University of Florida Ph.D. in Engineering Education CIP 14.9999 Proposal Documents

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

In Accordance with BOG Regulation 8.011 (Please do not revise this proposal format without prior approval from Board staff)

University of Florida

Institution Submitting Proposal

Herbert Wertheim College of Engineering Name of College(s) or School(s)

Engineering Education Academic Specialty or Field Spring 2023 Proposed Implementation Term

Engineering Education Name of Department(s)/Division(s)

Doctor of Philosophy and Master of Science Complete Name of Degree

10

14.9999 Proposed CIP Code (2020 CIP)

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

4-22-22	inter >1	24hz (10-5.22
Date Approved by the University Board of Trustees	President's Signature	Date 3/2/22	XF
Board of Trustees Chair's Signature Date	Provost's Signature	Date	7.19.22

PROJECTED ENROLLMENTS AND PROGRAM COSTS

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

Implementation Timeframe	ementation meframe HC		E&G Cost per FTE	E&G Funds	Contract & Grants Funds	Auxiliary/ Philanthropy Funds	Total Cost
Year 1	10	7.5	\$25,560	\$191,703	\$0	\$0	\$191,703
Year 2	20	15					
Year 3	30	22.5					
Year 4	35	26.25					
Year 5	40	30	\$24,268	\$728,025	\$268,510	\$0	\$996,535

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.

Traditional engineering programs focus on technical skills in specific engineering disciplines (e.g., mechanical engineering, civil engineering, etc.). This program is instead focused on broadbased transferable skills that enable graduates to become researchers, practitioners, future leaders, and agents of positive change in engineering education. Graduates of the program will have the knowledge and skills to better prepare K12 students, engineering students in higher education, and professionals through continuing education, to tackle the complex engineering problems of the 21st century. This will be achieved through a pragmatic research-to-practice approach where students will not just conduct research but also learn to apply the research into several platforms (e.g., classrooms, industrial trainings, policy). By incorporating a one-semester required research-to-practice experience for our students, whether in industry, academia, or policy think-tanks, among others, we will ensure widespread dissemination and leadership in several domains. Furthermore, incorporation of reflective practices such as engineering education portfolios will afford an action-oriented approach to tie evidence-based practices and lessons learned from research into tangible interventions, curriculum designs, and other products that may be applicable to a larger engineering education setting. Finally, the program is premised on the realities of a diverse prospective and current engineering workforce (e.g., working professionals, parents) via flexible programmatic options (e.g., M.S. thesis, M.S. nonthesis, Ph.D. thesis) The three components of the program: (a) research-to-practice required experiences, (b) research-to-practice products (e.g., portfolios), and (c) flexible programmatic requirements provides a unique distinction and quality of this Ph.D. program over more established graduate engineering education programs in the nation (e.g., Purdue, Virginia Tech). The goal of this program is to prepare our graduate students to become researchers, practitioners, future leaders, and agents of positive change in engineering education.

Rapid Changes in Engineering Education

Engineering education is in flux as evidenced by recent changes to reports and initiatives within the Accreditation Board of Engineering and Technology (ABET), the National Academy of Engineering (NAE), the American Society of Engineering Education (ASEE), the Institute of Electrical and Electronics Engineers (IEEE), among others. There is a widespread recognition that with the advent of new technologies (e.g., artificial intelligence), methods (e.g., data sciences), and educational platforms (e.g., online), our engineering students of tomorrow will need to be prepared with the rapid changing landscapes of their education and professionalization.

For example, in 2020, the National Academy of Engineering called for the need to pay attention to the role that "computational tools and artificial intelligence as it relates to the very fabric of our society." (NAE, 2020, p.7). Artificial intelligence is transforming the way individuals learn and interact with engineering knowledge. In this technological age, learning doesn't just happen through the classroom but by students' interactions with a wealth of resources and information found in the Internet of Things. At the same time, data sciences and its tools are increasingly being used in engineering projects as data sets become much more robust and complex. Together, the incorporation of AI and data sciences into engineering education necessitates a rapid change to remote emergency instruction has required that information is delivered in online and hybrid formats. To this end, engineering education and its delivery is rapidly changing to increase access and delivery of content to a wider and potentially more diverse audience.

In engineering education, innovation is always a need and a change. Innovation "requires a diversity of thought" (NAE, 2020, p. 9). Without a general understanding, reflection, and adaptation to reflect the broader sociopolitical context in the United States, inequities in engineering education, will continue to prevent that diversity of thought, backgrounds, and experiences to be present in engineering classrooms and workplace settings. As such,

engineering education must rapidly change to include more inclusive, diverse, equitable, and accessible (IDEA) spaces with a focus on social responsibility and its implications on society at large. <u>https://www.nae.edu/269658/Imagining-the-Future-of-Undergraduate-STEM-Education</u>

Furthermore, engineering is becoming increasingly multi-, inter-, and cross-disciplinary. To become a professional engineer in today's society, it is not uncommon to have a breadth of understanding in business, psychology, management, law, the humanities, to name a few. The rapid exchanges of ideas and information will also necessitate a rapid change in the way that engineering projects, assignments, and activities are conducted. As such, engineering education will need to situate their learning in the larger context of expertise and approaches.

The aforementioned examples reflect changes that require rapid responses are just a few examples of how engineering education is quickly evolving and becoming more encompassing, complex, and innovative. This program will prepare its graduates to develop the knowledge and skills to design and deliver curricula that meet these needs. Coursework will cover a range of topics in curriculum design, such as theories of learning, innovative approaches to teaching, and curriculum design, including design for online environments. Those students pursuing one of the research tracks (PhD or MS with thesis) will do an independent research project addressing some aspect of learning or teaching. For the PhD program, the research-to-practice experience will facilitate transfer of classroom knowledge to real-world practice.

After completion of the PhD, the candidate will be able to

- Synthesize the literature to identify research topics;
- Create relevant research question(s);
- Conduct independent research in engineering education to address the research question(s);
- Conduct an analysis of needs and context to identify gaps between research and practice;
- Collaborate with others in academia, industry, and other organizations to conduct research and develop evidence-based best practices
- Apply engineering education research findings, methodologies, concepts, and frameworks to real-world contexts such as industry or academic training experiences, professional development, classroom innovation, or assessment

a) We are proposing a doctoral program

b) A single track for Engineering Education is proposed.

c) The total number of credits is 90.

d) There are approximately 330 accredited engineering programs in the US and fewer than 15 offer degrees in Engineering Education. As part of the rapid changes in engineering education such as the UF program of the New Engineer, job opportunities include academia (both within engineering education departments, as well as in traditional engineering departments) and technical employee education and training programs at large engineering corporations.

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 program was reviewed by the CAVP on September 2, 2021 and 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.

The program was reviewed by Dr. Donna Riley who is the head of the School of Engineering Education at Purdue University. The Purdue program is the oldest and one of the most successful programs in the field.

Recommendations/Considerations in Consultant Report:

The consultant report reflects many strengths of the program and provided a few recommendations. Below are our rationale for incorporating or not incorporating these changes:

<u>Recommendation #1.</u> Explain how "your program balances quantitative and qualitative methods in engineering education research" (p. 2, Appendix D of report)

Response to Recommendation #1. In engineering education research, students will need to learn both about qualitative and quantitative methodologies and methods to conduct their research. Examples of qualitative methodologies include but are not limited to case studies, narrative inguiries, and grounded theory. These methodologies will include both a philosophical and theoretical/conceptual lens by which to design and conduct the research through tools such as interviews, observations, and document analysis. Quantitative methodologies include experimental, guasi-experimental, randomized controlled trials among others that include measurable tools such as surveys, frequency tables, and histograms. At times, a student may require a mix of both quantitative and qualitative methodologies and methods. The choice whether students will defend a thesis based on quantitative, qualitative, or mixed approaches is dependent on the research topic, scope, novelty, and goal of the research. For this reason, the Engineering Education Department (EED) at UF opted for a two-pronged approach where graduate students will be provided with an introductory course in Research Design and Research Methods with the option to take more advanced elective courses in the College of Education (or similar) at UF. To this end, we have identified elective courses that students can take in other colleges that will more succinctly address their need for a qualitative, quantitative, or mixed study.

<u>Recommendation #2:</u> Include milestones to ensure that the publication requirement for graduation is met before any time crunches around completing the dissertation (p. 2, Appendix D of report).

<u>Response to Recommendation #2.</u> The department had already considered this recommendation and will be including in their graduate student manual information about the milestones and tentative timelines to achieve each milestone. For the specific publication requirement, graduate students should have submitted a peer-reviewed publication (not published) one semester after completing the qualifying exam.

<u>Recommendation #3.</u> Consider admissions criteria that are more writing-oriented (p. 2, Appendix D of report).

<u>Response to Recommendation #3</u>. The department is discussing more comprehensive ways of admitting graduate students into the program as we too recognize the limitations that GRE requirements provide. In addition to the TOEFL exam, we will be requiring a written example in the form of an essay around an important topic in engineering education (e.g., role of active learning in the educational experience of engineering students). To this end, the Ph.D. committee in the department will be working on a rubric to evaluate the quality, criticality, and innovativeness of the writing. This information will be provided in the graduate student manual as well as on our website, once it is finalized.

<u>Recommendation #4</u>. The requirements as written do not indicate how much course is required, before moving to the qualifying exam (p. 2, Appendix D of report).

<u>Response to Recommendation #4</u>. The University of Florida Graduate School requires a statement of purpose for all applicants. It is standard to use this statement of purpose to assess the applicant's writing ability. The Graduate School also requires a minimum score of 80 on the TOEFL or 6.0 on the IELTS for all international applicants.

<u>Recommendation #5.</u> Fairness of the two-week qualifying examination period, in relation to disability accommodations should be reconsidered (p. 2, Appendix D of report).

<u>Response to Recommendation #5.</u> Given the Graduate School timelines, we believe a two-week qualifying examination period is ample time for students to complete their responses to the qualifying questions. With that said, we will include a clause regarding accommodations of such a timeline based on disability and other extenuating circumstances.

<u>Recommendation #6.</u> Added recruiting and advising efforts due to the flexible M.S. options (thesis and non-thesis) and Ph.D. programs (p. 3, Appendix D of report). <u>Response to Recommendation #6.</u> The department is currently discussing ways that the college of engineering can support further recruitment and advising. Also, the tenure-track faculty within the department have recently volunteered to develop and advertise information sessions. These are anticipated to be recorded for future use in our department and possibly in coordination with the marketing group in the Herbert Wertheim College of Engineering.

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).

Engineering education is a new field with expanding opportunities in student interest and research funding. It is field which researches new approaches to teaching engineering and equips its graduates to be the premier instructors in engineering. Thus, this program supports the BOG Program of Strategic Emphasis of Economic Development – STEM. By improving the way engineers are educated, through expertise gained by the PhD graduates and their research, engineers educated in the State of Florida will be better prepared to contribute to the state's economy. Many of our peer institutions (e.g. Purdue, Virginia Tech, University of Michigan) have PhD programs in engineering education. It is not sufficient to duplicate those programs. UF should distinguish itself in the type of PhD education it provides to students. These other programs focus solely on research outcomes (e.g. publications). In contrast, the UF program will be action-oriented requiring students to use research results to address a specific need. An action focus will better prepare the graduates to address engineering education needs within the state and nationwide. The curriculum will consist of courses in engineering education research methods, engineering curriculum design, student learning, as well as courses in a traditional engineering discipline. These courses provide the foundation for subsequent research which contribute to UF's and the SUS's goals for the creation of new knowledge. There are collaborative opportunities with all the engineering programs at universities in the SUS. Collaboration could occur through identifying educational needs in engineering throughout the SUS and conducting research to support those needs.

- E. If the program is to be included in a category within the Programs of Strategic Emphasis as described in the SUS Strategic Plan, please indicate the category and the justification for inclusion. The Programs of Strategic Emphasis Categories are:
 - Critical Workforce:
 - □ Education
 - □ Health
 - □ Gap Analysis
 - Economic Development:
 - □ Global Competitiveness
 - Science, Technology, Engineering, and Math (STEM)

Please see the Programs of Strategic Emphasis (PSE) methodology for additional explanations on program inclusion criteria at <u>the resource page for new program</u> <u>proposal.</u>

There currently is no CIP for the field of Engineering Education; therefore, CIP 14.9999 General Engineering is used. Because the field of engineering education applies to all the other traditional engineering fields, a CIP code specific to a traditional engineering degree would not be broad enough. In the State of Florida, FIU has an engineering education PhD approved in the 14.9999 CIP code.

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.

This program will be offered on the UF main campus only.

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.

Engineering Education is a growing field with strong demand from students. This program will be of interest to students with an engineering bachelor's and/or master's degree but who want to focus their career on education. Potential careers include instructional positions (tenure track and non-tenure track) in teaching-focused institutions, instructional positions in freshman engineering programs, and course development and instructional design positions in engineering companies. Growth is especially strong in Florida compared to National.

