perform their duties, including those that involve interaction with students, other faculty, and staff. The University shall make a reasonable and good faith effort, consistent with other provisions of this Agreement, to provide faculty members with the necessary facilities and resources for carrying out their assigned duties and responsibilities.

Faculty members receive their assignments of duties and responsibilities, in writing, from the University prior to the beginning of each new semester. Assignments generally include instruction, research, and service activities; however, research and service may be assigned on a more flexible basis.

6.14 Considerations in Assignments for Faculty. The University and UFF recognize that the Legislature has described the minimum full academic assignment as twelve (12) contact hours of instruction or equivalent research/scholarship/creative activity and service. The University and UFF also recognize that professional obligations undertaken by a faculty member will often be broader than that minimum. The University also recognizes that, to ensure quality of instruction and provide opportunities for appropriate professional development, faculty should be assigned more than twelve (12) credit hours of work in a fall or spring semester only in unusual circumstances.

(a) Any assignment of responsibilities that exceeds fifteen (15) credit hours in a fall or spring semester will be considered an overload.

(b) Any assignment that exceeds twelve (12) credit hours in teaching (classroom instruction and teaching buyouts) for a fall or spring semester will be considered an overload.

(c) When making assignments, the Chair should consider a credit hour of independent research or service as roughly equivalent to three (3) to four (4) hours of work per week over a fall or spring semester.

(d) Subject to the provisions of this Agreement, the University has the right to determine the type of duties and responsibilities that comprise the professional obligation and to determine the relative proportion of effort a faculty member may be required to expend on the various components.

(e) Faculty will be provided an opportunity to express their preference for courses that they would like to teach and preferred schedules for delivery that adhere to University established course scheduling standards. The Chair, or in the absence of Chair, the Director or Provost will consider these requests in addition to other considerations such as workload assignment fairness, providing an appropriate learning environment for students, upholding appropriate academic standards, and facilitating student success when assigning courses and other responsibilities.

(f) The Chair shall inform the faculty member of their course and service assignments and shall offer the faculty member the opportunity to discuss their overall course and service assignments.

6.15 Assignment Notification

(a) Communication of Assignment to Faculty

1. A tentative assignment of responsibilities for the fall semester shall be provided no later than July 15.

2. A tentative assignment of responsibilities for the spring semester shall be provided no later than November 20.

3. The faculty member shall be notified of the final assignment in writing no later than two (2) weeks in advance of the starting date of each semester.

4. New faculty members shall be informed of assigned duties as soon as can be done.

(b) Change in Assignment

1. If it should become necessary to make changes in a faculty member's assignment, the person responsible for making the change shall notify the faculty member as soon as practicable prior to making such changes and shall specify the changes and the reason for the changes in writing.

2. The University shall make a good faith effort not to change a faculty member's teaching assignment less than two (2) weeks prior to the beginning of the semester.

3. If a faculty member has been assigned or reassigned a course fewer than two (2) weeks prior to the beginning of the semester, such circumstances shall be taken into consideration when reviewing student evaluations of the course.

6.16 Equitable Opportunity. To the extent feasible, each faculty member will be given assignments that provide equitable opportunities in relation to other faculty members, to meet required criteria for annual evaluations, reappointment and promotion.

6.17 Resolutions of Assignment Disputes.

A faculty member shall, upon written request, be granted a conference with the person responsible for making the assignment to express concerns. If the conference does not resolve the faculty member's concerns, the faculty member shall be granted, upon written request (Submission shall not exceed a single page, double-spaced, utilizing size 12 Times New Roman), and within three (3) calendar days of the conference, an opportunity to discuss those concerns with the Division Director; if the faculty member is not a part of a Division, the conference will be with the Provost (or designee). A final decision shall be rendered within seven (7) calendar days of the Division Director or Provost (or designee) receiving the faculty member's written request. The faculty member shall perform the assignment until the final resolution of the matter as prescribed in this Agreement.

(a) The parties recognize the following factors are critical to assignments:

1. Assignments are driven primarily by the program and curricular needs of the students in the programs in the department. The preferences and desires of faculty members are secondary to those program and curricular needs.

2. Not all faculty assignment requests and circumstances can be accommodated, and that inability to accommodate does not in and of itself represent an arbitrary and unreasonable assignment.

3. The time between the beginning of the first assignment and the end of the last assignment in one (1) day should not exceed nine (9) hours, unless there is no practicable alternative.

4. The time between the end of the last assignment on one (1) day and the beginning of the first assignment for the next day should not be less than twelve (12) hours, unless there is no practicable alternative.

(b) If the director or Provost denies a faculty member's request for re-assignment, the University shall provide the reason in writing to the faculty member.

6.18 Overload Assignments.

(a) An overload assignment is defined in 7.3(a) and 7.3(b).

(b) As compensation for an overload assignment, the faculty member shall receive 4.167% of the faculty member's academic year rate of pay for each credit hour of overload assignment.

6.19 Summer Appointments and Assignments.

(a) Summer appointments are separate and distinct from the nine (9)-month academic year appointment and do not affect the faculty member's term of appointment.

(b) Summer assignments shall be offered based on student needs to qualified faculty members by the individual named in section 7.3(e) or (f). The summer course schedule shall be developed considering available budget, student demand, and program and curricular needs of the department, division, and University. Faculty members that would like to teach in the summer should inform their Chair of their availability and which courses they are available to teach. The Chair will consider these requests in addition to other considerations such as workload assignment distribution, budgetary constraints, providing an appropriate learning environment for students, upholding appropriate academic standards, and facilitating student success.

(c) A full-time (1.0) FTE summer assignment shall consist of teaching 7.4 credit hours. In normal circumstances, a summer teaching assignment will not exceed eight credit hours. The summer instructional assignment, like that for the fall and spring semesters, includes the normal activities related to such an assignment as defined by the department/unit and the nature of the course, such as course preparation, minor curriculum development, lectures, evaluation of student efforts, consultations and conferences with students, and minor committee activities.

(d) No faculty member with a nine (9) month appointment shall be required to accept a summer appointment.

(e) Faculty members with a nine (9) month appointment who have not been assigned a summer course shall not be required to undertake committee work during the summer without compensation.

6.20 Summer Assignment Considerations.

(a) The summer course schedule shall be developed to meet the program and curricular needs of the students in the programs in the department.

(b) The department officer (specified in Section 7.3(e) or (f)) who schedules summer courses shall consult with the faculty members about which courses they are qualified and available to teach.

(c) Summer appointments shall be offered no later than three (3) weeks prior to the beginning of the appointment, if practicable.

(d) In the event a faculty member does not receive a Summer Assignment, the faculty member may utilize the procedure set forth in Section 7.6.

6.21 Summer Compensation for Nine-Month Faculty.

(a) A faculty member's summer employment contract shall specify the compensation provided for the appointment.

1. For each credit hour assigned to be taught during the summer, the faculty member shall receive 4.167% of the faculty member's academic year rate of pay.

2. The University may choose to offer, and the faculty member may choose to accept, higher compensation than that described in the previous section.

(b) Other credit-generating activities such as thesis or dissertation supervision, directed independent studies, supervised teaching or research, or supervision of student interns, as well as research or service activities, may be offered during the summer term for mutually agreed-to compensation for that specific activity separate from the compensation provided for any summer instructional assignment.

(c) The University also reserves the right to employ faculty over the summer period for non-teaching duties, for agreed upon times and at a rate not below the faculty member's standard daily rate of pay.

6.22 Considerations in Assignment for the Academic Professionals. A work week for academic professionals will consist of a minimum of forty (40) hours. The University and UFF recognize that professional obligations undertaken by academic professionals will often require more than that minimum.

(a) Subject to the provisions of this Agreement, the University has the right to determine the type of duties and responsibilities that comprise the professional obligation of an academic professional.

(b) In making assignments, or adjustments to assignments, the University shall consider the needs of the unit and such non-teaching academic professionals' preferences, qualifications and experiences, and professional development interests.

ARTICLE 8
PERFORMANCE EVALUATIONS

8.1 Policy. Performance evaluations are used to assess, recognize, and facilitate improvement in Employees' performance. This strengthens the University's workforce by providing a periodic and formal exchange of information between supervisors and employees regarding progress, accomplishments, and when applicable, areas needing improvement. Performance evaluations also provide an opportunity to clarify work standards, discuss training and development needs, set goals for the next year, and identify the support needed to reach such goals.

8.2 Purpose and Scope of Evaluation.

(a) Purpose. Annual evaluations for faculty members focus on performance in functions such as teaching, research, service, and other duties that may be assigned. Annual evaluations for academic professionals focus on performance of all assigned duties. In addition, all Employees are evaluated based on their contributions to the orderly and effective functioning of the University and their academic department/unit.

(b) Scope. Evaluators should endeavor to assist the Employee in correcting any performance deficiencies reflected in the annual evaluation. Employees are encouraged to accept and seek such assistance, if needed. The evaluation should also state goals for the upcoming year and address progress toward promotion.

8.3 Annual Evaluation. Employees are evaluated at least once annually.

(a) The annual appraisal period will cover all employment occurring from February 1 through January 31, regardless of the employment start date. The annual evaluation process will approximately follow the sample schedule below:

DATE / DATE RANGE	ACTIVITY
February 1 – January 31	*Performance appraisal time period*
February 1 – February 15	*Employee evaluation materials completed by Employee and transmitted to their evaluator*
February 16 – March 30	*Evaluators complete draft evaluations and submit faculty evaluations to Panel for review*
April 1 – April 7	*Panel reviews faculty evaluations*
April 8 – May 15	*Evaluations revised if necessary, and distributed to Employees*
May 15 – May 29	*Evaluations discussed with employees*
May 30	*Evaluations submitted to HR*

(b) This process does not align with the academic semesters but provides for evaluation during the spring semester while all Employees are on campus. The evaluator must complete the appraisal, review and discuss it with the Employee (unless the Employee chooses to not discuss the appraisal), and provide a copy to the Employee prior to May 15. The Evaluator and Employee shall sign the appraisal, and the Evaluator shall submit the signed appraisal to Human Resources by May 30, and a copy of the signed appraisal shall be placed in the Employee's personnel file.

8.4 Probationary Appraisal. In addition to the annual evaluation, the academic professional shall receive a probationary appraisal after ninety (90) days of employment in their position.

(a) In the absence of a completed probationary appraisal, a probationary employee will default to a "satisfactory" rating.

(b) If the academic professional's probationary period ends between October 31 and January 30, the employee's immediately following annual appraisal may be skipped. If skipped, the employee shall be evaluated during the next annual appraisal period.

8.5 Evaluators.

(a) Faculty Evaluators are the Department Chair or Division Director that has been assigned personnel management responsibility by the Provost for the Employee's area. When the evaluator is a Division Director, the Division Director will seek advice and context from a department chair for each of the faculty members in the unit. The Assistant Librarian and Wellness Counselor are evaluated by their immediate supervisor.

(b) For faculty, the Provost will appoint an evaluation review panel which will consist of Evaluators, and if the Faculty Representative Council chooses to do so, two faculty members of senior rank (Associate Professor or Professor) appointed by the Faculty Assembly. The purpose of the review is to ensure the Evaluators have applied a consistent standard to all faculty members when conducting the evaluations. This review may produce changes in evaluations. The Provost will serve as chair of the evaluation review panel. All members of the evaluation review panel must agree to the confidentiality of the review process.

8.6 Evaluation Review.

(a) Within fourteen (14) calendar days of receipt of the evaluation, the faculty member may request a review, in writing, with the Provost's Office to discuss (with the Provost or Provost's designated administrator) concerns regarding the evaluation which were not resolved in previous discussions with the evaluator. The Provost shall designate an administrator to meet with the

(b) Within fourteen (14) calendar days of receipt of the evaluation, the academic professional may request, in writing, a meeting with the administrator at the next higher level in their line of authority to discuss concerns regarding the evaluation which were not resolved in previous discussions with the evaluator.