Academic examples

A current job post board is maintained by members of the American Society of Engineering Education (current listing 68 jobs): <u>http://engineeringeducationlist.pbworks.com/w/page/48108151/Engineering%20Education%20Jo</u> b%20Postings

Industry examples

Google: Director, Technical Program Management, Engineering Education

At Engineering Education (engEDU), we develop innovative systems, content, and processes to enable high quality education at scale. Our goal is to advance the technical abilities of all, at Google and beyond, to create new knowledge and to prepare the world's workforce for the jobs of the future.

Amazon: Industry Specialist, Education to Workforce

The AWS Education to Workforce (E2W) Team is passionate about enabling growth for public and private sector companies by creating talent pipelines aligned to customers' most indemand, attainable roles. We design and implement education pathways that integrate cloud skills into classrooms, prepare the workforce of the future for high-demand, high-wage cloudenabled jobs, and help companies grow by connecting them with the talent they need.

Honeywell: Manufacturing Training Specialist

The Technical Learning Specialist assists with the administration, design, development, delivery, implementation, and evaluation of training programs to effectively develop employees across the organization and maximize productivity.

Letters of support from the following industries are included in Appendix E: Boeing, Raytheon, Medtronic, Wastefuel, zyBooks Wiley, Vispero Brands, and Northrop Grumman.

Labor Market Demand, CIP Code 14 9999

	Employme %	nt Change	Annual Av Job Open	/erage ings	Employme (numbers)		
Occupations	FL 2021-29	National 2020-30	FL	National	FL 2021-29	National 2020-30	BLS Typical Education Needed forEntry
Engineering	14.8	4.1	643	14,700	1,150	8,100	Bachelor's
Managers							degree
Engineers, All	10.1	2.7	765	11,000	1,037	4,400	Bachelor's
Others							degree
Engineering	18	12.5	164	5,100	263	5,800	Doctoral or
Teachers,							professional
Postsecondary							degree

Sources: U.S. Bureau of Labor Statistics – https://www.bls.gov/ooh Florida Department of Economic Opportunity - http://www.floridajobs.org/labor-market-information/data-center/statistical-programs/employment-projection

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.

The University of Florida manages a database of student interest: Engineering National Graduate Institutional Name Exchange (ENGINE). Data is provided by 78 member institutions. For the past 3 years, we have been collecting interest in Engineering Education and in that period, 443 students indicated an interest in studying a PhD in Engineering Education at UF as a first or second choice. Of those students, 121 indicated UF as a first choice if a degree program were available. A sampling of communication between students and faculty currently doing Engineering Education research at UF is included in Appendix F.

YEAR	TOTAL	BS	MS	TOP CHOICE	2 ND CHOICE
2021	158	144	14	47	111
2020	147	128	19	35	112
2019	138	126	12	39	99
TOTAL	443	398	45	121	322

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 is currently one other similar program in the SUS, a Ph.D. in Engineering and Computing Education at FIU (CIP code 14.9999, Engineering, Other), which was approved by the BOG in July 2019. Preliminary discussions about collaboration across the SUS have occurred, with details to be finalized. A meeting was held on Nov 1, 2021 with Monica Cardella, director of the School of Computing, Construction, and Engineering Education at FIU to discuss the effect our proposed program would have on the FIU program. Based on the Nov 1, 2021 meeting, both institutions agreed that there is a great need for our students to serve the state and beyond and there is room for another program in the state. The creation of this program will not affect the FIU program. There is a great opportunity to collaborate on topics such as K-12 STEM education in the state to prepare students for an engineering career. A letter of support from FIU is included in Appendix G.

D. Use Table 1 - Appendix A (1-A for undergraduate and 1-B for graduate) to categorize projected student headcount (HC) and Full Time Equivalents (FTE) according to primary sources. Generally undergraduate FTE will be calculated as 30 credit hours per year and graduate FTE will be calculated as 24 credit hours per year. Describe the rationale underlying enrollment projections. If students within the institution are expected to change

majors to enroll in the proposed program at its inception, describe the shifts from disciplines that will likely occur.

We expect some initial transitions of students in existing engineering Ph.D. program, approximately 5. Additional students will be recruited. Graduate student enrollment is proportional to research funding levels. Currently, UF is not taking full advantage of the federal funding opportunities. Expansion of research in engineering education will happen in conjunction with the growth of the Ph.D. program. Additional tenure-track faculty hires and expansion of the research assignment of existing faculty are planned. Enrollment into the program will be a mix of local BS graduates, national applicants recruited through the Engineering National Graduate Institutional Name Exchange (ENGINE) run by the University of Florida, and international applicants. We intend to initially recruit 10 new students per year for the first 3 years and 5 new students per year for the next 2 years. A steady-state enrollment is 40 students.

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

Diversity starts with a diverse department. The Department of Engineering Education is very diverse with 52% females, 24% Hispanic, and one African American female faculty.

Outstanding, diverse students will be recruited through the Engineering National Graduate Institutional Name Exchange (ENGINE), the national McNair Scholars list, GEM Consortium Membership, engineering student societies (i.e. American Indian Science and Engineering Society (AISES), National Society of Black Engineers (NSBE), Out in Science, Technology, Engineering, and Mathematics (oSTEM), Society of Hispanic Professional Engineers (SHPE), Society of Women Engineers (SWE), etc.), National Name Exchange, and State of Florida Public University student access. Systematic recruitment using the various databases started in 2015 and the table below shows the impact on domestic students, female students, and under representative minority students in the Herbert Wertheim College of Engineering (HWCOE) a UF.

HWCOE Ph.D. Applications	FA13 1.359	FA14 1 257	FA15 1.374	FA16 1.612	FA17 1 400	FA18 1 294	FA19 1.304	FA20 1 126	FA21 1 447
Domestic	231	217	388	533	523	503	568	430	493
Female	321	314	369	426	366	338	393	334	436
Female Domestic	56	67	120	147	167	162	189	156	179
Underrepresented Minority	56	49	126	136	155	152	155	109	140
Cumulative Undergraduate GPA	3.53	3.55	3.60	3.62	3.63	3.65	3.64	3.65	3.64
HWCOE Ph.D. Enrolled	FA13	FA14	FA15	FA16	FA17	FA18	FA19	FA20	FA21
Total	174	171	196	196	155	163	173	122	144
Domestic	97	94	109	118	94	99	112	89	86
Female	33	44	46	67	43	50	43	44	52
Female Domestic	19	21	20	33	34	31	34	34	34
Underrepresented Minority	18	22	23	29	32	41	22	27	26
Cumulative Undergraduate GPA	3.53	3.58	3.61	3.66	3.71	3.71	3.70	3.71	3.69

There is currently one other similar program in the SUS, a Ph.D. in Engineering and Computing Education at FIU (CIP code 14.9999, Engineering, Other), which was approved by the BOG in July 2019. A meeting was held on Nov 1, 2021 with Monica Cardella, director of the School of Computing, Construction, and Engineering Education at FIU to discuss the effect our proposed program would have on the diversity of the FIU program. The FIU program is in south Florida, while the UF program is taught at the north-central Florida campus in Gainesville. Geographically far apart and the UF program is not expected to have an impact on the ability of FIU to draw a diverse local group of students. Enrollment in both the UF and FIU programs is expected to have a national and international interest in addition to a local pathway for students. FIU's ability to recruit from the national and international pool will not be affected by the creation of the UF program and is not expected to affect the diversity of the FIU program.

III. Budget

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

The faculty of the Department of Engineering Education and the supporting departments are well prepared to teach the proposed program. The initial program can be managed through a refocusing of effort and by reassigning existing teaching and research time to the program. In year 1, \$165,341 of faculty salaries and benefits and \$13,661 of staff salaries and benefits will be reallocated to the program. Expense cost is estimated to be \$12,700 (based on the 2021 department budget and includes: office supplies, computer equipment, copying expenses, etc.) and is also reallocated from the existing program. The year 5 budget was created by increasing the time assignment for the faculty involved – including allocating new faculty, accounting for a 3% salary increase per year, and the addition of student fellowships through contracts and grants. This results in \$670,139 in faculty salaries and benefits, \$30,752 in staff salaries and benefits, and \$27,134 in expenses (approximately 15% increase per year as the program admits more students and the faculty and staff grow).

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

This program will not be offered through continuing education or be offered with a marked rate or differentiated graduate tuition. The current rate of resident tuition for graduate courses is \$448.73 per credit hour and a non-resident fee of \$690.21 per credit hour for non-resident tuition per UF Regulation 3.0375.

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 Department of Engineering Education currently has the faculty expertise to teach the program using faculty with PhDs in Engineering Education or related degrees and experience. Those faculty are currently assigned teaching related to engineering service courses and their assignments will shift to the proposed graduate program. Additional effort can be assigned using current teaching faculty, and we are conducting one search for an additional teaching faculty. There are no expected impacts on other departments.

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).

Several meetings with the College of Education (COE) were held. We value COE as a partner and are already collaborating with them on several projects. In addition to a meeting of associate deans, a meeting of faculty from the College of Education and the Department of Engineering Education was held on October 4, 2021. The discussion focused on the educational requirements of the proposed program. No changes were suggested but the COE faculty offered to maintain a list of relevant elective courses the Engineering Education Ph.D. students could take.

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

The National Science Foundation has awarded \$368M in the last 3 years to engineering educationrelated activities through its Division of Engineering Education and Centers. This amount does not include awards made to centers. UF was awarded \$1.9M in this period while peer schools with engineering education doctoral programs were awarded a larger portion (Purdue \$36M, ASU \$39M).

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

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

The proposed program will graduate doctoral students with both a solid engineering as well as a solid educational, pedagogical background. These graduates can go on to research and teaching careers at any engineering program. In addition, the engineering industry is developing educational content for their employees and customers and there has been a need for people with both engineering micro-credentials and badges which can be shown on trainees' LinkedIn pages. Examples of these positions are: Google: Director, Technical Program Management, Engineering Education, Amazon: Industry Specialist, Education to Workforce, and Honeywell: Manufacturing Training Specialist.

There are approximately 330 accredited engineering programs in the US and with an increased focus on quality education and the changing needs in engineering education, our students should find a good fit and employment.

V. Access and Articulation – Bachelor's Degrees Only

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

Not applicable; this is not a bachelor's degree.

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 <u>the resource page for new program proposal</u>). 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.

Not applicable; this is not a bachelor's degree.

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; this is not a bachelor's degree.

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 <u>the resource page for new program proposal</u>). List the prerequisites, if any, including the specific AS degrees which may transfer into the program.

Not applicable; this is not an AS-to-BS capstone program.

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).

SUS Strategic Plan.

The proposed program aligns with the 2025 SUS Strategic Plan which defines 3 critical points of emphasis: Excellence, Productivity, and Strategic Priorities for a Knowledge Economy. This proposal aims to produce graduates who can vastly improve the quality of engineering education, which will lead to higher quality Florida engineering graduates who will contribute greatly to the State's knowledge economy. Programs like our proposed program in CIP 14.9999 are designated as a Program of Strategic Emphasis because they aim to produce more graduate level educators, professors, and researchers.

UF Strategic Plan.

The proposed program aligns with the 2015 UF Strategic Plan through the following Goals: Goal 1: diversity. Through a purposeful strategy of diverse hiring and student recruitment, the program aims to have diverse demographic and geographic characteristics. This has already been shown in the diversity of our faculty. Goal 2. Obj 3: Academic programs that promote effective and accessible learning through innovation. Our program's research will focus on effective, innovative, accessible learning. Goal 4: Research Growth. Our program's PhD students will contribute to the research activities in their assigned labs and will drive additional grant proposals.

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 proposed program will be part of the highly ranked Herbert Wertheim College of Engineering

which is ranked 25th in public universities graduate rankings and 18th in undergraduate rankings. Faculty in the Department of Engineering Education contribute to the teaching of all undergraduate engineering students at UF through service courses and by embedding engineering educators in discipline departments.

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

The program has been developed primarily by the faculty of the Department of Engineering Education with help from joint faculty and through consultation from faculty from other departments.

Planning Process

Date	Participants	Planning Activity
9/17/2019	PhD Program committee formed with members from the department of engineering education and other engineering departments	Review existing programs, design the Ph.D. curriculum, create syllabi for new courses
Monthly meetings through 4/22/2021	PhD Program Committee	Continue the creation of the PhD program
4/21/2021	Meeting between College of Education associate dean Tom Dana, College of Engineering associate dean Toshi Nishida, and Engineering Education Department Chair Hans van Oostrom	Discuss proposed program and synergies
10/4/2021	Meeting between faculty from the College of Education and the College of Engineering	Discuss overlaps and synergies

Events Leading to Implementation

Date	Implementation Activity
3/26/2021	Proposal discussed and approved by the faculty members of the Department of
	Engineering Education
9/3/2021	Preproposals approved by SUS CAVP
10/12/2021	Proposal discussed and approved by the full faculty of the Herbert Wertheim
	College of Engineering
12/16/2021	Graduate Council review
1/13/2022	Faculty Senate Steering Committee
1/20/2022	Faculty Senate Information Item
2/17/2022	Faculty Senate Voting Item
4/21/2022	Board of Trustees

VII. Program Quality Indicators - Reviews and Accreditation

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

Doctoral Programs in the Herbert Wertheim College of Engineering are reviewed and accredited through the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC).

The most recent (2017) seven-year program reviews shows the following common strengths and weaknesses: Strengths

High rankings among their peers. High quality students.

Weaknesses

Available funding for PhD students, aging laboratory facilities in some programs, limited diversity increased undergraduate teaching load.

The proposed program's department is already helping through the teaching of college-wide engineering service courses.

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.

After completion of the PhD, the candidate will be able to

- Synthesize the literature to identify research topics;
- Create relevant research question(s);
- Conduct independent research in engineering education to address the research question(s);
- Conduct an analysis of needs and context to identify gaps between research and practice;
- Collaborate with others in academia, industry, and other organizations to conduct research and develop evidence-based best practices
- Apply engineering education research findings, methodologies, concepts, and frameworks to real-world contexts such as industry or academic training experiences, professional development, classroom innovation, or assessment.

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

Admission standards:

- B.S. in STEM related field or B.S. and related experience; or Masters in an engineering or Computer Science discipline
- A minimum grade point average of B (3.0), calculated from all grades and credits after the semester where the applicant reached 60 semester hours or 90 quarter hours is required.no GRE requirement
- For applicants from countries where English is not the official language, a minimum score on one of these English Language Skills tests:
 - Test of English as a Foreign Language (TOEFL): 550 paper, or 80 Internet;
 - International English Language Testing System (IELTS): 6; or
 - Documented successful completion of the University of Florida English Language Institute program.

Graduation requirements:

- Minimum of 90 credits beyond the bachelor's degree.
- Successful defense of a dissertation

Transfer of credits

- A maximum of 30 credits from a MS degree will be transferred to the PhD, subject to UF Graduate School policies and reviewed by the Graduate Program Committee.
- 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.

Semester credit hours for doctoral and master programs are typically 12 credits per major semester and 9 credit hours in the summer semester. The M.S. degree will primarily be used for students who do not complete the Ph.D. program. While many students completing the Ph.D. will also meet the M.S. degree requirements, students will not receive the M.S. degree unless they apply for it and meet all the requirements.

Ph.D. program

Minimum of 90 credits beyond the bachelor's degree.

- EED Core Courses: 15 credit hours
- Experiential Learning: 5 credit hours
- Elective Requirement: 6 credit hours
- Disciplinary Concentration: 15 credits of graduate work in computer science or a single engineering discipline outside of EED. This requirement is waived if a student is admitted with a master's degree in an engineering or computer science discipline.

Course substitutions may be petitioned and considered on a case-by-case basis.

Successful presentation and defense of the:

- o Qualifying exam (limited to 2 attempts), in core areas of engineering education;
- Dissertation proposal, in an individual area of engineering education, designed by the student with support from their advisor and supervisory committee;

- Doctoral dissertation, based on the proposal, and will be the culminating experience of the degree.
- The Doctoral dissertation will follow the procedures from UF's Graduate School, which require a supervisory committee with a minimum of four faculty from the UF graduate faculty (minimum of 2 from the academic unit). The quality and contents of the dissertation is guided and reviewed by the supervisory committee. Each student will have an Individual Development Plan, discussed annually with the supervisory committee chair, which will be used to ensure the quality and contents of the dissertation.

Submission of 1 peer-reviewed journal article AND acceptance of {1 conference presentation or 1 seminar presentation or 1 workshop presentation}, both as first author.

One semester of a research to practice experience, such as a teaching experience, a practical internship, (e.g. educational policy internship, educational industry partner) or curriculum development/creation/transformation (e.g., a single module for a course, multiple modules, an entire course, or multiple courses, etc., as appropriate).

Creation of a reflective engineering education portfolio, which highlights EED teaching, research, service, and practical application of the student's research towards the discipline. The portfolio will be reviewed by the supervisory committee.

M.S. non-thesis program

Minimum of 30 credits beyond the bachelor's degree.

- o EED Core Courses: 9 credit hours
- o Elective Requirement: 21 credit hours
- Comprehensive examination

M.S. thesis program

Minimum of 30 credits beyond the bachelor's degree.

- EED Core Courses: 15 credit hours
- Research requirement: 6 credit hours
- o Additional graduate or research credits: 9 credit hours
- o Successful present and defend a Master's thesis

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

Ph.D. Program

<u>Core Courses (15 cr)</u> EGS 6050: Foundations in Engineering Education (3 cr) EGS 6XXX: Cognition, Learning, and Pedagogy in Engineering Education (3 cr) EGS 6XXX: Instructional Design in Engineering Education (3 cr) EGS 6XXX: Research Design in Engineering Education (3 cr) EGS 6XXX: Research Methods in Engineering Education (3 cr)

Experience (5 cr)

EGS 6XXX: Preparation for Engineering Education Research to Practice Experience. (1 credit) EGS 6XXX: Research to Practice Experience in Engineering Education (3 cr) EGS 6XXX Engineering Education Seminar (1 cr) - required registration for one semester, attendance required for entire program

Elective Requirement (6 credits)

Students must take 6 credits of graduate courses related to their dissertation research topic and/or career goals. The courses must be approved by the student's advisor.

Disciplinary Concentration (15 cr)

Students must take 15 credits of graduate courses in a single engineering or computer science discipline. At least 9 credits must be at the 6000 level. This requirement is waived if a student is admitted with a master's in an engineering discipline or computer science.

Doctoral Research (49 cr minimum)

Students will enroll in research which will be supervised by their supervisory committee chair or designee. Students will continue to take research credits until ready to defend their dissertation. Additional elective courses where needed for the research can be substituted.

Typical semester plan

Year 1

FallEGS 6050: Foundations in Engineering Education (3 cr)EGS 6XXX: Cognition, Learning, and Pedagogy in Engineering Education (3 cr)Discipline Concentration (3cr)SpringEGS 6XXX: Instructional Design in Engineering Education (3 cr)EGS 6XXX: Research Design in Engineering Education (3 cr)Discipline Concentration (3cr)BummerEGS 6XXX: Preparation for Engineering Education Research to Practice Experience. (1credit)Doctoral research (5cr)

Year 2

Fall EGS 6XXX: Research Methods in Engineering Education (3 cr) EGS 6XXX Engineering Education Seminar (1 cr) Disciplinary Concentration (3cr) Doctoral research (2cr) Spring EGS 6XXX: Research to Practice Experience in Engineering Education (3 cr) Disciplinary Concentration (3cr) Doctoral Research (3cr) Summer Doctoral Research (3cr)

Year 3-4

Students take remaining disciplinary concentration, elective, and doctoral research courses. Nine credits each for Fall and Spring, six credits in the summer.

Admission to Candidacy

Successful completion of both the Qualifying Exam and Dissertation Proposal will result in admission to Ph.D. candidacy.

Qualifying Exam Procedure

The student's supervisory committee will prepare a set of questions for the student. The student will have two weeks from the date the questions are delivered to the student to submit written answers to the committee. The student will then meet with the committee as a panel to discuss those answers.

Dissertation Proposal

The student must write an original proposal that will serve as the basis for the dissertation research. The student will then meet with their dissertation committee to defend the proposal.

Final Dissertation and Defense

The student will write a dissertation based on their research activities. The student will then meet with their dissertation committee to present and defend the dissertation. The dissertation and defense serve as the culminating activity of the Ph.D. program.

M.S. non-thesis program

Core Courses (9 cr) EGS 6050. Foundations in Engineering Education (3 cr) EGS 6XXX: Cognition, Learning, and Pedagogy in Engineering Education (3 cr) EGS 6XXX: Instructional Design in Engineering Education (3 cr)

Elective Requirement (21 credits)

Students must take 18 credits of engineering education-related graduate courses. The courses must be approved by the student's advisor and the graduate coordinator. A maximum of 6 credits of the 18 may be S/U courses.

Typical semester plan

Year 1

Fall
EGS 6050: Foundations in Engineering Education (3 cr)
EGS 6XXX: Cognition, Learning, and Pedagogy in Engineering Education (3 cr)
Elective (3cr)
Spring
EGS 6XXX: Instructional Design in Engineering Education (3 cr)
Electives (6cr)
Fall

Year 2

Electives (9cr) Spring Electives (3cr)

Comprehensive Examination

In conjunction with the student's advisor, the student will design a culminating experience related to the student's career goals. Examples of possible experiences include: teach a class period; write a position paper on a policy issue; write a literature review; etc. Note that this list is not intended to be complete, and students are encouraged to be creative in designing the experience. The experience must be approved by the student's advisor, and will be evaluated by the student's advisor.

M.S. thesis program

Core Courses (15 cr) EGS 6050. Foundations in Engineering Education (3 cr) EGS 6XXX: Cognition, Learning, and Pedagogy in Engineering Education (3 cr) EGS 6XXX: Instructional Design in Engineering Education (3 cr) EGS 6XXX: Research Design in Engineering Education (3 cr) EGS 6XXX: Research Methods in Engineering Education (3 cr)

Research Requirement (6 credits) Students must take 6 credits of EGS6971, Research for Master's Thesis.

Additional Course Requirements

Students must take 9 credits of graduate courses and/or EGS6971. The courses must be approved by the student's advisor.

Typical semester plan

Year 1

Fall
EGS 6050: Foundations in Engineering Education (3 cr)
EGS 6XXX: Cognition, Learning, and Pedagogy in Engineering Education (3 cr)
Elective or EGS 6971 (3cr)
Spring
EGS 6XXX: Instructional Design in Engineering Education (3 cr)
EGS 6XXX: Research Design in Engineering Education (3 cr)
Elective or EGS 6971 (3cr)

Year 2

Fall EGS 6XXX: Research Methods in Engineering Education (3 cr) Elective (3cr) EGS 6971 (3cr) Spring EGS 6971 (3cr)

Master's Thesis

The student will write a thesis based on their research activities. The student will then meet with their thesis committee to present and defend the thesis. The thesis and defense serve as the culminating activity of the MS with thesis option.

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

Required Courses

EGS 6050: Foundations in Engineering Education (3 cr) An introduction to fundamental issues, questions, and approaches to engineering education

EGS 6XXX: Cognition, Learning, and Pedagogy in Engineering Education (3 cr) Applications of cognitive psychology, educational learning theory, and pedagogy to engineering education. The processes learned will inform research and instructional practice decisions, approaches, and analysis.

EGS 6XXX: Instructional Design in Engineering Education (3 cr) Introduces students to the design of instructional interventions in engineering education that are focused on facilitating students' learning. Includes how to align the content, assessment and pedagogy of these interventions guided by the premises of a learning theory.

EGS 6XXX: Research Design in Engineering Education (3 cr) Fundamentals of research design in engineering education research. How to select a research approach that aligns with a research question, principles of research design, management of data, and ethics of human subject research.

EGS 6XXX: Research Methods in Engineering Education (3 cr) Introduce basic principles and practices of quantitative, qualitative, and mixed method research methods used in engineering education research.

EGS 6XXX: Preparation for Engineering Education Research to Practice Experience. (1 cr) Preparation for the research to practice experience in engineering education. Develop a research-based plan and create the content that will be implemented during a research to practice experience.

EGS 6XXX: Research to Practice Experience in Engineering Education (3 cr) Practical work experience in engineering education under pre-approved supervision.

EGS 6XXX Engineering Education Seminar (1 cr)

Graduate seminar in engineering education. Speakers may include graduate students in the program, faculty from campus, and speakers from other institutions.

Elective Courses

EGS 6XXX, Advanced Engineering Educational Technology (3 cr)

Design principles and their application in engineering education towards developing effective tools and methods that enhance the learning experience and increase effectiveness with respect to student lifelong learning. Theory and practical applications in engineering education based on Learning Sciences and Human-Computer Interaction. System evaluation through theoretical and empirical learning data. Recognize the ethical and professional responsibilities with technology in engineering education

EDF 6400 Quantitative Foundations of Education Research Overview (3 cr) Overview of quantitative methods: validity, reliability, research design, and inferential statistics.

EDF 6475 Qualitative Foundations of Educational Research (4 cr) Introduction to philosophical, historical, sociological, and other methodologies as aspects of qualitative educational research.

EDF 7491 Evaluation of Educational Products and Systems (3 cr) Models and methods for formative and summative evaluation of educational products and programs. EDG 6356 Teaching, Learning and Assessment (3 cr) Historical and in-depth exploration of assessment practices related to curricular issues.