8.7 Evaluation Information Sheet. A sample Faculty Activity Report format is attached to this contract in Appendix B. The Faculty Representative Council may provide the Provost with recommended changes to the information sheet's format no later than December 1 on an annual basis. The Provost will communicate decisions on changes in the format to the Faculty Representative Council by January 15. (See Appendix B). Information used to evaluate a faculty member other than that included in the faculty member's dossier will be disclosed to the faculty member.

8.8 Evaluation Criteria. The administration will develop a set of evaluation guidelines for each of the faculty ranks that indicates performance characteristics appropriate to each rating for teaching, scholarship, and service. The guidelines will also indicate how an overall "rating' will be determined. The guidelines for a review period will be provided to the academic departments by September 15 of the year prior to the beginning of the review period and the departments will provide comment on the guidelines on or before November 1 of that year. The comments provided shall be approved by majority vote of the department. The vote shall take place anonymously. In early January, the review evaluation panel will consider the department recommendations and provide a recommendation to the Provost on evaluation guidelines to be used for the next review cycle. The final guidelines shall be provided to faculty before the review period begins.

Annual evaluations for February 1, 2018 through January 31, 2019 period will use the evaluation guidelines that were used for the 2017-2018 evaluations.

The scale for the evaluations is provided in the following table:

EVALUATION KEY	
Unsatisfactory	*Performance that is clearly substandard.*
Needs Improvement	*Performance that is below a reasonable expectation for the person's job description.*
Meets Expectations	*Performance is basically sound and within reasonable expectations for the person's job description.*
Exceeds Expectations	*Performance is basically sound and within reasonable expectations for the person's job description. The individual has distinguished themselves in some way by performing at a level that is above a normal expectation for their job description.*
Exemplary	*Performance is basically sound and above reasonable expectations for the person's job description. The individual has truly done something that is outstanding.*

8.9 Evaluation File. Faculty members shall refer to 6C13-6.008 Personnel Records and Limited-Access Records regarding access to performance evaluations. All employees may provide a written response and/or comments regarding their evaluation and have it added to the evaluation file within sixty (60) days of the receipt of the evaluation. All written material used to produce a performance evaluation shall be included in the evaluation file.

ARTICLE 9
DISCIPLINE

9.1 Policy. Employees are subject to disciplinary action, up to and including discharge, for just cause, including but not limited to, for violating University procedures, policies, rules, and regulations, contract provisions, personnel directives, and/or general orders. Due process shall be provided prior to any final decisions regarding disciplinary actions (excluding oral reprimands). Employees shall be provided notice and a written statement of any disciplinary action taken (excluding oral reprimands).

9.2 Just Cause. Discipline of bargaining unit employees shall be for just cause. Just cause is defined as:

(a) incompetence; or

(b) misconduct

9.3 Progressive Discipline. Disciplinary actions shall be progressive. Certain actions by their nature may be severe enough, however, to justify deviating from progressive disciplinary principles, and result in immediate discharge of employment or other disciplinary action. Forms of discipline may include, but are not limited to:

(a) oral counseling;

(b) written reprimand;

(c) suspension without pay; and

(d) discharge of employment.

9.4 Review of Personnel Files. Employees shall have the right to review their official personnel file upon request. The employee shall have the opportunity to submit a written statement responding to any written reprimand issues. The employees' responding statement will be entered in the personnel file included with the written reprimand.

9.5 Investigations. When an employee is questioned by management, and the employee reasonably believes that the questioning may lead to disciplinary action, the employee has the right to request that a union representative be present at the meeting. When an employee requests union representation pursuant to this section, and no union representative is immediately available, the University shall postpone the meeting until a representative is available, cancel the meeting, or at the employee's option, continue the meeting without a representative.

9.6 UFF Representation. UFF determines representation per its governing documents. The UFF does not represent bargaining unit employees who are not members in good standing at the time of an alleged incident.

ARTICLE 10
LEAVES

10.1 Policy. Leave is provided in a variety of forms to meet the needs of both the University and its employees. All leaves are administered in accordance with this Agreement and applicable laws. All leaves are granted at the discretion of the appropriate administrator unless the applicable law or this Agreement provides otherwise. Permission for annual leave and sick leave shall not be arbitrarily withheld. Nothing contained in this Agreement shall modify or replace any leave governed by Florida Statutes, federal law, and/or applicable rules or regulations.

10.2 Annual Leave. Regulation FPU-6.004 Annual Leave adopted by the Board of Trustees, and amended on September 14, 2016, governs the provision of, administration of, and use of Annual Leave for and by eligible employees.

10.3 Sick Leave. Regulation FPU-6.005 Sick Leave adopted by the Board of Trustees, and amended on March 1, 2018, governs Sick Leave for eligible employees.

10.4 Sick Leave Pool. Regulation FPU-6.006 Sick Leave Pool adopted by the Board of Trustees on February 5, 2014 governs the Sick Leave Pool for eligible employees.

10.5 Family and Medical Leave Act (FMLA). Policy FPU-6.0071P Family and Medical Leave of Absence adopted by the University on February 3, 2017 governs FMLA leave by eligible employees.

10.6 Paid Parental Leave. The University will provide paid parental leave to eligible employees following the birth of an employee's child or the placement of a child with an employee in connection with adoption. Eligible employees are eligible for paid parental leave as follows:

(a) An employee shall be granted, upon request, a paid parental leave:

1. For twelve-month employees the leave is up to a period of ten (10) contiguous weeks, normally commencing no sooner than one (1) week prior to, and no later than three (3) months after, the date of the birth or adoption;

2. For employees with full time academic year appointments, up to twelve (12) contiguous weeks during the Academic Year, normally commencing no sooner than one (1) week prior to, and no later than three (3) months after, the date of the birth or adoption period.

(b) During a parental leave, there is no accrual of sick or annual leave time.

(c) Parental leave may be used no more than twice during the employee's employment at the University. If both parents are employees of the University, only one parent may request paid parental leave under this program for each qualifying event (birth or adoption).

(d) In order to participate in this program, an employee must be employed full-time for a minimum of one academic year prior to the date of the birth or adoption. This program does not apply to individuals on a temporary, a term limited, or a visiting appointment.

(e) Under normal circumstances, the employee will request the use of paid parental leave in writing no later than three (3) months prior to the beginning of the leave.

(f) Parental leave is separate from, but may run concurrent with, medical or FMLA leave.

(g) The employee will sign a written agreement detailing the terms of the paid parental leave. Participation in paid parental leave is contingent upon execution of the signed agreement.

(h) The employee must agree in writing to return to University employment as a full-time employee for one academic year following participation in the program. The employee shall repay the salary, retirement, benefits, and expenses received during paid parental leave to the University in those instances where payments are made to the employee in the absence of a signed agreement by the employee, or when the employee fails to comply with the terms of such agreement.

(i) An employee who makes use of parental leave and who remains in University employment full-time for at least one academic year (calendar year for non-instructional employees) following participation in the parental leave program shall have the total number of unfunded hours used during the parental leave deducted from the employee's sick leave and/or annual leave balance (with sick leave being deducted first) that the employee has remaining at the time of separation from the University, or upon transferring between an annual and non-annual leave accruing contract.

(j) Employees on paid parental leave cannot engage in outside employment unless approved by the Provost in writing in advance.

10.7 Other Types of Leave. Regulation FPU-6.007 Other Types of Leave adopted by the Board of Trustees on February 5, 2014 governs Administrative Leave (including Jury Duty, Non-Expert Witnesses in a Hearing or Trial, Athletic Competition, Official Closing of the University, Florida Disaster Volunteers, Volunteer Emergency Response Team Members, Voting in Public Elections, University Investigations, Disciplinary Notice, Best Interest of the University, and Presidential Discretion); Bereavement Leave; Compulsory Leave; Family and Medical Leave; Military Leave; Workers' Compensation; and Domestic Violence Leave for eligible Faculty Members.

10.8 Certification of Work and Absences. Employees will comply with University Policy FPU-6.0031P Work and Absence Certification adopted April 12, 2017.

10.9 Unpaid Leave.

(a) Granting/Denial. Upon request of an employee, the University may grant a leave without pay for a period not to exceed one (1) year, provided such leave would not be inconsistent with the best interests of the University. Such leave may be extended upon mutual agreement. The University shall approve or deny such request in writing no later than thirty (30) days after receipt of the request, and if not approved within thirty (30) days, the request shall be deemed denied.

(b) Retirement Credit. Retirement credit for such periods of unpaid leave shall be governed by the rules and regulations of the Division of Retirement and the provisions of Chapter 121, Florida Statutes.

(c) Retention of Leave and Holiday Pay. While on unpaid leave pursuant to this section, the employee shall retain accumulated sick leave and annual leave, but shall not accrue or be entitled to use, sick leave or annual leave, nor are they entitled to holiday pay, during the unpaid leave period.

(d) Benefit Premiums. Employees on unpaid leave will be responsible for the entire cost of benefit premiums. Employer contributions shall be governed by applicable rules, regulations or Florida law.

(e) Other Benefits. Employees on unpaid leave are not entitled to any benefits during the unpaid leave period.

10.10 Return from Leave.

(a) An employee who returns from an approved paid leave shall be returned to the same or equivalent position in the same work location.

(b) An employee who returns from unpaid leave shall be returned to the same or equivalent position in the same work location, unless such a position is unavailable. In the event an equivalent position in the same work location is unavailable, the University will identify and offer the employee an equivalent position at a different location.

(c) Regardless of whether the employee returns from paid or unpaid leave, the base salary of the returning employee shall be adjusted to reflect all base salary increases distributed to in-unit employees during the period of leave, if the returning employee is eligible for said increases.

ARTICLE 11
GRIEVANCE & ARBITRATION PROCEDURE

11.1 Policy/Informal Resolution. The parties agree that all problems should be resolved, whenever possible, before the filing of a grievance but within the time limits for filing grievances stated elsewhere in this Article, and encourage open communications between administrators and employees so that resorting to the formal grievance procedure will not normally be necessary. The parties further encourage the informal resolution of grievances whenever possible. At each step in the grievance process, participants are encouraged to pursue appropriate modes of conflict resolution including the use of mediation. The purpose of this Article is to promote a prompt and efficient procedure for the investigation and resolution of grievances. The procedures hereinafter set forth shall be the sole and exclusive method for resolving the grievances of employees as defined in this Article.

11.2 Definitions and Forms. As used in this Article:

(a) The term "grievance" shall mean a dispute filed on a form referenced in Section 11.2(d) concerning the interpretation or application of a specific term or provision of this Agreement, subject to those exclusions appearing in other Articles of this Agreement. The grievance must specify the act that allegedly violates this Agreement, including the name(s) of any individual(s) which committed the act, the term of this Agreement that has allegedly been violated, and propose a remedy.

(b) The term "grievant" shall mean an employee or group of employees who has/have filed a grievance in a dispute over a provision of this Agreement which confers rights upon the employee(s). In accordance with state law, the UFF may file a chapter grievance on behalf of a person, a group of people, or the chapter itself. In order to process a chapter grievance submitted on behalf of a group of employees, the grievance must identify the group with sufficient specificity to allow the University to identify the individual members. A chapter grievance shall identify the specific remedy sought for the members.

(c) A chapter grievance or a grievance of a decision made by the President or Provost may be initiated at Step 2. The parties may agree to consolidate grievances of a similar nature to expedite the review process.

(d) Grievance Forms. Each grievance, request for review, and notice of arbitration must be submitted in writing on the appropriate form attached to this Agreement as Appendix C, and shall be signed by the grievant. All grievance forms shall be dated and assigned an identifying number by the Office of the General Counsel when the grievance is received. If there is difficulty in meeting any time limit, the UFF representative may sign such documents for the grievant; however, the grievant's signature shall be provided prior to the Step 1 meeting or Step 2 review if filed directly at Step 2. All grievance forms shall be filed by email, to the General Counsel's office email address (ogc@floridapoly.edu), and must contain the identifying grievance number once assigned.

11.3 Burden of Proof. In all grievances, except those challenging disciplinary actions, the burden of proof shall be on the employee.

11.4 Representation. UFF shall have the exclusive right to represent any in-unit employee in a grievance unless an employee elects self-representation or to be represented by legal counsel. If an employee elects not to be represented by UFF, the University shall promptly inform UFF in writing of the grievance. No resolution of any individually processed grievance shall be inconsistent with the terms of this Agreement, and for this purpose, UFF shall have the right to have an observer present at all meetings called to discuss such grievance and shall be sent copies of all decisions at the same time as they are sent to the other parties.