EME 5207 Designing Technology-Rich Curricula (3 cr) Extensive work in curriculum development utilizing instructional technologies. Contrasting views of curriculum development.

EME 6059 Blended Learning Environments (3 cr) Exploring blended learning from perspectives of theory and practice. The course is designed for educators and instructional designers in K-12, higher education, corporate environments, and other professional settings.

SCE 5765: Data-Driven Science Instruction (3 cr) Focusing on assessment of science instruction and learning. The course will include the study of research-based approaches to assessment, learning, and teaching. In addition, the course will facilitate the adoption of an inquiry stance for integrating assessment data into teaching decisions.

F. For degree programs in the science and technology disciplines, discuss how industrydriven 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 program has been created utilizing feedback from the HWCOE Dean's advisory board, consisting largely of industry members and engineering alumni. Industry-driven competencies related to our program are:

- Produce graduates who have advanced studies in a traditional discipline
 A 15 credit discipline concentration was included in the program
- Produce graduates with the ability to organize educational content and teach The program's core courses have been designed for this purpose and additional experience courses were included.

The Department of Engineering Education is forming an advisory board with industry and academic members to guide the departments direction, including research and academic programs.

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

The American Society of Engineering Education is the main profession society in this field. No specialized accreditation is available.

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?

Undergraduate engineering programs are accredited by ABET and are a feeder into our proposed program.

I. Briefly describe the anticipated delivery system for the proposed program (e.g., traditional delivery on main campus; traditional delivery at branch campuses or centers; or nontraditional delivery such as distance or distributed learning, self-paced instruction, or

external degree programs). If the proposed delivery system will require specialized services or greater than normal financial support, include projected costs in Table 3 in Appendix A. Provide a narrative describing the feasibility of delivering the proposed program through collaboration with other universities, both public and private. Cite specific queries made of other institutions with respect to shared courses, distance/distributed learning technologies, and joint-use facilities for research or internships.

This program will be offered through traditional delivery on the main campus.

IX. Faculty Participation

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

The program can launch with existing faculty because as detailed in Table 2, 5 faculty have terminal degrees in Engineering Education and the remainder of faculty have scholarly work in the field.

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

All full-time faculty and departmental expenses are currently funded on E&G. The cost of the program has been calculated by estimating the teaching and research supervision need of the program. Specific faculty with experience in engineering education were identified and a portion of their time was allocated to the program. For year 5, the costs were calculated with an annual 3% increase. The additional tenure-track faculty are needed to provide more research spaces for the students and to expand the externally funded research.

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 Department of Engineering Education teaches service courses required for most engineering majors. In addition, we have faculty embedded in other engineering departments reaching a range of courses from sophomore to senior year.

-leadcount and credits for course	es taught by fa	culty in the	Department of	Engineering	Education.

Academic year	Headcount	Credits
2017-18	3,789	9,823
2018-19	5,304	14,433
2019-20	8,415	22,094

The existing departments in the Herbert Wertheim College of Engineering have been very successful in obtaining research grant. Below are the expenditures and PhD degree awarded for

fiscal year 2021. No current data is available for the Department of Engineering education as it was formed recently. Research productivity has increased in the past year, largely through strategic hires. \$1.0M was awarded in grants, of which \$693K from federal sources. Starting Fall 2022, three non-tenure track faculty were hired as tenure-track research faculty. Currently, 4 PhD students are actively performing engineering education research funded by faculty in the department.

	FY 21 expenditures	PhD Awarded
Engineering School of Sustainable Infrastructure & Environment	\$ 13,989,000.00	27
Agricultural & Biological Engineering	\$ 4,450,000.00	5
Chemical Engineering	\$ 3,473,000.00	14
Computer & Information Sci. & Engineering	\$ 8,811,000.00	19
Electrical and Computer Engineering	\$ 21,976,000.00	23
Industrial & Systems Engineering	\$ 760,000.00	3
J. Cravton Pruitt Family Department of Biomedical Engineering	\$ 7.576.000.00	14
Materials Science & Engineering	\$ 8,283,000,00	17
Mechanical & Aerospace Engineering	\$ 12,771,000.00	24

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 Libraries of the University of Florida form the largest information resource system in the state of Florida. The libraries hold over 6.7M print volumes, 1.5M e-books and provide access to over 148K full-text print and electronic journals, as well as over 1,992 electronic databases. The George A. Smathers Libraries of the University of Florida, a system of six research libraries, includes libraries for sciences, humanities & social sciences, architecture & fine arts, education, and health sciences. Additional library resources are available in two specialized libraries, the UF Digital Collections and the Special & Area Studies Collection. Books and periodicals related to engineering education are primarily online resources. Any print resources are located primarily in the Marston Science Library and the Education Library.

Electronic books, journals and many key databases, such as Compendex, ERIC, Education Source, IEEE Explore Digital Library, INSPEC, Web of Science, and others, are available via the internet to UF students, faculty and staff. Compendex and INSPEC are provided by FLVC (Florida Virtual Campus) at the state level. The UF Libraries expend over \$12.2 million annually on electronic resources. Listed below is a selection of key journals available through UF Libraries for use by students pursuing a PhD in Engineering Education:

- Active Learning in Higher Education
- Chemical Engineering Education
- Computers & Education
- Computer Applications in Engineering Education
- Design Studies
- Education for Chemical Engineers
- IEEE Transactions on Education
- International Journal of Science Education
- International Journal of Technology and Design Education
- Internet and Higher Education
- Journal of Engineering Education
- Journal of Professional Issues in Engineering Education and Practice
- Journal of Science Education and Technology

- Journal of Research in Science Teaching
- Journal of Women and Minorities in Science and Engineering
- Research in Engineering Design

In addition, there is a growing number of open access journals in the field; the content of these journals is freely available to readers and discoverable through the UF libraries catalog and journal databases. Here are six open access journals related to engineering education:

- Advances in Engineering Education
- Higher Education Pedagogies
- International Journal of Engineering Pedagogy
- International Journal of Service Learning in Engineering
- Journal of International Engineering Education
- Journal of Pre-College Engineering Education Research
- Studies in Engineering Education

The Libraries hold memberships in a number of consortia and in institutions such as the Center for Research Libraries, ensuring access to materials not held locally. "UBorrow" service allows UF patrons to easily borrow materials from any other Florida state university or college library. Materials not held in UF collections and unavailable via UBorrow are procured through Interlibrary Loan. Interlibrary Loan requests are fulfilled at no cost to the library patron; participation in this library collection exchange program is paid for by the UF Libraries. All students, faculty, and staff may use interlibrary loan services.

With monies allocated through the Provost and the UF budgeting process, the library materials budget is determined by the Dean of Libraries in consultation with the Senior Associate Dean for Scholarly Resources & Research Services and subject specialist librarians. Standing subscriptions to journal literature and databases make up the majority of purchasing. Online research guides for all UF disciplines and many specific topics are available from the library website http://library.ufl.edu. Many online tutorials for specific databases are also available. Additionally, the UF Libraries offer consultations, workshops, and events throughout the year.

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

Due to the multidisciplinary nature of Engineering Education, a listing of highly ranked journals for the specific area does not currently exist. However, Clarivate's Journal Citation Reports curates a list of the highest-ranked journals in the categories of *Education, Scientific Disciplines* and *Engineering, Multidisciplinary*. Although the library subscribes to most of the top journals on these lists pertaining to Engineering Education, we do not currently subscribe to the following:

Established Journals

- International Journal of Engineering Education (\$1,079 annually)
- Engineering Studies (\$688 annually)

Emerging Journals

- European Journal of Engineering Education (\$3,979 annually)
- International Journal of Continuing Engineering Education and Life-Long Learning (\$1,588 annually)

The department is not currently planning to fund the purchase of these journals, but we continue to work through the libraries to make them part of packages the library already subscribes to.

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.

General classrooms are available through the Registrar's office. The Department of Engineering Education directly manages the following spaces:

- Freshmen Design Studio. 84 seat active learning/laboratory space
- iClassroom. 48 seat innovative classroom
- Herbert Wertheim Laboratory for Engineering Excellence Makerspace. Design space for engineering students
- Computer Engineering Design studio. 79 seat laboratory for Computer Engineering Capstone design.
- 1 interdisciplinary design suite for senior students
- 3 conference rooms
- 22 faculty offices
- 10 staff offices
- 1 administrative suite
- 3 research laboratories
- D. Describe additional classroom, teaching laboratory, research laboratory, office, and other space needed to implement and/or maintain the proposed program through Year 5. Include any projected Instruction and Research (I&R) costs of additional space in Table 3-Appendix A. Do not include costs for new construction because that information should be provided in response to X (E) below.

No additional space is anticipated through Year 5.

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

Not applicable, no new capital expenditure for instructional or research space is required.

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

No specialized equipment is needed for this program. Typical research activities require dry-lab computer space, teaching spaces such as flipped classrooms and observation classrooms, and recording studios. All spaces and equipment needed are already available in the departments. As additional tenure-track faculty are hired, startup funds are provided, funded by the university, which can be used to purchase specialized equipment for research labs. A typical startup package is \$400,000.

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

No specialized equipment is needed for this program.

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

Not applicable, no additional special categories of resources are needed to implement the program through Year 5.

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

All Ph.D. students will be fully funded on graduate assistantships as is the standard in the Herbert Wertheim College of Engineering. Students are funded as graduate assistants from research grants with the exceptions of initial students of new tenure-track research faculty which are funded as graduate assistants from the faculty's startup (2 students for 2 years). The anticipated total budget in year 5 is \$268,510 from research grants.

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.

The proposed Ph.D. program includes a significant experiential educational component. Students can participate in a teaching experience, a practical internship, (e.g. educational policy internship, educational industry partner) or curriculum development/creation/transformation. Initially, these experiences will be hosted on the UF campus in or related to existing courses. Policy and Industrial Partner opportunities will be developed.

List of Appendices

- Appendix A Tables 1-4
- Appendix B Signatures of the Equal Opportunity Office and Library Director
- Appendix C Faculty CVs
- Appendix D External Consultant's Report
- Appendix E Industry Support Letters
- Appendix F Student Inquiries/Demand for Program FIU Letter of Support
- Appendix G

APPENDIX A TABLE 1-B PROJECTED HEADCOUNT FROM POTENTIAL SOURCES (Graduate Degree Program)

Source of Students (Non-duplicated headcount in any given year)*	Year 1 HC	Year 1 FTE	Year 2 HC	Year 2 FTE	Year 3 HC	Year 3 FTE	Year 4 HC	Year 4 FTE	Year 5 HC	Year 5 FTE
Individuals drawn from agencies/industries in your service area (e.g., older returning students)	0	0	0	0	0	0	0	0	0	0
Students who transfer from other graduate programs within the university**	5	3.75	5	3.75	2	1.5	0	0	0	0
Individuals who have recently graduated from preceding degree programs at this university	1	0.75	2	1.5	4	3	5	3.75	6	4.5
Individuals who graduated from preceding degree programs at other Florida public universities	1	0.75	2	1.5	4	3	5	3.75	6	4.5
Individuals who graduated from preceding degree programs at non-public Florida institutions	0	0	0	0	0	0	0	0	0	0
Additional in-state residents***	0	0	2	1.5	4	3	6	4.5	7	5.25
Additional out-of-state residents***	2	1.5	5	3.75	9	6.75	11	8.25	12	9
Additional foreign residents***	1	0.75	4	3	7	5.25	8	6	9	6.75
Other (Explain)***	0	0	0	0	0	0	0	0	0	0
Totals	10	7.5	20	15	30	22.5	35	26.25	40	30

* 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 Anticipated Faculty Participation

Faculty Code	Faculty Name or "New Hire" Highest Degree HeldRankContract StatusInitial Date for Participation in 		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			
А	Hans van Oostrom, Ph.D.	Assoc Prof	Tenured	Spring 2023	12	1.00	5.00	0.05	12	1.00	10.00	0.10
	Electrical Engineering											
Α	Idalis Villanueva, Ph.D.	Assoc Prof	Tenured	Spring 2023	9	0.75	25.00	0.19	9	0.75	50.00	0.38
	Chem&Bio Engineering											
Α	Elliott Douglas, Ph.D.	Prof	Tenured	Spring 2023	9	0.75	10.00	0.08	9	0.75	25.00	0.19
	Polymer Science & Eng											
Α	Andrea Goncher, Ph.D.	Lecturer	Non-Tenure	Spring 2023	12	1.00	10.00	0.10	12	1.00	25.00	0.25
	Engineering Education		Track									
Α	John Mendoza Garcia, Ph.D.	Lecturer	Non-Tenure	Spring 2023	12	1.00	10.00	0.10	12	1.00	25.00	0.25
	Engineering Education		Track									
Α	Lily Virguez, Ph.D.	Lecturer	Non-Tenure	Spring 2023	12	1.00	10.00	0.10	12	1.00	25.00	0.25
	Engineering Education		Track									
Α	Pamela Dickrell, Ph.D.	Engineer	Non-Tenure	Spring 2023	9	0.75	10.00	0.08	9	0.75	15.00	0.11
	Mechanical Engineering		Track									
A	Sindia Rivera-Jiménez, Ph.D.	Lecturer	Non-Tenure	Spring 2023	9	0.75	10.00	0.08	9	0.75	25.00	0.19
	Chemical Engineering		Track									
Α	Amie Baisley, Ph.D.	Lecturer	Non-Tenure	Spring 2023	12	1.00	10.00	0.10	12	1.00	25.00	0.25
	Engineering Education		Track									
A	Jeremy Waisome, Ph.D.	Lecturer	Non-Tenure	Spring 2023	9	0.75	10.00	0.08	9	0.75	25.00	0.19
			Irack									
В	New Hire, Ph.D.	Asst Prof	Non-Tenure	Fall 2024		0.00	0.00	0.00	9	0.75	50.00	0.38
	Engineering Education		Irack									
В	New Hire, Ph.D.	Asst Prof	Non-Tenure	Fall 2024		0.00	0.00	0.00	9	0.75	50.00	0.38
	Engineering Education		Irack									
В	New Hire, Ph.D.	Prof	Non-Tenure	Fall 2024		0.00	0.00	0.00	9	0.75	50.00	0.38
	Engineering Education		Track									
	Total Person-Years (PY)							0.94				3.28

Faculty			PY W	orkload by Budget Classifica	ation
Code	Code Description	Source of Funding	Year 1		Year 5
А	Existing faculty on a regular line	Current Education & General Revenue	0.94		2.15

APPENDIX A Table 2 Anticipated Faculty Participation

В	New faculty to be hired on a vacant line	Current Education & General Revenue	0.00	1.1
С	New faculty to be hired on a new line	New Education & General Revenue	0.00	0.0
D	Existing faculty hired on contracts/grants	Contracts/Grants	0.00	0.0
E	New faculty to be hired on contracts/grants	Contracts/Grants	0.00	0.0
F	Existing faculty on endowed lines	Philanthropy & Endowments	0.00	0.0
G	New faculty on endowed lines	Philanthropy & Endowments	0.00	0.0
Н	Existing or New Faculty teaching outside of regular/tenure-track line course load	Enterprise Auxiliary Funds	0.00	0.0
<u> </u>		Overall Totals for	0.94	3.2

APPENDIX A TABLE 3 PROJECTED COSTS AND FUNDING SOURCES

Budget Line Item	Reallocated Base* (E&G) Year 1	Enrollment Growth (E&G) Year 1	New Recurring (E&G) Year 1	New Non- Recurring (E&G) Year 1	Contracts & Grants (C&G) Year 1	Philanthropy/ Endowments Year 1	Enterprise Auxiliary Funds Year 1	Subtotal Year 1	Continuing Base** (E&G) Year 5	New Enrollment Growth (E&G) Year 5	Other*** (E&G) Year 5	Contracts & Grants (C&G) Year 5	Philanthropy/ Endowments Year 5	Enterprise Auxiliary Funds Year 5	Subtotal Year 5
Faculty Salaries and Benefits	165,341	0	0	0	0	0	0	\$165,341	670,139	0	0	0	0	0	\$670,139
A & P Salaries and Benefits	0	0	0	0	0	0	0	\$0	0	0	0	0	0	0	\$0
USPS Salaries and Benefits	13,661	0	0	0	0	0	0	\$13,661	30,752	0	0	0	0	0	\$30,752
Other Personal Services	0	0	0	0	0	0	0	\$0	0	0	0	0	0	0	\$0
Assistantships & Fellowships	0	0	0	0	0	0	0	\$0	0	0	0	268,510	0	0	\$268,510
Library	0	0	0	0	0	0	0	\$0	0	0	0	0	0	0	\$0
Expenses	12,700	0	0	0	0	0	0	\$12,700	27,134	0	0	0	0	0	\$27,134
Operating Capital Outlay	0	0	0	0	0	0	0	\$0	0	0	0	0	0	0	\$0
Special Categories	0	0	0	0	0	0	0	\$0	0	0	0	0	0	0	\$0
Total Costs	\$191,703	\$0	\$0	\$0	\$0	\$0	\$0	\$191,703	\$728,025	\$0	\$0	\$268,510	\$0	\$0	\$996,535

*Identify reallocation sources in Table 4.

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

***Identify if non-recurring.

Faculty and Staff Summary

Total Positions	Year 1	Year 5
Faculty (person- years)	0.94	3.28
A & P (FTE)	0	0
USPS (FTE)	0.2	0.4

Calculated Cost per Student FTE

	Year 1	Year 5
Total E&G Funding	\$191,703	\$728,025
Annual Student FTE	7.5	30
E&G Cost per FTE	\$25,560	\$24,268

APPENDIX A TABLE 3 PROJECTED COSTS AND FUNDING SOURCES

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

APPENDIX A TABLE 4 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
101 (E&G)	1,834,593	86,375	\$1,748,218
107 (E&G, Preeminence)	1,591,564	105,328	\$1,486,236
108 (E&G, World Class Faculty)	292,503	0	\$292,503
	0	0	\$0
	0	0	\$0
	0	0	\$0
	0	0	\$0
	0	0	\$0
Totals	\$3,718,660	\$191,703	\$3,526,957

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

APPENDIX B

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

Date

Signature of Equal Opportunity Officer

11/3/2021 Date

Signature of Library Director

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. October 30, 2021

Hans van Oostrom, Ph.D. Founding Chair and Associate Professor Department of Engineering Education University of Florida P.O. Box 116561 Gainesville, FL 32611

Dear Dr. van Oostrom:

It is my pleasure to evaluate the EED degree programs for your Ph.D. and Master's degrees in engineering education. I am currently serving my fifth year as Kamyar Haghighi Head and Professor in the School of Engineering Education at Purdue University. Before coming to Purdue, I served as Interim Head and Professor in the Department of Engineering Education at Virginia Tech. I am thus thoroughly familiar with the two earliest and largest graduate programs in engineering education. Both in my role as head, and while serving as Program Director for Engineering Education at the National Science Foundation from 2013-2015, I have consulted (formally or informally) with many faculty members or administrators in emerging engineering education programs in the US, including Nebraska, FIU, NSCU, Michigan, Ohio State, Texas A&M, Cincinnati, Nevada-Reno, UTEP, Rowan, and ASU, as well as programs in South America, Australasia, and Europe. I am also familiar with the logistics of program start-up as I began my career as a founding faculty member in the Picker Engineering Program at Smith College, the nation's first engineering program at a women's college. My undergraduate degree is in chemical engineering (B.S.E. Princeton, 1993) and my doctorate is in Engineering and Public Policy (Ph.D. Carnegie Mellon, 1998). In reviewing the Florida EED program, I reviewed the program materials provided and considered the variety of program models in existing engineering education graduate programs.

Goal and Objectives:

The program's goal is in line with the discipline's vision of using research to improve knowledge and drive positive change in engineering education and practice. The objectives speak to developing research skills and applying them to engineering educational practice in academia, industry, and beyond. A robust research-practice loop is supported by these objectives, a crucial feature for long-term success.

Program Requirements:

Program course requirements are similar to most other engineering education PhD programs, with a common core (including topics in the historical and philosophical context of engineering education, cognition, pedagogy, and instructional design, and research methods), some practical application courses, advanced electives related to the research topic, and

significant technical depth in an engineering discipline, which can be waived with a relevant master's degree. Most programs also require a practical experience, typically in teaching. It is a strength of your program that you have broadened the notion of research-to-practice to include industry or policy internships and the like. We have supported similar activities at Purdue, though it has been outside of our practicum requirement. Students have had success finding financial support for industry activities with the NSF INTERN program, and such pursuits have supported a variety of student interests and career destinations. Kudos to you for this strong innovation to include it as a pathway in your practicum requirement.

One aspect that was unclear from the materials sent is how your program balances quantitative and qualitative methods in engineering education research. It is likely you would cover both in your introductory research methods class. You may wish to consider whether you would want your Ph.D. students to have a balance of quantitative and qualitative focus in their advanced electives, or whether you wish to keep it entirely open depending on research area.

I am not aware of other programs that have a publication requirement for graduation. It certainly is something that Ph.D. students would normally meet in their path toward the degree, and it sets them up for success to have first authorship on record prior to graduation. I recommend building this activity into certain milestones early on, to ensure this cab be met well before any time crunches around completing the dissertation. Having graduated over 100 Ph.D. students, we have had circumstances, though rare, related to funding, visa situations, or job start requirements, in which we worked with students who needed to finish by a certain hard deadline. Finally, I commend your choice to require a portfolio; these are used both at Virginia Tech and Purdue, and serve student learning and professional career development well. I will observe that both programs have found we need to be vigilant to keep the portfolio in front of both students and the committee; working it into milestones and/or courses as much as possible has been helpful.

Admission requirements

Admission requirements are similar to others in our discipline. Most graduate schools are letting go of GRE requirements. I noticed there was no indication of TOEFL, IELTS, or other English language proficiency requirements (or a statement, as with the GRE, that such tests are not required). I will note that standardized testing is not very reliable and more programs seem to be abandoning such requirements. I do recommend thinking through admissions criteria related to writing, as engineering education research is both reading and writing intensive.

Candidacy and Defense Processes

The processes for moving to candidacy is fairly typical; the requirements as written do not indicate how much coursework is required, or typical, before moving to the qualifying exam. The two-week writing time followed by a committee meeting is also common practice. I will observe that at both Virginia Tech and Purdue, there has been active conversation about fairness related to the two-week requirement, in relation to disability accommodations, semester timing and scheduling, as well as writing time needed for native English speakers vs. those writing in a second (or third, etc.) language. The general concern is to allow ample

time for successful completion, without dragging out the stress of the exam over long periods. In this regard two weeks seems about right, though there may be need for some flexibility, accommodation, or exception in certain circumstances.

Master's Programs

The non-thesis master's program is an extremely flexible option with just 9 core credits and 21 elective credits. I can see the potential utility of this degree option, because it can serve a large range of interests and career paths. For example, it could be a vehicle for Ph.D. students in engineering disciplines who seek an education credential to strengthen their preparation for academic careers. It could be a vehicle for a K-12 STEM teacher, a higher ed STEM instructor, or an engineer in industry charged with developing in-house educational programs, to enhance their respective skillsets – which would be distinct for each audience. It could be a first introduction for a recent bachelor's engineering graduate to explore engineering education before potentially moving on to a Ph.D., and so on. The capstone approach to the comprehensive exam is similarly customizable and appropriate to the flexibility of the degree. I think this flexibility is wise given that our discipline is still learning what populations may be served by a master's in engineering education. Such an approach is likely to require additional effort in recruiting and advising initially, which will become less burdensome as particular pathways through the degree become apparent. Purdue's online master's was just recently approved, and we are still learning about our students and their aspirations. (We have had an in-person master's since our inception, but it had been used for Ph.D. exit purposes only.) I look forward to learning with Florida about these programs and how they can serve our engineering education community.

The research master's appears to build on the flexible non-thesis master's by adding required research methods courses and research credits, and then requiring a research-based thesis instead of a capstone/comprehensive project. This is a pragmatic design that allows a clear distinction between the two master's degrees for prospective students.

In sum, the program offers three distinct degree pathways that each provide appropriate preparation for future researchers, practitioners, leaders, and change agents in engineering education. I commend you on your progress thus far and am available for continued conversation if I can be of further assistance.

Sincerely,

Don

Donna Riley, PhD Professor of Engineering Education Kamyar Haghighi Head School of Engineering Education

Appendix E

(LEOEINO

Boeing Commercial Airplanes P. O. Box 3707 Seattle, Washington 98124

Dear Florida Board of Governors committee:

If the Ph.D. Program in Engineering Education program is approved, it is the intent of Boeing to collaborate as an industry resource as detailed in the Project Description.

As Advanced Manufacturing expands into digital twin, digital thread technologies and AI/ML enabled cognitive technologies, changes in the skills and knowledge necessary for successful digital life and work flow will impact organization and cultural systems. AI/ML will not involve computers replacing people, but rather, people and computers working together—as "superminds"—to do both cognitive and physical tasks that could not be done before.

The Engineering Ph.D program proposed is fundamental to preparing the future digital literate society. Furthermore, we are excited about UF's AI initiative and the intersection of graduates with engineering education and research expertise. At Boeing, we currently have positions that we are seeking to expand, and this program would help meet these needs. Below are some positions with their salaries;

- Senior Machine Learning Scientist, (\$150,000 to \$200,000), will have experience in human and cognitive behavior, learning theories, as well as experience in multi-modal sensor data fusion and visualization technologies
- Senior Data Scientist, (\$90,000 to \$150,000), Lead and mentor small teams of data scientists in the design, development, and implementation of complex and challenging efforts in advanced analytics and machine learning.