11.5 Grievance Representatives. UFF shall annually furnish to the University a list of all persons authorized to act as grievance representatives and shall update the list as needed. The UFF grievance representative shall have the responsibility to meet all classes, office hours, and other duties and responsibilities incidental to the assigned workload. Such representative shall have the right during times outside of those hours scheduled for these activities to investigate, consult, and prepare grievance presentations and attend grievance hearings and meetings. Should any hearings or meetings with the Vice Provost of Assessment and Instruction, Provost, or their designees necessitate rescheduling of assigned duties, the representative may, with the approval of the appropriate administrator, arrange for the rescheduling of such duties or their coverage by colleagues. Such approval shall not be unreasonably withheld.

11.6 Appearances.

(a) When an employee participates during working hours in an arbitration proceeding as the grievant, or in an official capacity during a grievance meeting between the grievant or representative and the University, that employee's compensation shall neither be reduced nor increased for time spent in those activities.

(b) Prior to participation in any such proceedings, conferences, or meetings, the employee shall make arrangements acceptable to the appropriate supervisor for the performance of the employee's duties. Approval of such arrangements shall not be unreasonably withheld. Time spent in such activities outside regular working hours shall not be counted as time worked.

11.7 Formal Grievance Procedure.

(a) Filing. All grievances shall be electronically filed via email (Appendix C) with the Office of the General Counsel (ogc@floridapoly.edu). In all cases, a grievance must be filed within twenty (20) days following the act or omission being grieved, or the date on which the employee knew or reasonably should have known of such act or omission if that date is later. Twenty (20) days shall be calculated from the date in which the grievance is emailed to, and confirmed as received by, the General Counsel's office.

(b) Time Limits. All time limits contained in this Article may be extended by agreement of the parties, except that the time limits for the initial filing of a grievance may be extended only by the University. Upon failure of the University to provide a decision within the time limits provided in this Article or as extended by agreement, the grievant or the UFF, where appropriate, may appeal to the next step. Upon the failure of the grievant or the UFF, where appropriate, to file an appeal within the time limits provided in this Article or as extended by agreement, the grievance shall be deemed to have been resolved by the decision at the prior step or withdrawn.

(c) Postponement. The grievant may, in the timely-filed written grievance at Step 1, request the postponement of any action in processing the grievance formally for a period of up to thirty (30) days, during which period efforts to resolve the grievance informally shall be made. The initial request shall be granted. Upon the grievant's written request, additional extensions may be granted unless to do so would impede resolution of the grievance. Upon request, the Provost or his/her designee shall, during the postponement period(s), arrange an informal meeting between the appropriate administrator and the grievant. The grievant shall have the right to representation by the UFF during attempts at informal resolution of the grievance. The grievant may, at any time, terminate the postponement period by giving written notice to the Provost or his/her designee that the grievant wishes to proceed with the Step 1 meeting. If the postponement period, or any mutually agreed to extension thereof, expires without such written notice, the grievance shall be deemed informally resolved to the grievant's satisfaction and need not be processed further.

(d) Step 1.

1. Meeting. The Vice Provost of Assessment and Instruction or his/her representative and the grievant and the grievant's representative shall meet within ten (10) days following (a) receipt of the grievance if no postponement is requested, or (b) receipt of written notice that the grievant wishes to proceed with a Step 1 meeting. At the Step 1 meeting, the grievant shall have the right to present any evidence in support of the grievance, and the grievant and/or the UFF representative or the grievant's legal counsel (if selected pursuant to Section 11.4), and the Vice Provost of Assessment and Instruction or his/her representative, shall discuss the grievance.

2. Decision. The Vice Provost of Assessment and Instruction or his/her representative shall issue a written decision, stating the reasons therefore, to grievant's Step 1 representative within seven (7) days following the conclusion of the meeting. Seven days shall be determined by a receipt executed by the office receiving the grievance, or by the date of mailing as determined by the postmark or email. In the absence of an agreement to extend the period for issuing the Step 1 decision, the grievant may proceed to Step 2 if the grievant's Step 1 representative has not received the written decision by the end of the 10th day following the conclusion of the Step 1 meeting. A copy of the decision shall be sent to the grievant and to the UFF grievance representative if the grievant elected self-representation or representation by legal counsel.

3. Documents. All documents referred to in the decision and any additional documents presented by the grievant shall be attached to the decision, together with a list of these documents.

(e) Step 2.

1. Review. If the grievance is not satisfactorily resolved at Step 1, the grievant may file a written request for review (Appendix C) with the Office of the General Counsel within ten (10) days following receipt of the Step 1 decision by grievant's Step 1 representative. Ten (10) days shall be determined by the sent date indicated on the email to ogc@floridapoly.edu.

2. Meeting. The Provost or designee and the grievant and the grievant's representative shall meet no later than seven (7) days following receipt of written notice of request for a Step 2 review. At the Step 2 meeting, the grievant shall have the right to present any evidence in support of the grievance, and the grievant and/or the UFF representative or the grievant's legal counsel (if selected pursuant to section 11.4), and the Provost or designee shall discuss the grievance.

3. Decision. The Provost or designee shall issue a written decision, stating the reasons for the decision to grievant's Step 2 representative within five (5) days following the conclusion of the review meeting. Five days shall be determined by a receipt executed by the office receiving the grievance, or by the date of mailing as determined by the postmark or email. In the absence of an agreement to extend the period for issuing the Step 2 decision, UFF may proceed to Step 3 if the grievant's Step 2 representative has not received the written decision by the end of the 10th day following the conclusion of the Step 2 meeting. Step 2 decisions in grievances not involving alleged procedural violations are final and binding. A copy of the decision shall be sent to the grievant and to UFF if the grievant elected self-representation or representation by legal counsel.

(f) Step 3 Arbitration.

1. Filing. If a grievance alleging a procedural violation has not been satisfactorily resolved at Step 2, UFF may, upon the request of the grievant, proceed to arbitration by filing a written notice of the intent to do so (Appendix C). Notice of intent to proceed to arbitration must be filed at the Office of the General Counsel within ten (10) days after receipt of the Step 2 decision by grievant's Step 2 representative, and must be signed by the grievant and a UFF representative. Ten (10) days shall be determined by the date of mailing as indicated on the email to ogc@floridapoly.edu. The grievance may be withdrawn at any time by the grievant or by the UFF President at any point during Step 3. The parties shall stipulate to the issue(s) prior to the arbitration. In the event a stipulation is not reached, the parties shall proceed to a hearing on arbitrability pursuant to Section 11.7(f)4.

2. Selection of Arbitrator.

   a. Representatives of the University and UFF shall meet within ninety (90) days after the execution of this Agreement for the purpose of selecting an Arbitration Panel of seven (7) members. Each party shall submit six (6) arbitrators to create a selection list, from which the parties may mutually agree to, or alternatively strike names until they, select the Arbitration Panel. The right of the first choice to strike shall be determined by a coinflip. The Arbitration Panel shall be operative until a successor Agreement is ratified.

b. The parties shall either mutually agree upon the arbitrator charged with hearing any grievance, or select the arbitrator from the Arbitration Panel as set forth below. A mutually agreed upon arbitrator does not need to be a member of the Arbitration Panel. In the event the parties cannot mutually agree upon an arbitrator, and no later than fourteen (14) days after receipt of a notice of intent to arbitrate, the parties shall confer for the purpose of selecting an arbitrator from the panel. The parties shall alternatively strike names from the list until one name remains. The right of the first choice to strike shall be determined by a coinflip.

3. Authority of the Arbitrator.

   a. The arbitrator shall neither add to, subtract from, modify, nor alter the terms or provisions of this Agreement. Arbitrations shall be confined solely to the application of this Agreement and the issue(s) submitted for arbitration. The arbitrator shall refrain from issuing any statements of opinion or conclusions not essential to the determination of the issues submitted.

   b. The arbitrator shall not substitute the arbitrator's or another's judgment for that of the University in any matter.

4. Arbitrability. Issues of arbitrability shall be separated from the substantive issue(s) and, whenever possible, determined by means of a hearing conducted by conference call. The arbitrator shall have ten (10) days from the hearing to render a decision on arbitrability. If the issue is judged to be arbitrable, an arbitrator shall then be selected to hear the substantive issue(s) in accordance with the provisions of Section 11.7(f)2.

5. Conduct of Hearing. The arbitrator shall hold the hearing at the University, unless otherwise agreed by the parties. The hearing shall commence within sixty (60) days of the arbitrator's acceptance of selection, or as soon thereafter as is practicable, and the arbitrator shall issue the decision within forty-five (45) days of the close of the hearing or the submission of briefs, whichever is later, unless additional time is agreed to by the parties. The decision shall be in writing and shall set forth findings of fact, reasoning, and conclusions on the issues submitted. Except as modified by the provisions of this Agreement, arbitration proceedings shall be conducted in accordance with the current Labor Arbitration Rules of the American Arbitration Association.

6. Effect of Decision. The arbitrator's decision shall be final and binding upon the Board, the University, the UFF, and the grievant, provided that either party may appeal to an appropriate court of law a decision that was rendered by the arbitrator acting outside of or beyond the arbitrator's jurisdiction, pursuant to this Agreement and the Florida Arbitration Code as defined by law.

7. Fees and Expenses. The parties shall equally divide all arbitration fees and expenses, unless the arbitrator rules that the grievance was frivolous, in which case the filing party shall bear the cost of all fees and expenses associated with the arbitration, including, if awarded, attorney's fees. Fees and expenses charged by an arbitrator for cancelation after the arbitrator's deadline shall be borne by the party requesting the cancelation. However, if a grievance is resolved, and the cancelation of the arbitration results in any arbitration fees or expenses, such costs shall be divided equally between the parties. Each party shall bear the cost of preparing and presenting its own case including payment of expenses and compensation for its own representatives, attorneys, and witnesses. The party desiring a transcript of the arbitration proceedings shall provide notice to the other party of its intention to have a transcript of the arbitration made prior to the arbitration. The party desiring such transcript shall be responsible for scheduling a stenotype reporter to record the proceedings. The party originally requesting a transcript of the proceedings shall pay for any appearance fee of the court reporter.

11.8 Filings and Notification. All documents, except the initial filing, required or permitted to be issued or filed pursuant to this Article may be transmitted by email, fax, United States mail, or any other recognized delivery service. If any action falls due on a Saturday, Sunday, or University recognized holiday, the action will be considered timely if it is accomplished by 5:00 P.M. on the following business day.

11.9 Precedent. No complaint informally resolved, or grievance resolved at either Step 1 or 2, shall constitute a precedent for any purpose unless agreed to in writing by the Board of Trustees or representatives and the UFF acting through its president or representative.

11.10 Reprisal. No reprisal of any kind will be made by the Board, the University, or the UFF against any grievant, any witness, any UFF representative, or any other participant in the grievance procedure for such participation.

11.11 Records. All written materials pertinent to a grievance shall be filed separately from the evaluation file of the grievant or witnesses, except decisions resulting from arbitration or settlement.

11.12 Inactive Grievances. A grievance which has been filed at Step 2 or Step 3 and on which no action has been taken by the grievant or the UFF for forty-five (45) days shall be deemed withdrawn and resolved in accordance with the decision issued at the prior Step.

ARTICLE 12
SALARIES

The parties of this Agreement recognize the importance of providing appropriate compensation as an essential component in the delivery of quality higher education programs and quality scholarship that is recognized nationally and internationally.

12.1 Annual Salary Increases. The following table describes the implementation of merit increases throughout the life of this Agreement with the qualifications described below.

BARGAINING-UNIT MEMBER ON PAYROLL AS OF:	PERIOD OF PERFORMANCE REVIEWED FOR MERIT	INCREASE TAKES EFFECT FIRST PAY PERIOD:	MERIT INCREASE TO BASE SALARY AMOUNT[1]:
June 30, 2018	AY 2017 – 2018	*Following ratification of this Agreement*	**ME**: 2% **EE**: 2.75% **EX**: 3.5%
June 30, 2019	AY 2018 – 2019	July 1, 2019	*To Be Negotiated*
June 30, 2020	AY 2019 – 2020	July 1, 2020	*To Be Negotiated*

[1] *ME: Meets Expectations; EE: Exceeds Expectations; EX: Exemplary.*

Eligibility: The salary increases described in the above table in Section 12.1 shall be distributed to each bargaining unit member if the bargaining unit member received an annual evaluation and received a rating of "Meets Expectations" or above; individuals that received below a "Meets Expectations" are not eligible for any increase.

12.2 Other Increases (OI). The University BOT may provide annual OIs up to one percent (1.0%) of the total salary rate of the bargaining-unit.

(a) OIs may be granted at any time at any time in the following circumstances:

(b) In response to verified written offers of outside employment;

(c) As recognition for special achievements and/or exceptional merit, including, but not limited to, awards from national or international academic/professional community or funding agencies;

(d) To address compression and inversion;

(e) For equity and market equity considerations;

(f) No other OIs shall be provided unless negotiated with UFF and ratified by both parties.

(g) The University shall notify the UFF annually on OI.

12.3 Promotion Increases. A bargaining-unit member who receives a promotion utilizing the promotion procedures in this collective bargaining agreement shall receive the base-salary increase shown below, effective August 15th following the academic year in which the successful review takes place.

CURRENT RANK	PROMOTION RANK	PROMOTION INCREASE TO BASE SALARY AMOUNT
Assistant Professor	Associate Professor	*9% or increase to minimum of 90% of median target salary, whichever is greater*
Associate Professor	Professor	*9% or increase to minimum of 90% of median target salary, whichever is greater*

Median target salary noted in the above table is the median salary provided by College and University Professional Association (CUPA) for the rank and field for the individual using the following target universities, when they participate in the salary survey, as comparators: Alfred University, Kettering University, Rose-Hulman Institute of Technology, South Dakota School of Mines, University of Alaska Southeast, University of Central Florida, University of South Florida, Clarkson University, Colorado School of Mines, Franklin W. Olin College of Engineering, Illinois Institute of Technology, Oregon Institute of Technology, Rochester Institute of Technology.

12.4 Legislatively Mandated Increases. Any additional legislatively mandated increases shall be implemented following the corresponding law and does not conflict with this agreement.

12.5 Salary floors. The salary floors for all bargaining-unit members with meets expectations ratings or above shall follow 85% of the median salary (parity level) for comparable roles and comparable ranks in the target salary for peer institutions.

12.6 Starting Salary. All bargaining-unit position will be hired at a starting salary commensurate with their experience. It is expected that those salaries will typically be within 20% of employees within that unit at a similar rank and/or experience level. In exceptional cases, bargaining-unit positions may be hired at a salary above that range contingent on extraordinary experience and extramural funding.

12.7 Grievability. The only issues to be addressed in a grievance filed pursuant to this Agreement (Article 11) alleging violation of this Article are whether there is unlawful discrimination pursuant to state or federal law, or whether there is an arbitrary and capricious application of the provisions of one or more sections of this Article.

12.8 Increases Contingent on Receipt of New Recurring/Non-Recurring Funds. Unless the University chooses to fund the increases, and in the event the University does not receive sufficient new legislative or performance funding to fund the salary increases, they shall become void and re-opened for negotiations by the parties.

12.9 Labor Management Committee. The University and the UFF agree to form a Labor Management Committee ("Committee") for the purpose of examining opportunities for advancement (i.e. promotions, longevity increases, etc.) for employees holding the title of Instructor, Assistant Librarian, or Wellness Counselor. The Committee shall meet and confer, with the intention that the Committee will make a recommendation to the collective bargaining teams for possible inclusion in the next collective bargaining agreement. The Committee shall consist of a minimum of two representatives each from the University and UFF. At least one representative from the University should hold the title of Vice Provost or higher. The Committee shall be formed and have its first meeting within six (6) months from the ratification of this Agreement. The Committee shall meet at least three times each semester (fall and spring) unless otherwise agreed, or they have agreed to a recommendation for the University's and UFF's collective bargaining teams. This provision shall expire at the end of this Agreement's term.

ARTICLE 13
BENEFITS

13.1 Benefits Enrollment. All benefit-eligible employees may enroll in state benefit plans. New employees must complete the enrollment process themselves by going online to the People First website within sixty (60) days of becoming employed in the benefit-eligible position or will otherwise have to wait until the next open enrollment period occurs.

13.2 Eligibility. All active, permanent, full-time bargaining unit members qualify for coverage under the State of Florida Insurance Programs. All eligible employees should review the Marketplace Notice included in the Description Employee Benefits Package administered to new employees upon hiring. The Marketplace Notice is required under the Affordable Care Act and provides employees additional information about affordable health plan options that are available through the Marketplace or Health Care Exchanges.

13.3 Dependent Coverage. Employees may enroll eligible dependents for State of Florida sponsored plans in accordance with the plan documents.

13.4 Spouse Program. An eligible employee whose spouse works in a benefits-eligible position for a State of Florida government agency may enroll in the health insurance Spouse Program. This program combines the state's matching portion of each member's insurance premium, providing health insurance at a minimal cost provided that both employees are in full-time, benefits eligible positions. Should one spouse terminate employment with the State of Florida, or in the event of a divorce, change in FTE, or leave of absence-the employee must notify People First of the event within 60 days of the event.

13.5 Health Benefits. Employees may choose from several State of Florida health insurance plan options. Health insurance premiums are deducted on a pre-tax basis unless the employee requests post-tax deductions through a state pre-tax waiver. Coverage is not effective until after the employee receives insurance cards from the companies.

13.6 Life Insurance. The State of Florida offers Basic and Optional term life insurance coverage to eligible full-time and part-time employees.

13.7 Retirement Plans. Eligible employees may choose to participate in one of three plans: the State University System Optional Retirement Program, the Florida Retirement System's Florida Pension Plan, or the Florida Retirement System's Florida Investment Plan. All three retirement plans include employer and mandatory employee contributions. To enroll in a retirement plan, the employee must fill out the appropriate form and turn it in to the Human Resources Department for processing.

ARTICLE 14
PROFESSIONAL DEVELOPMENT & SABBATICAL LEAVE

14.1 Professional Development. The University supports the development of its workforce as teachers, scholars, and practitioners by providing resources and programs. Such support includes but is not limited to internal research grants, financial support including travel support, orientation programs, instructional technology workshops, and speakers' series. Professional Development funds are dispersed by the Provost or his/her designee based on appropriateness of the request and budget availability.

14.2 Sabbatical Leave. A sabbatical leave is intended to provide faculty members with opportunities for professional and scholarly development that will contribute to their achievements and the value of their service to the University. A sabbatical recognizes prior teaching and scholarly achievements at the University and anticipates future teaching and scholarly contributions. Sabbaticals must provide the University with professional value, and offer faculty with opportunities for professional renewal, planned travel, study, formal education, research, faculty development, certification, or other experiences.

(a) Eligibility for Sabbatical Leave. The University does not guarantee the opportunity to take a sabbatical leave. Leave is granted when, in the Provost's assessment, the conditions of the department and of the University are such that the faculty member's absence will not seriously impair the interests of the University. A faculty member who accepts a sabbatical is expected to return to the University for at least two semesters (a spring and a fall) of service immediately after the conclusion of the sabbatical. If a faculty member does not return to the University immediately following the leave, the faculty member is responsible for compensating the school for the salary and benefits received during the sabbatical. Ordinarily, sabbaticals are granted only if, at the expiration of such leave, the applicant would be eligible for continued service on the faculty of the school for at least one year before retirement or contract expiration. The University allows full-time faculty who have completed at least six years of full-time service with the University to be eligible to apply for a sabbatical. Sabbaticals are granted to increase an employee's value to the University through further professional development, not as a reward for service. Applications for sabbaticals are usually distributed by the Provost in early January for the subsequent academic year.

(b) Duration and Compensation. A sabbatical may involve absence for an academic year at half-salary (fall-spring or spring-fall) or a semester (fall or spring) at full salary. An academic year sabbatical can be for fall-spring or for spring-fall.

(c) Application. A complete application for sabbatical is due in the Provost's office by January 15 preceding the academic year in which the sabbatical is requested. The application must include a well-considered, suitable written plan for the requested research or professional development activity. A detailed written statement of this plan, indicating its professional value to the University and faculty member, as well as a current curriculum vitae, must accompany the application. This plan should be at least two pages and not more than five pages in length, using 11-point font and one-inch margins. The application must include a statement from the Division Director or, if there is no Division Director in the management chain, the Department Chair, whether the applicant's absence will or will not unreasonably hinder the delivery of the curriculum.

(d) Sabbatical approval is based on the candidate's proposal and its value to the University. The Provost, one Vice-Provost, and two faculty members (one chosen by the Faculty Representative Council, one chosen by the Provost) evaluate the sabbatical proposals and make a recommendation to the President. Final decision authority on sabbaticals lies with the President, and the President will report annually to the BOT on sabbatical activity. The President shall provide his or her decision in writing to the candidate and the committee.

(e) Mutual Consent. The letter from the President, or designee, to the applicant approving the leave represents a commitment by the University and the faculty member. Therefore, any subsequent changes to the plans for the leave require the written agreement of both parties.

(f) Required Report. Within sixty (60) days of returning to academic duties at the University after a sabbatical leave, the faculty member shall submit a detailed report of activities during the leave to the Provost.

(g) Additional Sabbatical Leave. Employees shall not normally be eligible to take another paid sabbatical until six (6) years of continuous employment are completed following the prior sabbatical.

(h) Maximum Sabbaticals. Under normal circumstances, the number of individuals on sabbatical will not exceed one individual in a department/program area and across the faculty, it may not exceed 7% of the full-time faculty in any single semester.

14.3 Professional Development Leave. Professional Development Leave (PDL) is designed to provide eligible employees with opportunities for professional renewal, educational travel, study, formal education, research, faculty development, certification, or other experiences of professional value. Professional Development Leave is not compensated and is not benefited. Full-time employees who have completed three or more years of full-time service with the University are eligible to apply for such leave. The eligibility of employees to receive compensation pursuant to a contract or grant is subject to the terms of the contract or grant. However, in the case of non-full-time status, while supported part-time by a contract or grant, the individuals' benefits will be funded at the fraction of full-time represented by the grant activity. Procedures for application and approval shall be the same as those followed for Sabbatical Leave.

Under normal circumstances, no more than one (1) employee in a department/unit may be awarded professional development leave at the same time.

ARTICLE 15
PAYROLL DEDUCTION

15.1 Deductions. The University will deduct, twice monthly, the following from the pay of those bargaining unit members who individually and voluntarily make such request on a written authorization form provided by the UFF. The form will specifically state the amount to be deducted, as established by UFF and can be submitted in a form similar to Appendix D. ("Appendix D – United Faculty of Florida – Sample Dues Check-Off Authorization Form").

15.2 Timing of Deductions.

(a) The University will make deductions each pay period, beginning with the first full-pay period commencing at least thirty (30) days following receipt of authorization.

(b) UFF must give written notice to the Board of any changes in its dues at least forty-five (45) days prior to the effective date of any such changes.

15.3 Remittance.

(a) The University must remit dues and other authorized deductions to the UFF State Office on a bi-monthly basis within thirty (30) days following the end of the pay period by automatic funds transfer.

(b) Accompanying each remittance will be a list containing the following information relating to each dues paying member:

(c) Names and departments of the bargaining unit members;

(d) Amounts deducted.

15.4 Termination of Deduction. The University's responsibility for deducting dues and other authorized deductions from a bargaining unit member's salary will terminate automatically upon either:

(a) thirty (30) days written notice from the bargaining unit member to the University, the University personnel office, and to the UFF revoking that bargaining unit member's prior deduction authorization; or

(b) the transfer of the authorizing bargaining unit member out of the bargaining unit.

15.5 Indemnification. The UFF assumes responsibility for (1) all claims against the University, including the cost of defending such actions, arising from the University's compliance with this Article, and for (2) all monies deducted under this Article and remitted to the UFF. The UFF must promptly refund the University excess monies received under this Article.