Sincerely,

Michael Richey

Michael Richey, PhD Chief Learning Scientist Associate Technical Fellow The Boeing Company 4 October 2022

Dear Florida Board of Governors or Pertinent Parties:

We would like to express our support for the University of Florida Department of Engineering Education to receive approval of their Ph.D. program. In Raytheon Technologies, the need for training, professional development, and/or instructional design is of great importance.

As the workforce needs of our company continue to evolve, we are in need of employees who have expertise in engineering education to propel our next generation of workers to acquire the needed competencies to meet the goals of our company. These goals include delivering disruptive technologies our customers need to succeed against any challenge, finding skilled engineers across multiple disciplines, and developing relations with universities to bring cutting edge technology to our warfighters.

Within our industry, some example positions those engineers with a PhD in Engineering Education may qualify for are derived from our Raytheon Technologies current open job requisitions and are listed below:

Associate Director, Ul/UX Human Factors Engineering to join our Advanced User Experience Team within our Department 22 strategic business area. This position is a hybrid role that will be located within commuting distance of one of our Raytheon Intelligence & Space major campuses in Richardson, TX, Dulles, VA, El Segundo, CA, or Aurora, CO. In this role, you will actively promote our User Experience processes and capabilities throughout all of Raytheon Technologies. You will be responsible for promoting the benefits and advantages of a User-Centered Design approach to Raytheon Executive Leadership, directly to Customers, Internal Technical & Functional Management and team members to grow awareness of User Experience capabilities across a diverse set of domains. The Associate Director, Ul/UX Human Factors Engineering role will have a strong focus on technical and scientific rigor, blending User Experience, Data Science, Big Data Analytics, and Human Factors Engineering strategies and methodologies to solve complex challenges for our end users and customers.

Customer Experience/User Experience Strategist to envision, research, model and develop the end user experience for digital products and services to ensure the interface is intuitive and consistent. Champions user-centered design and "design thinking" methodologies. You'll get to lead design thinking workshops, build design prototypes, manage outsourced design projects and be the organizational evangelist for all things customer/user experience related. Oversees user testing and application of interaction design principles. Assesses and optimizes the performance of new and existing service offerings through creation and testing of user flows, persona development, customer journey mapping, wireframes. Creates clickable prototypes; sets strategy for usability testing and research practices, pioneering new methodologies and protocols for data collection; and application of results to generate cutting edge, user-centered designs. What You'll Get To Do: Thomas J. Watson said it best: "Good design is good business." Visualization is critical to discovering data-driven insights and effectively communicating that knowledge to others. As part of the Digital Technology strategy team, you'll work alongside program managers, business analysts, digital strategists and technical staff to identify requirements, set design goals, study users and craft experiences that translate business and user needs into highly engaging experiences.

Application Architect to work in a dynamic, high-profile office located in McLean, VA. The Application Architect will be responsible for assisting in the development and management of the software architecture within the division and may be required to provide guidance to programlevel software architects. This person will also serve as a direct interface to the client during important reviews, briefings, and technical exchange/demos. The communication and collaboration with the customer as well as with other engineering disciplines is required to ensure the application architectures support the client program's needs. The Application Architect will lead the analysis of issues that directly affect the software architecture and potentially the hardware architecture. The successful candidate will have a systems level approach to resolving complex programs and the ability to convince leadership that the proposed solution is best for the mission (including program cost and schedule as well as the technical solution). The individual will work with client executives in the development of CONOPS for new systems, providing strategic input and planning for applications architecture and design. He/She will assist in the tracking of key roadmaps and deliverables.

Engineer Fellow, E&E Engineering to join our Raytheon Space and Airborne Systems (SAS) Systems Engineering Integration and Test (SEIT) Center as a strategic technical leader passionate about effective application of principled Systems Engineering to deliver world-class sensor product technologies and solutions to our commercial and defense customers. Applicants must exhibit an exceptional degree of ingenuity, creativity and resourcefulness; and will apply and develop highly advanced technologies, scientific principles, theories and concepts and is viewed within the company and the customer community as an expert in the Radar technologies. The Engineering Fellow will assume a key leadership and advisory role to the Engineering organization and will have frequent interaction with program customers. Additionally, the Engineering Fellow will need to be cognizant of business execution as they craft the technical roadmaps that align with the organization's strategic direction. This role requires industry experience.

We are enthusiastic about the contributions that these types of positions will have at Raytheon. Our salaries are competitive within the market. If there are additional questions you have about these or adjacent positions in our company, please do not hesitate to contact us using the information below.

Sincerely,

Eller / Fun

Ellen Ferraro Vice President, Engineering Raytheon Intelligence and Space ellen.j.ferraro@raytheon.com

Medtronic

Neurovascular

Human Resources 5290 California Ave Irvine, CA 92617 USA

Tel: 1.949.490.3787

www.medtronic.com

Dear Florida Board of Governor or Pertinent Parties:

We would like to express our support for the University of Florida Department of Engineering Education to receive approval of their Ph.D. program. In Medtronic plc the need for training, professional development, and/or instructional design is of great importance.

As the workforce needs of our company continue to evolve, we are in need of employees who have expertise in engineering education to propel our next generation of workers to acquire the needed competencies to meet the mission of our company: To contribute to human welfare by application of biomedical engineering in the research, design, manufacture, and sale of instruments or appliances that alleviate pain, restore health, and extend life.

Within our industry, some example positions those engineers with a Ph.D. in engineering education may qualify for along with the estimated salary ranges are:

Principal R&D Engineer, Designs, develops, analyzes, troubleshoots and provides technical skills during research and/or product development. Designs studies to investigate specific life science questions within field of expertise. Salary Range:113,600.00 - 142,000.00 - 170,400.00

Sr Product Development Manager: Plans, directs and implements all aspects of the company's design and development of new medical device products or software systems. May develop, evaluate, implement and maintain technical quality assurance and control systems or reliability systems and standards pertaining to materials, techniques, or company products. Salary Range: 145,600.00 - 182,000.00 - 218,400.00

Sr Product Development Program Manager: Leads cross functional teams to evaluate, develop and manage projects for new product development and ongoing lifecycle management of products, processes and therapies. Oversees and manages the operational aspects of ongoing projects and serves as liaison between project management and planning, project team, and line management. Salary range: 170,000.00 - 212,500.00 - 255,000.00

We are enthusiastic about the contributions that these types of positions will have in our company. If there are additional questions you have about these or adjacent positions in our company, please do not hesitate to contact us using the information below.

Spe

Sara Le Pronouns: She/Her Sr. Director | Human Resources

Medtronic

Neurovascular 5290 California Ave. | Irvine, CA 92617 | USA Mobile 1.949.333.9274 <u>sara.le@medtronic.com</u> <u>medtronic.com</u> | <u>Facebook</u> | <u>LinkedIn</u> | <u>Twitter</u> | <u>YouTube</u>



September 28, 2022

Dear Florida Board of Governors or Pertinent Parties:

We would like to express our support for the University of Florida Department of Engineering Education to receive approval of their Ph.D. program. At WasteFuel, the need for training, professional development, and/or instructional design is of great importance.

As the workforce needs of our company continue to evolve, we are in need of employees who have expertise in engineering education to propel our next generation of workers to acquire the needed competencies to meet the goals of our company. These goals include designing and building state-of-the-art, clean energy biorefineries across the world.

Within our industry, some example positions those engineers with a Ph.D. in engineering education may qualify for along with the estimated salary ranges are:

- Senior Process Engineer, helping to train, design, build, and troubleshoot clean energy biorefineries – the salary range is \$140-170K.
- 2. Senior Project Engineer, helping to manage the construction of green methanol modules and training associated with all projects the salary range is \$140-170K.

We are enthusiastic about the contributions that these types of positions will have in our company. If there are additional questions you have about these or adjacent positions in our company, please do not hesitate to contact us using the information below.

Sincerely,

Pachy

Blake Mobley Chief Data Officer

WasteFuel Global LLC 15260 Palisades Village Lane, #204 Pacific Palisades, CA 90272 E bmobley@wastefuel.com

W wastefuel.com

[@] wastefuel



zyBooks, a Wiley Brand 54 N Central Avenue Campbell, CA 95008

Dear Florida Board of Governors or Pertinent Parties:

We would like to express our support for the University of Florida Department of Engineering Education to receive approval of their Ph.D. program. At zyBooks, the need for training, professional development, and/or instructional design is of great importance. As the workforce needs of our company continue to evolve, we are in need of employees who have expertise in engineering education to propel our next generation of workers to acquire the needed competencies to meet the goals of our company. These goals include developing and deploying the best learning materials to improve engineering students' abilities to succeed in their engineering careers.

Within our industry, some example positions those engineers with a Ph.D. in engineering education may qualify for are:

- 1. Associate Engineering Content Developer
- 2. Engineering Content Developer
- 3. Senior Engineering Content Developer

We are enthusiastic about the contributions that these types of positions will have in our company. If there are additional questions you have about these or adjacent positions in our company, please do not hesitate to contact us using the information below.

Best, Kristen Ford

Kita Fal

VP of Content kristen.ford@zybooks.com



Dear Florida Board of Governors or Pertinent Parties:

We would like to express our support for the University of Florida Department of Engineering Education to receive approval for their Ph.D. program. In Vispero, the need for training, professional development, and/or instructional design is of great importance.

As the workforce needs of our company continue to evolve, we need employees who have expertise in engineering education to propel our next generation of workers to acquire the needed competencies to meet the goals of our company. These goals include focusing on UX research, improving the core competency of our engineers in the field of accessibility as well as understanding and learning cutting-edge paradigms like data engineering and machine learning.

Within our industry, some example positions those engineers with a Ph.D. in engineering education may qualify for along with the estimated salary ranges are:

1. User Experience Manager – Research the role UX plays in products. This is a leadership position. Salary Range - \$90,000 - \$110,000 USD per year.

We are enthusiastic about the contributions that these types of positions will have in our company. If there are additional questions you have about these or adjacent positions in our company, please do not hesitate to contact us using the information below.

M. R. Sriram

Sriram Ramanathan Director – Web Services, Cloud and Innovation 727-667-2785

From: Oguete, Joel [US] (AS) <Joel.Oguete@ngc.com>
Sent: Thursday, September 29, 2022 4:12 PM
To: Villanueva Alarcón, Idalis <i.villanueva@ufl.edu>
Cc: Montoya, Paul D [US] (SP) <Paul.Montoya@ngc.com>; Beattie, Chris [US] (AS)
<Christopher.Beattie@ngc.com>
Subject: In Support of UF Ph.D. program for Engineering Education

[External Email]

Dr Idalis Villanueva Alarcón,

As executive champion for Northrop Grumman toward the University of Florida, I am supportive of the University of Florida Department of Engineering Education to receive approval of their Ph.D. program. Within Northrop Grumman there are several jobs where a degree in engineering education* aligns with goals/objective for our company.

The positions below are the middle level for each role below and the salaries are representative of compensation at that level (salary ranges are sourced from our externally facing careers website: <u>https://www.northropgrumman.com/careers/</u>). External hire candidates with PhD's are hired in at the levels above what is shown below.

A285XX Training Representative: \$76,200 USD - \$114,400 USD

Designs and delivers programs to train all levels of personnel. Develops tests and visual aids, conducts training classes, and develops criteria for evaluating effectiveness of training activities. Keeps abreast of training and development research: learning theory, motivation theory, and new materials, methods, and techniques. Develops in-house programs and practices to identify developmental needs, including preparing personnel for more responsible positions and increasing effectiveness in present assignments. May evaluate and/or oversee contractors or vendors to develop and/or administer training programs. May be responsible for development of e-learning programs.

S158XX Manager Training: Leadership Role \$102,500 USD - \$153,700 USD Monitors work operations of exempt and/or non-exempt employees on a daily basis and

actively assists or provides direction to subordinates as required. May perform, especially in staff or professional groups, on-going operational tasks of organizational groups.

A287XX Org Development Rep: \$76,200 USD - \$114,400 USD

Assesses critical business issues and designs organization development and strategic plans to enhance company performance. Designs and implements development training programs to enhance the effectiveness of managers and teams to increase organization productivity and customer satisfaction. Identifies key talent areas and provides coherent well-developed plans for obtaining, developing and managing critical talent. Advises on team design and performance. Provides development, coaching and training to managers on leadership skills. Uses valid and reliable research to create, manage and embrace efficient and effective change.

A283XX Maintenance Trainer: \$61,900 USD - \$92,900 USD

Establishes and directs a training system and/or conducts classroom and practical instruction to provide technical knowledge for the safe maintenance, repair, and operation of aircraft, aircraft systems, ground equipment, tools, test equipment, stores and facilities, according to established procedures. May analyze current operating problems and future operating requirements to identify training needs and develop training programs. Writes, edits, and produces materials for technical instruction.