15.6 Exceptions. The University will not deduct any UFF fines, penalties, or special assessments from the pay of any bargaining unit member, nor is the University obligated to provide more than one payroll deduction field for the purpose of making the deductions described in this Article.

15.7 Termination of Agreement. The University's responsibilities under this Article will terminate automatically upon (1) decertification of the UFF or the suspension or revocation of its certification by the Florida Public Employees Relations Commission, or (2) revocation of the UFF's deduction privilege by the Florida Public Employees Relations Commission.

ARTICLE 16
INTELLECTUAL PROPERTY

16.1 University Policy FPU-1.0061P Intellectual Property, approved by the Board of Trustees on June 3, 2015, is applicable to all bargaining unit employees.

ARTICLE 17
OFFICE SPACE, EQUIPMENT, & SAFETY CONDITIONS

17.1 Offices and Meeting Space.

(a) The University shall provide each employee with an individual lockable office (to the extent practicable) and office furniture and equipment appropriate to their assigned duties and responsibilities.

(b) The Wellness Counselor shall be provided with an enclosed individual lockable office to guarantee the privacy of students.

(c) Subject to availability in the IST building, faculty shall have access to private meeting space for confidential conferences with students.

(d) Each employee shall, consistent with building security, have reasonable access to the faculty member's office space, and laboratories, and the classrooms used in connection with assigned responsibilities. This provision may require that campus security provide access on an individual basis.

17.2 Change in Office Space. Each employee shall be notified, if practicable, at least one (1) month prior to a change in their office location or a planned alteration to their office that impedes their work effectiveness. Each employee shall be provided the reason(s) necessitating the change or alteration. The University shall move University supplies and equipment.

17.3 Equipment. Each employee shall have the access to the administrator's account of their IT devices if requested to the CIO and approved. Approval for such a request shall not be unreasonably denied.

17.4 Safe Conditions. Whenever an employee reports a condition to an appropriate administrator that the employee reasonably believes is a potential violation of safety or health rules and regulations, the appropriate administrator shall investigate such conditions. Upon conclusion of the investigation, the appropriate administrator shall inform the employee of what action must be taken by the employee, and what action is being taken by the administration, if action is necessary.

ARTICLE 18
LAYOFF

18.1 Layoffs.

(a) Implementation. Subject to compliance with applicable University policy, the University may implement a layoff at any time as a result of reallocation of resources; reorganization of academic or administrative structures, programs or functions; reorganization of degree or curriculum offerings or requirements; adverse financial circumstances; or reduction or elimination of programs or functions. Layoffs shall not be arbitrary or capricious.

(b) Layoff Unit. The layoff unit may be at any organizational level of the University.

18.2 Layoff Considerations.

(a) The University shall consider appropriate factors, including but not limited to, rank, length of continuous employment at the University, performance evaluations, the employee's academic training and credentials, external professional reputation and experience, teaching effectiveness, research record, and service to the profession, community, and public prior to conducting any layoff.

(b) In the event that more than one employee is being considered for a layoff, and said employees are substantially similar with respect to the factors in Section 18.2(a) above, seniority shall be the determinative factor, and the layoff shall occur in the inverse order of seniority.

(c) An employee laid off under this section may request within twenty (20) days of the notification of a layoff a written justification for their selection to be laid off. Thereafter, the President or representative shall provide such statement within twenty (20) days following receipt of such request.

18.3 Notice of Intent. The University shall provide the UFF and faculty member with no less than one (1) academic year advance notice prior to the effective date of any layoff. The University shall provide the UFF and the Wellness Counselor and/or Assistant Librarian with a length of advance notice prior to conducting any layoff as negotiated with UFF prior to the date of hire.

The notification to the employee shall include the effective date of the layoff; the reason for the layoff; a statement of recall rights; and a statement of appeal/grievance rights and applicable deadlines for filing.

The notification to UFF shall include the units affected by the layoff, the reason for the layoff, and the employee(s) to be laid off. The UFF may request a consultation with the President or representative pursuant to Article 2 (Consultation) during this period to discuss the layoff.

18.4 Terminations (voluntary or involuntary) which occur pursuant to another article of this Agreement shall not be deemed a layoff.

18.5 The University shall determine the program areas, subject areas, positions, and personnel subject to the layoff.

18.6 Employees who are laid off remain eligible for reemployment.

18.7 Grievability. The decision to layoff is only grievable according to Article 11 – Grievance and Arbitration Procedure, if an employee who receives written notice of layoff, contests the decision because of an alleged violation of this Agreement or because of an alleged violation of an employee's constitutional rights. Such grievances must be filed in accordance with the provisions set forth in Article 11.

18.8 Re-employment/Recall. For a period of two (2) years following a layoff, an employee who has been laid off shall be offered reemployment in the same or similar position at the University should an opportunity for such reemployment arise. It shall be the employee's responsibility to keep the University advised of the employee's current address. Any offer of re-employment pursuant to this section must be accepted within twenty (20) days after the date of the offer. In the event such offer of reemployment is not accepted, the employee shall receive no further consideration pursuant to this Article. The appointment term for any employee recalled in accordance with this article shall be equal to the time remaining on the employee's prior appointment at the time the prior layoff occurred. The University shall notify the local UFF-Florida Polytechnic Chapter when an offer of re-employment is issued.

18.9 Sections 18.2 through 18.8 of this article shall not apply to positions funded from contracts, grants, and sponsored research funds, including any research appointments supported by the University; or positions funded by "soft money".

ARTICLE 19
TRAVEL

19.1 Professional Meetings.

(a) Employees may attend professional meetings, conferences, and other professional activities, with prior approval from the Provost, or Provost's designee, whether or not they receive University funding to attend. The University fully supports travel that provides appropriate benefit to the institution. In considering a travel request, the University will consider, amongst other factors, the impact of an employee's absence on the employees normal duties. If a travel request is denied, the reason for the denial must be given to the requesting employee in writing. Approval to attend such activities shall not be arbitrarily denied.

(b) Employees must initiate a travel authorization request utilizing the University's approved form as soon as practicable.

(c) Allocations of travel funds to employees shall be set by the funding that is made to each department, and will be determined by the Provost, or Provost's designee, in accordance with University guidelines. Allocation of funds to an individual or group does not guarantee approval of travel activity, and funding that is not used in a particular fiscal year may not be carried over for usage during a future fiscal year.

19.2 Reimbursement. The reimbursement rate for expenses in connection with meetings, conferences, or other professional activities shall be as specified by Florida law, up to the amount of funding available under department policies.

19.3 Travel Advances. To the extent permitted by law, the University may provide travel advances, upon request, of up to eighty (80) percent of budgeted expenses for authorized travel.

ARTICLE 20
ACCESS TO DOCUMENTS

20.1 Board of Trustees and University Documents.

(a) Upon request, the University shall provide UFF with an electronic copy of documents necessary to administer grievances and other provisions of this agreement or otherwise carry out UFF's obligations as the certified bargaining agent for the bargaining unit. Alternatively, the University may provide UFF with the URL address for these materials.

(b) If not available on a web site, the University shall, upon request, provide UFF with an electronic copy of the agenda, supporting materials, and minutes of public meetings (including public subcommittee meetings) that bear on the terms and conditions of employment of unit members.

(c) The University shall ensure that the documents below are available by links on the University's web site:

1. Faculty handbook;
2. Employee handbook;
3. Agenda, supporting materials, and minutes of public meetings of the Board of Trustees and its committees;
4. University regulations;
5. Collective bargaining agreement and all supplements to it; and
6. Other University policies and procedures affecting employee terms and conditions of employment.

20.2 Salary Records Access. The University shall, upon request, and no more than once per academic year, provide UFF, within twenty (20) business days with an electronic report reflecting the base academic year salary and any academic year salary increase (provided as a percent increase) for each in-unit member during the preceding twelve (12) months by each increase category.

20.3 Bargaining Unit Member List. The University shall provide, within twenty (20) business days of a request by the UFF, and no more than twice per academic year, the following information pertaining to each bargaining unit member: name, date of hiring, department/unit or units if hired as joint appointment, title, rank, date promoted to rank, current year salary rate, and e-mail address, contact telephone number, and last known mailing address.

20.4 UFF Designee. UFF shall, upon request, and no more than once per academic year, provide the University's designee for contract administration with the names and email addresses of the union officers and the name of the union representative designated to receive documents referred to in this Article. UFF shall notify the University's designee in writing of any changes to the list of union officers or designated representatives to receive documents.

20.5 Costs. All electronic copies of materials and access to materials discussed in this article shall be provided without cost. In the event hard copies are requested, or electronic copies are unavailable, the UFF shall reimburse the University for the costs incurred according to Chapter 119, Florida Statutes.

ARTICLE 21
MAINTENANCE OF BENEFITS

21.1 The rights and benefits provided by this Agreement shall apply to any employee who is a member of the bargaining unit may not be waived without the employee's consent.

21.2 Except to the extent required by law, the rights and benefits set forth in this Agreement shall not change absent collective bargaining.

ARTICLE 22
OTHER EMPLOYEE RIGHTS

22.1 Constitutional Rights. Nothing in this Agreement shall be understood to diminish the constitutional rights which bargaining unit members have as citizens of the United States or Florida, or to diminish the right of employees to exercise those rights.

22.2 Limitation on Personal Liability.

(a) In the event an employee is sued for an act, event, or omission which may fall within the scope of Section 768.28, Florida Statutes, the employee should notify the Office of the General Counsel as soon as possible after receipt of the summons commencing the action in order that the University may fulfill its obligation. Failure to notify the employer promptly may affect the rights of the parties.

(b) For information purposes, the following pertinent language of Section 768.28(9), Florida Statutes, is reproduced herein. "No officer, employee or agent of the State or any of its sub-divisions shall be held personally liable in tort or named as a party defendant in any action for any injury or damages suffered as a result of any act, event or omission of action in the scope of his or her employment or function unless such officer, employee or agent acted in bad faith or with malicious purpose or in a manner exhibiting wanton or willful disregard of human rights, safety or property."

ARTICLE 23
FPU REGULATIONS & POLICIES

23.1 Changes in Regulations or Policies

(a) Established terms and conditions of employment cannot be changed without providing the opportunity for negotiation.

(b) If any regulation, policy, or resolution proposed by the University has a direct and substantial impact on wages, hours, or any other term or condition of employment, the University shall satisfy any collective bargaining obligation with respect to the change prior to implementing it, unless UFF declines in writing to bargain over the change.

23.2 Notice of Proposed Policies or Regulations. The University shall provide to UFF, via posting on the University web site and via email notification, an advance copy of any proposed regulation or policy that could reasonably be construed to affect terms or conditions of employment contained in this Agreement.

23.3 Inconsistencies with Agreement. No provision of any existing, new, or amended University regulation, policy, or resolution shall apply to bargaining unit members if it conflicts with an express term of the Agreement.

ARTICLE 24
MISCELLANEOUS PROVISIONS

24.1 No Strike or Lockout. The University agrees that there will be no lockout at the University during the terms of this Agreement. The UFF agrees that there will be no strike by it or any bargaining unit member during the term of this Agreement.

24.2 Effect of Passage of Law. Any provision of this Agreement which is contrary to law, but becomes legal during the term of this Agreement, shall be reinstated consistent with such legislation.

24.3 Venue. For purposes of venue in any judicial review of an arbitrator's decision, the parties elect to submit themselves to the jurisdiction of the courts in Polk County, Florida. In an action commenced in Polk County, neither the University nor the UFF will move for a change of venue based upon the defendant's residence in fact if other than Polk County.

24.4 Titles and Headings. The titles of articles and headings which precede text are inserted solely for convenience of reference and shall not be deemed to limit or affect the meaning, construction, or effect of any provision of this Agreement.

ARTICLE 25
SEVERABILITY

25.1 Invalidation of a Provision of this Agreement. If any provision of this Agreement is found to be invalid by any court of competent jurisdiction, or is expressly rendered invalid by reason of subsequently enacted legislation, such action shall not affect the remainder of the Agreement, and all other terms shall continue in full force and effect.

25.2 Negotiations on Replacement Provisions. If a provision of this Agreement is rendered invalid pursuant to Section 25.2 above, then upon request of either party, the University and UFF shall enter into negotiations for the purpose of arriving at a mutually satisfactory replacement for such provision.

ARTICLE 26
AMENDMENT & DURATION

26.1 Effective Date.

(a) The Agreement shall become effective upon ratification by both the University and the UFF and shall remain in effect through August 31, 2021.

(b) Renegotiations for a successor agreement shall begin no later than October 1, 2020.

26.2 Amendments. In the event the University and the UFF negotiate a mutually acceptable amendment to this Agreement, such amendment shall be put in writing and become part of this Agreement upon ratification by both parties.

26.3 Reopener Negotiations. For the fiscal years 2019-2020 and 2020-2021, the parties shall reopen and negotiate Article 12 – Salaries, and each party has the option to reopen one (1) additional article. However, by mutual agreement, the parties may reopen additional articles for consideration during each fiscal year. Reopener negotiations shall begin no later than March 1, 2019 for the fiscal year 2019-2020, and March 1, 2020 for the fiscal year 2020-2021.

ARTICLE 27
TOTALITY OF AGREEMENT

27.1 Limitation. The parties acknowledge that during the negotiations which resulted in the Agreement, the University and the UFF had the unlimited right and opportunity to present demands and proposals with respect to all matters lawfully subject to collective bargaining, and that the understandings and agreements arrived at thereby are set forth in this Agreement, and that it shall constitute the entire and sole Agreement between the parties for its duration.

27.2 No Obligation to Bargain. During the Term of this Agreement, the University and the UFF agree that the other shall not be obligated to bargaining collectively with respect to any subject or matter covered by this Agreement. Notwithstanding these limitations, if the University exercises its management rights in such a way that any term or condition of employment is affected, the University shall be obligated to bargain the impact of such change.

ARTICLE 28
DEFINITIONS

The following terms, not otherwise defined in the Articles, are used in this Agreement:

- "Academic Year (AY)" means a period consisting of a fall and spring semester of approximately 39 weeks.
- "Academic Professional" means a member of the bargaining unit who holds the position classification of Wellness Counselor or Assistant Librarian.
- "Administration" means Florida Polytechnic University acting through its President and staff
- "Bargaining unit" means those employees, collectively, represented for collective bargaining purposes by the UFF pursuant to Florida Public Employees Relations Commission Certification wherein the Commission determined the composition of the bargaining unit at Florida Polytechnic University, as outlined in Appendix A.
- "Board", "BOT," or "Board of Trustees" means the University's governing body acting through the President and staff.
- "Business Day" means Monday through Friday, excluding University holidays, in which the University is open and in normal operations.
- "Continuous employment" means employment uninterrupted by a break in service in which the employee is treated as a new employee for purposes of computing seniority and years of employment.
- "Days" means calendar days.
- "Department/unit" means a department or a comparable administrative unit generally equivalent in size and character to a department, unless provided otherwise in an express provision of this Agreement.
- "Employee" means a member of the bargaining unit.
- "Equitable" means fair and reasonable under the circumstances.
- "Faculty," "faculty member," or "faculty employee" means any member of the bargaining unit who holds a position classification of instructor, assistant professor, associate professor or professor.
- "FTE" means "full time equivalent."
- "Instructor" means member of the bargaining unit whose primary responsibilities are teaching, service, and related activities, and who does not hold the rank of an Assistant Professor, Associate Professor, or Professor.
- "Months" means calendar months.
- "Number" written in the singular form includes the plural.
- "Professors" means any member of the bargaining unit who holds a position classification of assistant professor, associate professor or professor.

- "Semester" means one of the two approximately 19.5 week periods which together constitute the academic year.
- "Supervisor" means an individual identified by the President or designee as having immediate administrative authority over bargaining unit employees.
- "UFF" means United Faculty of Florida.
- "UFF Chapter" means the Florida Polytechnic University Chapter of UFF.
- "Unfunded hours" are the total number of leave hours advanced to the employee for purposes of paid parental leave less the number of hours the employee paid back (in accordance with the written agreement) after returning from the parental leave.
- "University" or "FPU" means Florida Polytechnic University, including when acting through the President and staff.
- "Year" means a period of twelve (12) consecutive months

IN WITNESS THEREOF, the parties have set their signatures this ___ day of January, 2019.

FOR
FLORIDA POLYTECHNIC UNIVERSITY:

Dr. Randy K. Avent
President

Dr. Terry Parker
Provost & Executive Vice President

Mark L. Bonfanti, Esq.
Chief Negotiator

Regina DeIulio, Esq.
Vice President & General Counsel

Alexander M. Landback, Esq.
Assistant General Counsel

FOR
UNITED FACULTY OF FLORIDA:

Dr. Rich Matyi
President, UFF-FPU

Dr. Myles Kim
Chair, UFF-FPU Bargaining Committee

Candi Churchill, MA
Chief Negotiator, United Faculty of Florida

Dr. C. Wylie Lenz
Team Member, UFF-FPU Bargaining Committee

Dr. Patrick Luck
Team Member, UFF-FPU Bargaining Committee

APPENDIX A
POSITION CLASSIFICATIONS IN THE BARGAINING UNIT

PROFESSOR

ASSISTANT PROFESSOR

ASSOCIATE PROFESSOR

INSTRUCTOR

ASSISTANT LIBRARIAN

WELLNESS COUNSELOR

ACADEMIC PROGRAM COORDINATOR

All other University employees are excluded from the bargaining unit.

APPENDIX B
FACULTY ACTIVITY REPORT

(From Article 8 – Performance Evaluation)

REVIEW PERIOD: MM/DD/YYYY **to** MM/DD/YYYY

Name: _____

Rank: _____ **Academic Program:** _____

Teaching Activity and Accomplishments for the Year:

A. Table supplied by institutional research

B. Faculty commentary:

1. Formal Course Delivery:
2. Projects included in course delivery:
3. Undergraduate Advising:
4. Graduate advising and student support:
5. Educational resources sought or acquired:
6. Anything else that should be considered for this evaluation period:

Scholarship:

A. Publications (list those published during the review period. Items that are in press, in review, or in progress must be listed in the appropriate section but must be clearly noted as such. Do not list any publication multiple times)

1. Refereed Publications (give full archival citation. When available, include the DOI number, link to publication, or the first page of the publication)
   a. Refereed Articles in Journals
   b. Refereed Articles in Conference Proceedings
2. Industrial collaboration or activity
   a. Patents, patent applications, patent disclosures
   b. Industry sponsored project not listed in teaching section
3. Books, Book Contributions, and Issues of Journals (includes books you have written or edited, contributions to edited books, and special issues of journals you have edited. Give full archival citation. When available, include the DOI number or link to publication. If published on CD-ROM give number of pages of your paper)
4. Non-refereed Publications (give publication details)
   a. Abstracts
   b. Non-refereed Articles in Conference Proceedings
   c. Software

(See Next Page for Additional Requirements)

d. Project Reports (technical reports, final reports on grants, etc.)

e. Articles Posted on E-print Servers

f. Articles in Professional Magazines

g. Other (e.g., anything else with your name on it including book reviews, forewords to books/journal issues, software packages, etc.)

5. Publications in Progress (include status: submitted, under review, in press, etc.)

6. Presentations

a. Invited Talks (that you have given at conferences, or at organizations other than Florida Poly.)

b. Other Talks (by you, e.g., contributed papers or posters at conferences, talks at Florida Poly, etc.)

c. Co-authored Presentations (not presented by you)

B. Funded projects where there was expenditure during the year:

- Project Title:
- Project Staff:
- Source of Funds:
- Project Duration:
- Total Amount and estimated expenditure for the review period:
- Spending by the Faculty member for the current review period:
- Graduate Students Supported by the effort that were directed by the faculty member during the review period:
- Under Graduate Students Supported by the effort that were directed by the faculty member during the review period:
- Synopsis of accomplishments for the project for this review period:

C. Proposals written during the review period.

- Project Title:
- Project Staff:
- Source of Funds:
- Project Duration:
- Total Amount:
- Number of Graduate Students planned to be Supported by the effort.
- Undergraduate Student hours planned to be Supported by the effort.
- Fraction of proposal written by you:

D. Other scholarship activity (preproposal activity, unfunded work):

E. Any Additional Information that should be considered for this review period:

(See Next Page for Additional Requirements)

Service (include only those activities during the review period shown above):

A. Support of student activity on campus (clubs, etc.)

B. Departmental Committees (and other departmental service, include your role in the committee)

C. Institutional Committees (and other institutional service)

D. External Professional Service (regional and national committees, panels, etc.)

1. Regional and National Committees (list committee names)
2. Reviews (indicate number of papers and proposals reviewed; editorial work for journal and book publishers, external examinations, reviews for foundations and agencies, reviews of promotion and tenure dossiers, number of letters of recommendation written, etc.)
3. Other External Professional Service

E. Community Outreach (list the type of activity and the level of effort in the activity)

F. Anything else that should be considered for this review period

Honors and Awards (include only those honors and awards received in the review period shown above)

Professional Development

A. Describe how professional development funds or travel funds were used in the review period shown above (e.g., summer salary, graduate student support, conference travel, equipment, etc.)

B. Provide commentary on how this activity has helped you (or not) as a faculty member.

C. Describe any other significant professional development activity that you have accomplished this review period.

Other Pertinent Information

Comments on Statement of Expectations from the Previous Year

Proposed Statement of Mutual Expectation for the Upcoming Year
(presented under the headings "teaching, scholarship, service)

Signature of Faculty Member **Date**

Grievance #: _____
[Assigned by OGC]

APPENDIX C
GRIEVANCE FORM

(From Article 11.2 – Grievance & Arbitration)

Grievance Type (circle one): Step 1 Step 2 Arbitration

PART I
GRIEVANT(S)

Name(s) _____ Dept. _____

Mailing Address _____

Phone Number (Home) _____ (Work) _____

Email _____

GRIEVANCE REPRESENTATIVE

Name _____

Email _____

If Grievant is represented by the UFF or legal counsel, all University communications should go to the Grievance Representative.

Other address to which University mailings pertaining to grievance shall be sent _____

PART II
GRIEVANCE

Article(s) & Section(s) of Agreement allegedly violated _____

_____

(See Next Page for Additional Requirements)

Statement of Grievance (must include date of acts or omissions complained of and name(s) of any individual(s) that allegedly committed the acts or omissions):

_____

_____

_____

Remedy Sought: _____

PART III
AUTHORIZATION

I will be represented in this grievance by: (check one - representative must sign on appropriate line):

☐ UFF _____

☐ Myself _____

☐ Legal Counsel: _____

I [do] ☐ [do not] ☐ want a postponement for up to thirty (30) days to seek informal resolution of this grievance.

I UNDERSTAND AND AGREE THAT BY FILING THIS GRIEVANCE, I WAIVE WHATEVER RIGHTS I MAY HAVE UNDER CHAPTER 120 OF THE FLORIDA STATUTES WITH REGARD TO THE MATTERS I HAVE RAISED HEREIN AND UNDER ALL OTHER UNIVERSITY PROCEDURES WHICH MAY BE AVAILABLE TO ADDRESS THESE MATTERS.

This grievance was electronically filed with the Office of General Counsel (ogc@floridapoly.edu) on _____, 20__.

_____
Signature of Grievant
(Grievant must sign if grievance is to be processed).

DATE OF RECEIPT BY OFFICE OF GENERAL COUNSEL: _____

APPENDIX D

UNITED FACULTY OF FLORIDA – SAMPLE DUES CHECK-OFF AUTHORIZATION FORM

(From Article 15 – Payroll Deduction)

I authorize the University to deduct from my pay, starting with the first full pay period commencing not earlier than seven (7) days from the date this authorization is received by the University, membership dues and other authorized deductions of the United Faculty of Florida (UFF) as established from time to time by UFF in accordance with its Constitution, and as certified to the University by UFF. Furthermore, I understand that such dues will be paid to UFF.