Provides assistance and support to all divisions in helping them determine their training needs and develop and conduct their maintenance training programs. Establishes and directs the maintenance of a companywide training and qualification record system. Maintains currency in technical developments, technical training, and audiovisual techniques including the maintenance of company aircraft instruction manuals. Coordinates all required technical training and outside contract sales technical training programs. Exclude ground school instructors.

T005XX Internal Training Technical: \$87,600 USD - \$131,400 USD

Designs, schedules, delivers and tracks technical training. Establishes training and education modules and ensure consistency in the delivery of technical training and onboarding. Provides train-the-trainer program and qualifies all area trainers for content delivery. Partners with the functional area, develops training materials, and knowledge assessments, for area standard operation procedures (SOP's) and coordinates knowledge assessment. Utilizes training authoring and multimedia tools and software for assigned development projects. Keeps abreast of training and development research, learning theory, motivation theory, and new materials, methods, and techniques.

*Engineering Education: Training in learning theory, methods for assessing human behavior and perception, strategies to include and use digital and in-person learning and technologies, conduct user experience studies, among others

If there are additional questions you have about these or adjacent positions in our company, please do not hesitate to contact us using the information below.

Thank you,

JOEL OGUETE | Director, Software Engineering Northrop Grumman | Aeronautics Systems O: 321-951-6347 | C: 321-292-1075 | joel.oguete@ngc.com



Student Inquiries

This is a sampling of requests received by faculty who do research in Engineering Education. The messages are de-identified to protect the students' privacy.

Date: Thursday, September 8, 2022 at 3:03 PM To: Waisome, Jeremy A. Magruder <<u>jwaisome@eng.ufl.edu</u>> Subject: Lab Change Follow Up

Hey Dr. Waisome,

I just wanted to update you on how things were going on my end. I've met with the grad advisor and associate chair for grad studies in the BME department to discuss my plans moving forward. I initially planned to do the Masters with Thesis option so that my research would be considered, but they recommended that I do the Masters non-thesis option so that I would be able to finish by December if I planned to change labs in the Spring. I agreed with their suggestion plan. I informed Dr. Williams of this change and have sent her the paperwork for change the in degree type. They were concerned about how many of my coursework credits would be able to be transferred over for the Eng. Edu. degree. They also brought up the funding situation regarding my assistantship and fellowship, asking if the lab I was moving to had funding available to support me as a student. I answered those questions based on what you and I talked about regarding those matters. So now I'm just working towards finishing the data analysis for the data I've been working with, working on the paper we've been writing, and helping with training the new students all of techniques that I have learned so that they still have those skillsets in the lab after I leave. Is there anything else I need do on my end regarding the administrative logistics?

Sent: Thursday, September 22, 2022 3:07:13 PM To: Waisome, Jeremy A. Magruder <<u>jwaisome@eng.ufl.edu</u>> Subject: RE: PhD Research Advice

Dr. Waisome,

I hope this message finds you well. I am reaching out to you, once again, to see if we can set up a time to meet and discuss some more ideas I have about moving forward with pursuing a PhD in Engineering Education. Since our last meeting, I have made some great connections and progress. I am interested in being able to connect with you again for a discussion. Please feel free to let me know if you have any questions or concerns. My schedule is generally open in the next few days. I look forward to speaking with you!

Thank you,

Sent: Thursday, September 15, 2022 1:32 PM To: Elliot P. Douglas <<u>Elliot.douglas@essie.ufl.edu</u>> Subject: PhD/NSF Applicant

[External Email]

Dr. Douglas,

I am preparing two applications, one for Nancy (UF Graduate Program Specializing in Engineering Education) and one for NSF (explaining that I wish to partner with UF and work within the engineering education department to accomplish research and earn a PhD degree). I need two things:

- (1) learn more about Engineering Education to develop a problem statement that is both valid and warranted; and
- (2) advocacy, support, or endorsement (not sure the correct jargon here) for both my graduate committee and letter(s) of recommendation for my NSF Fellowship application (<u>due Oct 10</u>).

Thank you for taking time to review my current application materials. These are materials I have prepared for Nancy/UF. I need to prepare application material for the NSF Fellowship application. I have a long way to go regarding a problem statement and broader impact, and I need to better show or explain how my past experience and "toolbox" are applicable to the field of engineering education and research that I/we will propose.

I have attached:

• JLS Dissertation Synopsis_v1, which is a problem statement I prepared and led me to discover the field of Engineering Education. Although this may not be applicable to Engineering Education but speaks to my broader impact desires, specifically underrepresented groups.

· Cover Letter or Letter of Intent, which I prepared for UF and needs to be revised for NSF.

• Education and Professional Work History, which is my current untraditional CV. I need to revise format and perhaps rewrite for both UF and NSF applications. I hope to get some feedback from Dr. Wasman and revise soon.

• Representative Project List, which will be updated and included in application to UF not NSF but perhaps elements can be incorporated into my untraditional CV (i.e., "Education and Professional Work History" attached), like my experience working with underrepresented groups and/or personally experiencing some disconnect between my education and application of said education in industry.

· JLS Resume (self-explanatory)

Sent: Thursday, August 18, 2022 11:09 AM Cc: Villanueva Alarcón, Idalis <<u>i.villanueva@ufl.edu</u>> Subject: Introduction - graduate research in engineering education

[External Email]

Hi,

I wanted to introduce you to Prof. Idalis Villanueva Alarcon, who will be giving a virtual seminar later this semester as part of the EECE seminar series. Prof. Villanueva Alarcon is an associate professor of engineering education at the University of Florida, and her bachelor's/PhD are in bioengineering/chemical engineering. Some of her current research topics is on the hidden curriculum in engineering education, as well as mentoring of minoritized students.

To get to the point, I mentioned that you were potentially interested in pursuing a PhD in engineering education after you graduate, and Prof. Villanueva Alarcon offered to set up a meeting with you to talk more about it! I hope you're able to connect and discuss what that kind of career path might look like.

Idalis,

Angelica is about to start her junior year in our chemical engineering program. She's a very bright student that I've really enjoyed getting to know, although I think she's in a space where she's trying to figure out what happens next with her life and whether her current path makes sense. Thanks so much for being willing to talk with her about engineering education!

Cheers,

Sent: Friday, August 5, 2022 12:28 AM To: <u>thetwisterlab@gmail.com</u> Subject: Prospective Ph.D. Student

[External Email] Dear Dr. Idalis Villanueva,

I hope you are doing good and keeping safe in these times.

Let me begin with an introduction about myself:

I completed my Baccalaureate in Computer Science (Hons.) from Forman Christian College (Pakistan) with a 3.36 CGPA in the year 2016. I also completed my Masters's degree in Innovative Technologies in Learning from the National University of Sciences and Technology (NUST, Pakistan) with a CGPA of 3.2 in the year 2020.

During my Masters thesis, I worked on the Deep Learning Algorithms (CNN and LSTM) using Computer Vision to detect the engagement of student in the classroom. From my thesis, I've published a conference paper at Springer sponsored conference. Overall I've 5 publications in reputed international conferences during my thesis and coursework. During my research, I faced difficulties due to COVID-19. But, among all of the difficulties I've faced, I completed my thesis and degree on time.

I am currently working as a Software Quality Assurance Engineer at Clustox. My daily tasks included writing test cases, automating the scripts for testing, APIs and DB testing, and training the junior resources.

I have been looking for admission in a Ph.D. program for 2022/2023 session. I am requesting you to be my Ph.D. supervisor.

My research interests are Machine Learning, Deep Learning, Computer Vision, STEM Education, Curriculum Design, Lesson Plans, Emotion Recognition, Behaviour Analysis, and Universal Design for Learning (UDL).

I would gladly share my documents if need be and would also make myself available for the interview.

I am enclosing my Resume for your reference.

Looking forward to hearing from you.

Thank you.

Profound regards,

Date: Sunday, July 24, 2022 at 1:25 PM To: Rivera-Jimenez, Sindia <<u>rivera.jimenez@eng.ufl.edu</u>> Subject: Prospective PhD Student

[External Email] Hello Professor Sindia.

I will like to seek your opinion as regards my Statement of Purpose (SOP). As you suggested earlier during the interview, I have initiated my application to the Environmental Science and Engineering Department.

I will like to ask if it should be obvious in my SOP that I will be transitioning from Environmental Science and Engineering to Engineering Education when the program is approved or I should just align it with Engineering Education?

Sent: Thursday, May 27, 2021 3:16 PM To: Elliot P. Douglas <<u>Elliot.douglas@essie.ufl.edu</u>> Subject: Fulbright assistant visit

[External Email]

Good afternoon, Professor Douglas.

My name is ..., a PhD student of Materials Science and Engineering in Brazil. I was granted a scholarship from Fulbright, a U.S. Cultural Educational Exchange Program. I'll have the opportunity to act as an assistant in the effort to improve Engineering education in Brazil. One of my tasks is to visit a U.S. university during 2-6 weeks, between September/21 and April/22, to learn more about teaching methods and to bring innovation to Brazilian courses.

I became interested in visiting University of Florida because I've noticed that you may have some interesting insights about Engineering education. It would be an enriching experience to watch the teaching methods and talk about it at your uni. I also want to visit UF because it supports research in biomaterials, polymers and materials processing, subjects related to the PhD thesis I'm developing about 3D printing of polycaprolactone and glass-ceramic continuous and discontinuous fibers for medical applications.

Let's talk more in case you can help me in my mission in any way. I'm attaching some slides in case you want to learn more about my context.

Thank you very much.

Sent: Thursday, August 4, 2022 5:33 AM To: Villanueva Alarcón, Idalis <<u>i.villanueva@ufl.edu</u>> Subject: Interested in PhD Engineering Education

[External Email]

Subject: Interested in PhD Engineering Education

Hello Dr. idalis Villanueva,

I hope you are well. I am ..., a colleague and mentee of Assad Iqbal, who informed me about potential PhD positions under your supervision. I am writing this email to share my brief academic and professional profile that I believe is relevant to justify my interest and suitability for PhD in Engineering Education.

I hold an undergraduate degree in Computer Science (2012) followed by master degree in Software Engineering (2015), complemented by around 7 years of experience working in academia (teaching) as well as industry (software development). Apart from teaching various computer science and engineering courses at undergraduate level, I have had hands on experience working on ideation, development, and implementation of software projects in STEM education.

Working under the supervision of two amazing research professors Dr. Tamim Ahmed and Dr. Shehzad Khalid, I worked on early detection of Dyslexic symptoms among primary school students in Pakistan as part of my master thesis. This was a sub-theme of a bigger project funded by Higher Education Commission (HEC) Pakistan. I also worked as software developer on E-Learning project funded by IGNITE Pakistan. The project focused on Specific Learning Disorders (SLDs) among various age group students (kindergarten – elementary level). Besides, I am also supervising and co-supervising several undergraduate Capstone Design Projects in the area of learning and education (see CV for details).

My STEM education background and exposure to research on teaching and learning as part of my development work, boosted my curiosity to pursue doctoral studies in engineering education. I believe that my interests, academic background, teaching experience and software development skills in learning related projects fit into the requirements for admission to PhD Engineering Education.

Please find attached my detailed CV. Thanking in anticipation.

Date: Monday, January 11, 2021 at 3:10 PM To: van Oostrom,Hans <<u>oostrom@UFL.EDU</u>> Subject: Engineering Education Grad School Application

[External Email]

Greetings, Dr. Oostrom,

My name is Nolgie Oquendo, and I am very interested in applying to the UF Engineering Education Graduate Program. Sadly, I mixed-up the application date and failed to apply on time. As a suggestion from Dr. Villanueva with whom I talked and she oriented me to ask you; if there is still a chance that I can still apply to the program in the next few days.

I acknowledge that this is not the usual procedure and I understand if it is not possible for me to apply.

Respectfully,

Date: Monday, September 21, 2020 at 12:29 PM To: "Rivera-Jimenez, Sindia" <<u>rivera.jimenez@eng.ufl.edu</u>> Subject: Engineering Education Graduate Program

[External Email]

Hi, Prof. Rivera

I hope this email finds you well,

I am ..., chemical engineering student that was part of the UF SURF program and, also, part of Prof. Saliceti Engineering Design course. You mentioned in the presentation you gave us for conflict resolution that you were part of the Engineering Education program at UF. I am deciding the subject of study in which I want to pursue a graduate degree and I have become very interest in Engineering Education. Plus, I have a lot of motivation.

I was wondering if we could meet, so that I could get a better picture of Engineering Education and the program offering at UF. I would appreciate any answer or information you could provide. Thanks in advance!

Sent: Monday, September 14, 2020 9:07 AM To: Villanueva,Idalis <<u>i.villanueva@ufl.edu</u>> Subject: Interest in Engineering Education Ph.D.