This authorization will continue until either (1) revoked by me at any time upon thirty (30) days written notice to the University payroll office; (2) my transition/transfer out of a UFF represented bargaining unit; (3) termination of employment; or (4) revoked pursuant to Section 447.507, F.S.

_____ _____

Signature Date

_____

Name (Print)

_____ _____

Department or Work Location Job Classification

Home Address: _____

_____

_____

Home Phone: _____

AGENDA ITEM: VI.

Florida Polytechnic University
Board of Trustees Meeting
January 16, 2019

Subject: Third Amended and Restated Bylaws

Proposed Action

Adopt Third Amended and Restated Bylaws.

Background Information

The existing Amended and Restated Bylaws were adopted by the Board on February 28, 2018. At the last board meeting a decision was made to institute an Executive Committee, and to adopt the Board policy- Public Comment at Board of Trustees Meetings; therefore, the Bylaws needed to be revised. A summary of the material changes reflected in the proposed Third Amended and Restated Bylaws is provided below:

1. Section 5.6 Executive Committee was added which provides the membership and authority of the Executive Committee.

2. Section 6.11 Appearances Before the Board was revised to add a reference to the Public Comment at Board of Trustees Meetings policy and delete the specifics that are now covered by the policy.

The existing Bylaws require the following steps be taken to amend the Bylaws:

1. Notice for the meeting must state a proposed alteration, amendment or repeal of the bylaws will be considered. (The notice posted for the January 16, 2019 meeting was in compliance with this requirement.)

2. Trustees must be sent a copy of the draft of the altered or amended bylaws at least seven (7) days prior to the meeting at which the alteration or amendment is to be voted on. (All trustees were sent a copy of the draft no later than January 9, 2019 via email.)

3. The approval of the alteration, amendment or repeal of the BOT bylaws requires the affirmative vote of two-thirds (2/3) of the Board members voting in any regular or special meeting.

Supporting Documentation:
DRAFT Third Amended and Restated Bylaws
Prepared by: Gina DeIulio, VP & General Counsel

FLORIDA POLYTECHNIC UNIVERSITY
BOARD OF TRUSTEES

~~SECOND~~ THIRD AMENDED AND RESTATED BYLAWS

Adopted: January 16, 2019

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ARTICLE I
STATEMENT OF PURPOSE

Section 1.1
PURPOSE

The Florida Polytechnic University Board of Trustees (the "Board") is established as a public body corporate, with all the powers of a body corporate as provided by the Florida Constitution, Florida law and by delegation of the Florida Board of Governors (the “Board of Governors”).

The Board has all the powers and authority to effectively govern and set policy for Florida Polytechnic University ("University") and has and exercises those powers and duties prescribed by law.

To more effectively discharge its responsibilities and duties, in connection with its governance of the University, the Florida Polytechnic University Board of Trustees has adopted the following bylaws.

ARTICLE II
THE BOARD

Section 2.1
CORPORATE NAME

The Board of Trustees is a public body corporate called "The Florida Polytechnic University Board of Trustees."

Section 2.2
COMPOSITION OF THE BOARD

Article IX, Section 7 of the Florida Constitution establishes the composition of the Board. It provides that the Board consists of thirteen (13) Trustees, with six (6) Trustees appointed by the Governor, five (5) appointed by the Board of Governors and two (2) serving by virtue of their offices, the president of the Florida Polytechnic University Student Government Association and the president of the equivalent of the faculty senate. All appointed members are confirmed by the Senate of the State of Florida. All Board members are public officers subject to the requirements of the Florida Code of Ethics.

Section 2.3
POWERS AND DUTIES OF THE BOARD

Article IX, Section 7 of the Florida Constitution posits in the Board of Governors the responsibility to establish the powers and duties of the boards of trustees of the state universities. By regulation, the Board of Governors delegated to the state universities’ boards of trustees the power to administer each constituent university.

The Board serves as the governing body of the University and approves the University’s mission. The Board selects the President of the University for ratification by the Board of Governors, evaluates the President’s performance annually, and holds the President responsible for the University's operation and management, performance, fiscal accountability, and compliance with federal and state laws and rules and the Board of Governors’ regulations. The Board is responsible for ensuring that the University has adequate financial resources to provide sound education program. The Board shall have the authority to carry out all lawful functions permitted by these bylaws, by delegation from the Board of Governors, or by law.

The Board is responsible for policy-making, planning and appraisal actions. Authority rests with the Board of Trustees as a whole in meetings of the board and not with individual board members. The Board is not controlled by a minority of Board members or by organizations separate from it. The Board of

Trustees shall work to preserve the University's and its own independence from undue political, religious, or outside influence; to ensure academic freedom; and to support the University President in discharging presidential responsibilities for the operation and administration of the University.

In order to effectively fulfill its obligations under the law, the Board may adopt resolutions, regulations, rules, and policies consistent with the University's mission, with law, and with the Board of Governors' resolutions, regulations, rules, and policies.

ARTICLE III
THE TRUSTEES

Section 3.1
FIDUCIARIES

Florida Statutes §112.311(6) provides that it is the declared policy of the state that public officers are agents of the people and hold their positions for the benefit of the public. Therefore, by virtue of their office, Trustees stand in a fiduciary relationship to the University and must serve the University's best interests at all times.

Section 3.2
TERM OF OFFICE

Appointed trustees shall serve for staggered 5-year terms, as provided by law and as specified in their appointment. The president of the University Student Government Association and the president of the equivalent of the faculty senate shall serve for terms equivalent to the terms of their respective offices.

Section 3.3
VACANCIES

The Board Chair shall report any vacancies in appointed trustee positions to the Governor and the Board of Governors. The appointing authority will fill the vacancies, subject to confirmation by the Senate of the State of Florida.

Section 3.4
REMOVAL

To the extent permitted by law, the governor or the Board of Governors, whichever is the appointing authority, may remove a Trustee for cause. Unexcused failure to attend three (3) consecutive regular board meetings in any fiscal year shall be grounds for removal.

Section 3.5
COMPENSATION

Members of the Board shall serve without compensation but may be reimbursed upon request for travel and per diem expenses in accordance with state law.

ARTICLE IV
OFFICERS OF THE BOARD

Section 4.1
OFFICERS

The Officers of the Board shall be the Chair, Vice-Chair, and University President who shall serve as the Executive Officer/Corporate Secretary.

Section 4.2
SELECTION OF OFFICERS AND TERMS OF OFFICE

The Board shall elect the Chair and Vice-Chair from the appointed members of the Board at its last regular meeting prior to August 1 upon recommendation of the Governance Committee and shall serve for a two year term to begin on August 1. The Chair and Vice-Chair shall be eligible for reselection for one additional consecutive term by vote of the Board, after which they may not be an officer for two years before being eligible for selection again. There shall not be automatic succession by virtue of holding an office, except as otherwise provided in Section 4.3.

Section 4.3
PERMANENT VACANCIES IN CHAIR AND VICE-CHAIR OFFICES

A permanent vacancy of the Chair shall be filled by the Vice-Chair for the remainder of the term. A permanent vacancy of the Vice-Chair shall be filled for the remainder of the term by a majority vote of the members of the Board at its next regular meeting. Assumption to an unfinished term created by a permanent vacancy shall not preclude that officer from being eligible to be selected and reselected as provided in Section 4.2. The Chair and Vice-Chair will continue to hold office until their successors have been selected. The Chair or Vice-Chair may be removed at any time by the affirmative vote of a majority of the members of the Board.

Section 4.4
CHAIR

The duties of the Chair shall include presiding at all meetings of the Board, calling special meetings of the Board, determining the composition of all Board committees, appointing committee chairs, serving as an ex officio voting member on all Board committees unless these Bylaws provide otherwise, appointing at least one representative~~s~~ to the board of directors and the executive committees of the direct support organizations, signing and executing all documents and instruments on behalf of the Board, attesting to actions of the Board, serving as spokesperson for the Board, and fulfilling other duties as may be required by law or assigned by the Board or the Board of Governors. The Chair shall perform such duties in consultation with the University President. The Chair may delegate the authority to sign and execute documents and instruments on behalf of the Board to the Corporate Secretary. The Chair is responsible for causing the Board to conduct an annual evaluation of the University President.

Section 4.5
VICE-CHAIR

The duty of the Vice-Chair is to perform the duties of the Chair with full authority during the absence or disability of the Chair and to fulfill other duties as may be assigned by the Board. In the absence of both the Chair and the Vice-Chair, the Corporate Secretary shall determine whether a quorum is present and, in that event, shall call for the election of a temporary presiding officer, who shall be elected by and from the appointed membership of the Board upon a majority vote. Upon arrival of the Chair or Vice-Chair, the temporary chair shall relinquish the chair after concluding the business then before the Board.

Section 4.6
EXECUTIVE OFFICER/CORPORATE SECRETARY

The University President shall serve as Executive Officer of the University and Corporate Secretary of the Board. As Executive Officer, the University President shall serve as the principal liaison officer and official contact between the Board and the faculty, staff and students of the university. The University President shall exercise such powers as are appropriate to that position in promoting, supporting and protecting the interests of the University and in managing and directing its affairs and serve as the University's key spokesperson. The President shall have the authority to execute all documents on behalf of the University and the Board consistent with law, Board policies, and the best interests of the University. The University President may issue directives and executive orders not in contravention of existing Board policies. The University President shall be responsible for all educational, financial, business and administrative functions of the University consistent with the policies established by the Board and shall exercise such other powers, duties and responsibilities as are delegated or assigned by the Board, the Board of Governors, and Florida law.

As Corporate Secretary, the University President shall be responsible for giving notice of all meetings of the Board and its committees; setting the agenda and compiling supporting documents for the meetings in consultation with the Chair; recording and maintaining the minutes of the meetings, which shall include a record of votes cast; executing documents or attesting to the signatures of other officers of the Board; and being custodian of the corporate seal. The Corporate Secretary shall perform the duties customarily performed by the secretary to a public body corporate as well as such other duties as may be prescribed by the Board. The Corporate Secretary may designate an individual to serve as Assistant Secretary to the Board.

ARTICLE V
COMMITTEES

Section 5.1
COMMITTEE MEMBERSHIP AND DUTIES

The Chair shall appoint and remove committee members and their chairs and may make changes, at any time, unless otherwise provided by these bylaws or law. A member of a committee shall hold office until the Chair appoints a successor. The Chair shall determine the length of the term of service of committee members and chairs.

Each committee shall consist of no less than three members. The Chair and the Vice-Chair shall be ex-officio voting members of all standing committees, subcommittees, and ad hoc committees. University staff with appropriate expertise in a committee's area of responsibility shall be appointed by the Chair in consultation with the University President to help ~~the~~ each committee in its business.

All Trustees who are not members of a particular committee are invited to attend that committee meeting and may comment, but not vote, on matters before the committee.

The duty of each committee shall be to consider and to make recommendations to the Board upon matters under its jurisdiction or referred to it. Unless specifically delegated, or as otherwise provided in these bylaws, authority to act on all matters is reserved to the Board. All committee chairs shall perform their duties in consultation with the University President and may appoint subcommittees to bring matters before the committee for further consideration.

Any committee of the Board may meet upon call of its chair to carry out its duties and responsibilities. Meetings shall be noticed under the procedure established for the Board.

Section 5.2
STANDING COMMITTEES

The following committees are the standing committees of the Board until dissolved by the Board:

Academic and Student Affairs Committee
Finance and Facilities Committee
Strategic Planning Committee
Audit and Compliance Committee
Governance Committee

The Chair may establish additional standing committees as it deems appropriate to discharge its responsibilities.

Section 5.3
AD-HOC COMMITTEES

The Chair may appoint ad-hoc committees and determine the powers and duties and period of service for each such committee, provided that no ad-hoc committee shall be created to act upon any matter appropriate to be acted upon by a standing committee. The Chair shall appoint the chairs of any ad-hoc committees and the ad-hoc committee chairs shall perform their duties in consultation with the University President.

Section 5.4
AUTHORITY

No committee has the power or authority to commit the Board to any policy or action unless specifically granted such power or authority by the Board. Committee chairs will report committee action as a recommendation for consideration and action by the Board. If the Board, however, authorized a committee to act on a matter referred to it, the committee chair will report the action taken to the Board at the Board's next scheduled meeting.

Section 5.5
PRESIDENTIAL SEARCH COMMITTEE

It is the duty of the Board to select the University President, subject to ratification by the Board of Governors. Candidates for the position of University President shall be recommended to the Board by a presidential search committee. The members of the presidential search committee shall be appointed by the Board. The selection of the members of the committee may be delegated to the Chair of the Board.

Section 5.6
EXECUTIVE COMMITTEE

The Executive Committee is made up of the Board Chair, the Board Vice-Chair, and the chairs of the standing committees. The University President is an ex-officio non-voting member of the committee. The Executive Committee may act only on matters that, in the opinion of the Board Chair, must be timely approved between regularly scheduled Board meetings.

The Executive Committee is delegated and may exercise all powers and authority of the BOT except where the law, BOG regulation or directive, or BOT Bylaws or directives specifically require the full board to act. The following matters shall also be reserved for the full board: Board officer selection; appointing and removing the President; approving or discontinuing programs; changes in institutional mission or purposes; changes to the Board's bylaws; incurring of indebtedness; adoption of the annual operating and capital outlay budgets and the University's Capital Improvement Program list for funding by the Legislature, including the Public Education Capital Outlay list; and the sale or other disposition of real property in the BOT's name.

Actions taken by the Executive Committee shall be reported to the Board at the next Board meeting.

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ARTICLE VI
MEETINGS

Section 6.1
NOTICE AND AGENDA

Notice of regular meetings, committee meetings, and special meetings of the Board will be given not less than seven (7) days before the event and will include a statement of the general subject matter to be considered. Whenever an emergency meeting is scheduled, the Corporate Secretary will post a notice of the time, date, place, and purpose of the meeting on the Board of Trustees website. All meetings of the Board and its committees shall be noticed and open to the public at all times. No resolution, rule, or formal action shall be considered binding except as taken or made at a public meeting in accordance with Florida Statutes § 286.011. However, these notice or public meeting requirements shall not apply where the matters being considered are exempt by law from the notice or open meetings requirements (for example, executive sessions to discuss pending litigation, collective bargaining, or evaluation of claims filed with a risk management program.) Notice of meetings that are required to be noticed will be posted on the Board of Trustee's webpage on the Florida Polytechnic University website at https://floridapoly.edu/about/board-of-trustees/

Agenda items requiring action by Trustees must be submitted to the Corporate Secretary or his/her designee with sufficient time for the agenda and supporting information to be forwarded and received by the Trustees prior to the meeting requiring their vote. The Board may also consider agenda items not included in the published agenda.

Items that are routine, procedural, informational and self-explanatory may be placed on the consent agenda for the full Board meeting. Minutes from the prior Board meeting and unanimously approved action items from committee meetings may also be placed on the consent agenda. The items placed on the consent agenda may be voted on by the Board without discussion. However, prior to the full Board meeting, either the Board Chair or a committee chair may choose to have any specific item from a committee meeting that would normally be placed on the consent agenda placed instead on the discussion section of the agenda. Additionally, any trustee may request that a specific item on the consent agenda be moved to the discussion section of the agenda prior to a vote on the consent agenda.

Section 6.2
SPECIAL NOTICE REQUIREMENTS

In the event the Board will consider a proposal to increase tuition or fees at an upcoming board meeting, notice of such proposal shall be posted at least 28 days before its consideration at a board of trustees meeting. The notice must:

(i) Include the date and time of the meeting at which the proposal will be considered.
(ii) Specifically outline the details of existing tuition and fees, the rationale for the proposed increase, and how the funds from the proposed increase will be used.
(iii) Be posted on the University's website and issued in a press release.

Section 6.3
MINUTES

Minutes of the meetings of the Board or Board Committees shall be kept by the Corporate Secretary, who shall cause them to be printed and preserved and who shall ~~transmit~~ provide copies to the members of the Board. All lengthy reports shall be referred to in the minutes and shall be kept on file as part of the University records, but such reports need not be attached to the minutes except when so ordered by the Board.

Minutes shall be posted prominently on the University website within two (2) weeks after a Board or Board Committee meeting, including the vote history and attendance of each trustee.

Section 6.4
REGULAR MEETINGS

There shall be no fewer than five (5) regular meetings a year, or as otherwise determined by the Board. A regular meeting means business meetings and Board retreats held at regular intervals; provided that time shall be made available when needed for the conduct of business at or around the time of any Board retreats. For each fiscal year, the schedule of meetings shall be set no later than the last meeting of the prior fiscal year. Once established in accordance with these bylaws, the time and date of a regular meeting may be changed only by an affirmative vote of a quorum of the Board, or where deemed a necessity by the Board Chair and the Corporate Secretary in consultation with each other.

Section 6.5
SPECIAL MEETINGS

The Board will meet in special meetings, including hearings and workshops, at a time and place designated by the Chair. Special meetings may be held by teleconference, at the discretion of the Chair.

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Section 6.6
EMERGENCY MEETINGS

An emergency meeting of the Board may be called by the Chair, Vice-Chair or University President upon a finding by the Chair, Vice-Chair or University President, respectively, that immediate action is required to preserve the health, safety or welfare of the public. Whenever such emergency meeting is called, the Corporate Secretary will immediately notify either verbally or in writing each member of the Board stating the date, hour and place of the meeting and the purpose for which the meeting has been called. As provided by Florida Statutes §120.525, an emergency meeting shall also be noticed by any procedure that is fair under the circumstances. Only action necessary to protect the interest of the University and the community it serves shall be taken at such meeting.

Section 6.7
QUORUM AND VOTING

A quorum for the conduct of business by the full Board shall consist of seven (7) Trustees. A quorum having been established, no business shall be transacted without a majority vote of all Trustees present, except as otherwise provided in these bylaws. A majority vote of the full Board is required for appointing or removing the University President. A Trustee may abstain from voting only under those circumstances prescribed by law. Should a Trustee abstain from voting, the Trustee may be counted for purposes of computing a quorum for a vote on that question. Voting by proxy or mail shall not be permitted.

A majority of the regular (not ex-officio) committee members shall constitute a quorum for all committee meetings. The Chair and Vice-Chair may be counted for purposes of establishing a committee quorum. A quorum having been established, no business shall be transacted without a majority vote of all committee members present.

Section 6.8
PROXIES

The use of proxies for purposes of determining a quorum or for any other purposes is prohibited.

Section 6.9
USE OF COMMUNICATION MEDIA TECHNOLOGY

The Board may use telephone conference calls and other communications media technology ("communication media technology") to conduct Board business in the same manner as if the proceeding were held in person.

A Trustee intending to attend a meeting of the Board by communication media technology shall provide the University President a written request to attend the board meeting by communication media technology at least seven (7) days in advance. A Trustee may attend a meeting by communication media technology provided the member can both hear and speak to all other members (allowing for simultaneous transmission). Participation by a Trustee by communication media technology shall constitute attendance in person at the meeting.

The Board may participate in and hold a meeting of which all members participating in the meeting are attending via communication media technology provided that seven (7) days' notice is given to the University President. Participation in such meeting shall constitute attendance in person at the meeting. The notice of any meeting which is to be conducted wholly by means of communication media technology will state where and how members of the public may gain access to the meeting.

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Section 6.10
RULES OF PROCEDURE

At the hour appointed for the meeting, the chair shall call the meeting to order and call the roll. The latest edition of *Robert's Rules of Order* will be followed in conducting all meetings of the Board, unless otherwise provided by the Board.

Section 6.11
APPEARANCES BEFORE THE BOARD

The Board shall allow for a public comment period during each Board and committee meeting ~~,~~ in accordance with the Board's Policy- Public Comment at Board of Trustees Meetings.~~Individuals or group representatives who desire to appear before the Board or committee regarding any item being considered on a meeting agenda shall submit their requests to the University President, as Corporate Secretary, specifying the agenda item about which they wish to speak. Such request, along with the requestor's name and contact information, any group or faction represented, and any supporting documentation, must be submitted at least twenty four (24) prior to the scheduled start of the meeting. The University President, in consultation with the Chair or Committee chair and complying with the law, will determine whether the item will be heard and when the item will be heard. A speaker's comments will be allotted three (3) minutes to present information; however this time limit may be extended or shortened depending upon the number of speakers at the discretion of the chair. Speaker shall confine their remarks to the agenda item being addressed.~~

~~The aggregate time for all public comments at a meeting need not exceed 15 minutes. If it appears that there are more speakers desiring to speak than may be accommodated, the chair or President may reduce the maximum amount of time allowed each speaker, may limit the number of speakers that may address an agenda item or topic, or may ask a group to designate a representative to speak on its behalf. The chair or President may decline to hear any matter determined by the President or chair not to relate to a particular agenda item or that is outside the Board's jurisdiction, or because it is not practicable for a particular meeting.~~

The chair may recognize any individual or representative of a group to address the Board.

In order to proceed with the essential business of the Board in an orderly manner, any individual or group representative who attempts to disrupt a Board meeting will be subject to appropriate action (including removal) pursuant to law.

ARTICLE VII
CODE OF ETHICS

Section 7.1
CODE OF ETHICS

As appointed public officers, Trustees stand in a fiduciary relationship to the University and the people of the State of Florida. Therefore, Trustees shall act in good faith, with due regard to the interests of the University and shall be guided by the provisions set forth in Florida law for the conduct of public officers. The Board has adopted a written ethics policy that also addresses conflicts of interest, which will be reviewed periodically and revised as necessary.

ARTICLE VIII
AMENDMENT OR SUSPENSION OF BYLAWS

Section 8.1
AMENDMENTS

Following initial adoption, these bylaws may be altered, amended or repealed by the affirmative vote of two-thirds (2/3) of the Board members voting in any regular or special meeting, provided the notice for the meeting states a proposed alteration, amendment or repeal of the bylaws will be considered, and provided the Trustees are provided a copy of the draft of the altered or amended bylaws via email at least seven (7) days prior to the meeting at which the alteration or amendment is to be voted on.

Section 8.2
SUSPENSION OF BYLAWS

Any provision of these bylaws not required by law may be suspended in connection with the consideration of a matter before the Board by a majority vote of the Board members in attendance.

ARTICLE IX
MISCELLANEOUS

Section 9.1
INDEMNIFICATION

The Board shall, to the extent legally permissible, indemnify and defend each of its Trustees, officers, employees, volunteers, and other agents against all liabilities and expenses incurred in connection with the disposition of defense of any action, suit or other proceeding, whether civil or criminal, in which such person may be involved by reason of University service, except with respect to any matter in which such person shall have been adjudicated in any proceeding to have acted unlawfully or not in good faith. Claims based on such actions or omissions may, in the discretion of the Board, be settled prior to or after the filing of suit.

Section 9.2
INSURANCE

The Board may arrange for and pay the premium for appropriate insurance to cover all losses and expenses of actions referred to in Section 9.1.

Section 9.3
LIMITATION OF LIABILITY

The Board is a public body corporate primarily acting as an instrumentality or agency of the state pursuant to Florida Statutes §768.28(2) for purposes of sovereign immunity.

Section 9.4
SERVICE OF PROCESS

In all suits against the Board, service of process shall be made on the Office of the General Counsel located at the Florida Polytechnic University offices located on the Polk State College Campus 3425 Winter Lake Road, LTB-2121, Lakeland, Florida 33803.

Section 9.5
FISCAL YEAR

The fiscal year of the Board shall commence on July 1 of each year and end on June 30 of each year.

Section 9.6
CORPORATE SEAL

The corporation shall have a seal on which shall be inscribed "Florida Polytechnic University." The corporate seal shall be used only in connection with the transaction of business of the Board and of the University. The University President may give permission for the use of the seal in the decoration of any University building or in other special circumstances.

I HEREBY CERTIFY that the foregoing ~~Second~~ Third Amended and Restated Bylaws of the Florida Polytechnic University Board of Trustees were approved by an affirmative vote of not less than two-thirds (2/3) of the members of the Board of Trustees at a regular meeting of the Board held on ~~February 28, 2018~~January 16, 2019.

_____
Board Chair

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