[External Email]

Dear Dr. Villanueva

I hope this email finds you well. My name is ..., I am a senior at the University of Maryland, Baltimore County majoring in Chemical Engineering with a minor in Entrepreneurship and Innovation. Currently, I am conducting research with Dr. Jamie Gurganus focused on understanding the Engineering Mindset of first year undergraduate students, specifically examining those who are affiliated with scholars' programs and those who are not. As a student who faced challenges in their academic journey, especially my matriculation from the secondary level to higher education I directly connected to this research. In the Fall, I am planning to apply to Ph.D. programs centered around Engineering Education. I am very interested in possibly working with you at the University of Florida because of your research in motivation, hidden curriculum in engineering, and student belonging. Recently, I came across your publication entitled "Student Perceptions of and Learning in Makerspaces Embedded in their Undergraduate Engineering Program Preparation Programs." I thoroughly enjoyed reading this publication, it was very relatable and interesting. There were quite a few aspects of your work that correlate to the current research I am conducting and as an undergraduate student I have felt a lack of belonging in some engineering spaces as well. I would love to discuss more about your research projects.

I was wondering if you might tell me whether you are planning to take on new graduate students in Fall 2021. I would also be interested in any other advice or information that you may have regarding the Engineering Education doctoral program at the University of Florida. If possible, I would like to set up a virtual meeting to discuss further. I have also attached my resume below for your perusal. Thank you.

Sent: Monday, October 2, 2017 11:57 AM To: Elliot P. Douglas <<u>Elliot.douglas@essie.ufl.edu</u>> Subject: Letter of Inquiry

Dear Dr. Douglas,

My name is Haley Lewis, and I am currently a 5th year undergraduate chemical engineering student at the University of Florida. I recently read your publication "Engineering as a Space of White Privilege," and it discussed topics that I experienced as a black female within the engineering college at the University of Florida. My personal engineering experience has inspired me to pursue a PhD in order to promote progress and diversity within the field of engineering for generations to come, and I believe that your work aligns closely with my goals.

I have been involved in research at the University of Florida within the Environmental Engineering department since the spring of 2014 under the direction of Dr. Barron H. Henderson. My work within his lab included testing the performance of air quality deposition models using data from Latin America. Our work is currently being submitted to the the journal of Global Biochemical Cycles under the working title, "Contemporary rates of atmospheric inorganic nitrogen (N) deposition to Latin American cities." My research experience also includes an internship at the

National Renewable Energy Laboratory which led to a publication in the journal of Applied Energy titled "Interactions of rooftop PV deployment with the capacity expansion of the bulk power system." I also recently completed a Research Experience for Undergraduates at the Georgia Institute of Technology where I worked on studying Environmental Enteric Dysfunction in children from Maputo, Mozambique under the direction of Dr. Joe Brown.

I am graduating this fall and plan to apply to the University of Florida for the following fall term, with the hopes of pursuing a PhD in Environmental Engineering. The Engineering Educational Collaborative at the University of Florida has further sparked my interests in the intersections between engineering and education. I would like to inquire whether you are currently accepting graduate students into your lab. I have attached a copy of my CV for your consideration as well as a copy of the poster I presented at the National Atmospheric Deposition Program Conference this past November, and would be very interested in discussing possibilities with your lab.

Respectfully,

Hi Dr. J!

I wanted to follow up with you on my meetings with both you and Dr. Dickrell last week. Dr. Dickrell said she would be talking with you about funding etc. for me, and I wanted to update you on another opportunity I was made aware of today. While talking with Dr. Sarntinoranont this afternoon, she mentioned that Drs. Niemi and Traum are searching for a PhD student to hire in their lab (also focusing on Engineering Ed.), but they can only fund half of them. I would love to pursue this, especially if you also only have the funds for half a student. I think it would be a great way to still stay in the Mechanical realm while also focusing on Engineering Education from both perspectives. I'm going to email them about this for more info but wanted to let you know about it as well since I'm still very interested in working with you!

Let me know what you think! I'm available for another Zoom meeting sometime this week if you'd prefer that.

Thanks!

Sent: Tuesday, November 27, 2018 9:46 PM
To: edouglas@ufl.edu
Subject: [UPRM Student interested in opportunity for PhD studies in UF] Christian G. Hernandez Negron

Greetings Dr. Elliot P. Douglas,

With a great enthusiasm, I write to you regarding a notification that I received from Nancy E. McIlrath, Graduate Academic Coordinator – University of Florida Engineering School of Sustainable Infrastructure & Environment, Department of Civil & Coastal Engineering. I understand that you are looking a graduate student interested in the area of engineering education for this project:

"Ambiguity in engineering problem solving: As part of our work on problem solving we are trying to understand what makes a problem ambiguous. The research involves interviews with students and engineering practitioners, and analysis of the interview data. "

Let me introduce myself first. My name is Christian Gabriel Hernández-Negrón. I earned dual undergraduate degrees in Civil Engineering and in Surveying and Topography from UPRM (6 year program). After my undergraduate studies, I immediately started a master's degree in Industrial Engineering at the same institution. I earn my master's degree the past June 2018.

During my engineering education research, I also confirmed that teaching in a university is a future goal in my career. Throughout a period of three years, I joined Prof. Aidsa Santiago's research group in two projects:(1)Testing the Efficacy of Concept Inventories with Bilingual Students: The application of the Concept Assessment Tool for Statics at the UPRM and (2)Leveraging Simulation Tools to Deliver III-Structured Problems: Enhancing Student Problem-Solving Ability in Statics and Mechanics of Materials (Phase1). Both projects were supported by the National Science Foundation (NSF). The project's aim was to understand the misconception in the area of statics and enhance the students' problem-solving capabilities. I contributed by developing the interview protocol, and transcribed and analyzed the information obtained. My work in these projects was disseminated as a poster presentation in 2014SACNAS Annual Symposium and I co-authored a published conference proceedings research paper titled Evidence of Learning Gains in Statics as a Result of Simulation-based Instruction in the 2015ASEE Annual Conference. Nevertheless, this research experience was not the only experience which polished me as an educator as I was, also, an AmeriCorps member participating in "Programa de Apoyo y Enlace Comunitario" (PAEC's AmeriCorps Project) in Aguada, Puerto Rico (PR) giving tutoring services in mathematics to different high school students. The tutoring program is aimed to increase student retention by offering individual and group tutorial sessions. This experience gave me the opportunity to help students with deficiencies in mathematics and drove me to explore teaching methodologies to transmit mathematical concepts. Also, I was a laboratory instructor in the Probability and Statistics for Engineers course at UPRM. Throughout this experience my goal of become a professor in a higher educational level was strengthened. I am currently a mathematics teacher in "Mi Escuelita Learning Center" at Mayaguez, PR while I aim to achieve a career in academic research. Doubtlessly, these experiences have enhanced my teaching skills and my ambitious to expand my knowledge.

During my graduate studies, I conducted research with Dr. Mayra Méndez-Piñero with the Engineering Economics and Cost Optimization (E2CO) research group. The research project title was *Engineering Decisional Model Approach for the Implementation of Bio-Digester in the Cattle-Livestock Industry of Puerto Rico*. In this work, I collaborated with a literature review on the topic as well as in the implementation of an analytical hierarchical process (AHP) model. The goal of the AHP model was to understand which factors and attributes (qualitative and quantitative) owners of farms and environmental specialist consider relevant and that could reduce the operational cost of the confined cattle livestock industry in Puerto Rico when implementing renewable energy technology as a bio-digester.

At this point, I am a prospective PhD student. I would like to continue growing as a researcher an if you understand my background fits with your research project, I would love to know more about your ongoing research. I have attached my resume to this email.

I look forward to hear from you.

Best Regards,

Sent: Thursday, November 1, 2018 5:31 PM To: <u>edouglas@ufl.edu</u> Subject: Ph. D. research

Hello Dr. Douglas,

I was reached out by Miss Nancy about joining the University of Florida. I found your research project very interesting. I worked as an intern in Viking Range in Greenwood, MS as an intern. I am currently working in ThyssenKrupp Elevator in Middleton, TN as an intern as well. In both big companies, I was surprised not seeing a black Engineers. I would also like to share a few things that I experienced myself working as a minor with a lot of male white people. I am a very outgoing person and I like to share my values and ideas with people. I would love to join your research group and assist you in the interview process. I will be graduating in May 2019 and would be able to join from August. Please take a look at my resume.

Hoping to hear back from you. Thanks for your time and consideration.

Appendix G



September 19, 2022

Dear Dr. van Oostrom,

I am delighted that the University of Florida is launching a graduate program in Engineering Education.

As we discussed when we met in November of 2021, I believe that an Engineering Education graduate program at the University of Florida would have minimal impact on our Engineering and Computing Education PhD program at Florida International University. In fact, I believe that a University of Florida Engineering Education PhD program has strong potential for collaborative opportunities for both of our programs as we work to impact undergraduate engineering education as well as K-12 STEM education in Florida. A second Engineering Education graduate program would also allow Florida's State University System to better serve the state (and beyond, as I expect that both of our programs will also attract students from outside of Florida).

Sincerely,

monina Caro

Monica E. Cardella, PhD Director, School of Universal Computing, Construction and Engineering Education (SUCCEED) Professor of Engineering and Computing Education, SUCCEED and STEM Transformation Institute September 27, 2022

MEMORANDUM

 TO: Dr. Joseph Glover Provost and Senior Vice President for Academic Affairs University of Florida
 FROM: Dr. Christy England Vice Chancellor for Academic and Student Affairs

SUBJECT: Ph.D. and Master of Science in Engineering Education, CIP 14.9999

The initial review of the Ph.D. and Master of Science in Engineering Education, CIP 14.9999, has been completed. The following clarifications and revisions are required. Please note that a substantive delay in responding to these issues and/or failure to adequately address the issues in the initial response may result in a delay in the implementation of this program.

- In Section II.A. (p. 6), the proposal notes course development and instructional design positions in engineering companies as possible career outcomes. Please provide letters of support for this program from industry partners. These letters should describe an industry need for doctoral graduates with an engineering education background, examples of positions that graduates may qualify for, and estimated salary ranges associated with those positions.
- Please revise the labor market demand table in Section II.A. (pp. 5 6) to accurately reflect recent employment projections from the U.S. Bureau of Labor Statistics and the Florida Department of Economic Opportunity. If data for an occupation is not available in the most recent CIP-SOC crosswalk tool available in ARTS, use the file from a year prior for which the data is available.
- In Section II.B. (pp. 6 7), please provide additional evidence that supports student demand for this program, such as surveys or other forms of communication with prospective students in an undergraduate or graduate engineering program.

 In Section II.C. (p. 7), please describe any conversations that have occurred with System institutions about collaborative opportunities following the September 2, 2021, CAVP ACG meeting. Please provide details about other collaborative opportunities discussed at the November 1, 2021, meeting with Florida International University (FIU). Additionally, please submit a letter of support for this program from FIU. At a minimum, the letter should indicate no duplication concerns and outline any major differences between FIU's doctoral program and the proposed program.

Please submit your response to this memo no later than **October 10, 2022.** Should you have any questions, please contact Dr. Disraelly Cruz at (850) 245-9681 or <u>Disraelly.Cruz@flbog.edu</u>.

CE/ms

c: Dr. Cheryl L. Gater Dr. Disraelly Cruz Mr. Michael Stowell Office of the Provost and Senior Vice President

235 Tigert Hall PO Box 113175 Gainesville, FL 32611-3175 352-392-2404 Tel 352-392-8735 Fax

October 5, 2022

MEMORANDUM:

TO:	Christy England
	Vice Chancellor for Academic and Student Affairs
FROM:	Cheryl L. Gater CLA Assistant Provost and Director of Academic Program Oversight

SUBJECT: Ph.D. and Master of Science in Engineering Education, CIP 14.9999

Thank you for your memorandum dated September 27, 2022, asking for clarifications for the Ph.D. and Master of Science in Engineering Education, CIP 14.9999 proposal. The degree proposal has been updated with the following information:

- In Section II.A. (p. 6), letters of support from industry partners have been added as Appendix E.
- Also, in Section II.A (p. 7) the labor market demand table has been updated to reflect recent employment projections from the U.S. Bureau of Labor Statistics and the Florida Department of Economic Opportunity.
- Section II.B. (p. 7) has been updated to reflect communications from interested students. A sampling of the emails received is included in Appendix F.
- Section II. C. (p. 7) has been updated to reflect collaboration opportunities with SUS institutions. A letter of support from FIU indicating no duplication concerns and a readiness to collaborate is included in Appendix G.

The full degree proposal with these revisions has been uploaded into ARTS. Please let me know if you have any questions.

cc: Dr. Joseph Glover Dr. Disraelly Cruz Mr. Michael Stowell