BOARD OF GOVERNORS
STATE UNIVERSITY SYSTEM OF FLORIDA
NEW DOCTORAL DEGREE PROPOSAL STAFF ANALYSIS

Program: Ph.D. in Intelligent Systems and Robotics
CIP Code: 11.0102
Institution: University of West Florida
Proposed Implementation Date: Fall 2019
Staffed By: Dr. Lynn Hunt Long
Initial Review Date: 8/21/18
Last Update: 10/8/18

Projected program costs:

	Total	% & $ Current Reallocated	% & $ New Recurring	% & $ New Non-Recurring	% & $ C&G	% & $ Philanthropy Endowments	Auxiliary Funds	Cost per FTE	SUS 16-17 Average Cost per FTE
Year 1	$439,020	13% $59,248	58% $254,772	0% $0	0% $0	29% $125,000	$0	$0	$16,766* 11 CIP
Year 5	$1,521,170	27.6% $420,148	15.1% $229,772	0% $0	0% $0	57.3% $871,250	$0	$0	

Projected FTE and Headcount are:

	Student Headcount	Student FTE
First Year	7	3.85
Second Year	14	7.70
Third Year	21	11.55
Fourth Year	28	15.40
Fifth Year	35	19.25

On March 29, 2007, the Florida Board of Governors approved Board Regulation 8.011, which sets forth criteria for implementation and authorization of new doctorates by the Board of Governors, as well as criteria for implementation and authorization of Bachelor's, Master's and Specialist degrees by Boards of Trustees. The following staff analysis is an assessment of how well the university meets Board Accountability and Readiness criteria for implementation of this degree program.

Proposal Page Numbers:

INTRODUCTION		ACCOUNTABILITY		READINESS				
Program Description	**BOARD Goals**	**Overall**	**Budget**	**Mission and Strength**	**Program Quality**	**Curriculum**	**Faculty**	**Resources**
2	4	5	14	18	21	22	30	39

A. Program Description:

The University of West Florida's Hal Marcus College of Science and Engineering, Department of Intelligent Systems and Robotics, is proposing to establish a Doctor of Philosophy in Intelligent Systems and Robotics. The proposed Ph.D. in Intelligent Systems and Robotics would be the first program under CIP 11.0102 to be offered in the State University System of Florida. The program will be an affiliation between the University of West Florida and the Florida Institute for Human and Machine Cognition (IHMC), a not-for-profit research institute of the State University System of Florida. IHMC has a Pensacola campus and an Ocala campus.

According to the National Center for Education Statistics, CIP 11.0102, Artificial Intelligence and Robotics is a program that focuses on the symbolic inference, representation, and simulation by computers and software of human learning and reasoning processes and capabilities, and the modeling of human motor control and motions by computer-driven machinery. It includes instruction in computing theory, cybernetics, human factors, natural language processing, robot design, and applicable aspects of engineering, technology, and specific end-use applications (Source: https://nces.ed.gov/pubs2002/cip2000/cip2000.asp?CIP2=11.0102). This CIP code appropriately aligns with the proposed program.

The purpose of the Ph.D. in Intelligent Systems and Robotics is to prepare highly qualified educators and researchers to develop technology combining human and machine elements (p. 2). Potential employment opportunities include a variety of high-tech industries such as advanced manufacturing, healthcare, defense, and transportation, as well as in higher education.

The degree program will require the completion of 42 semester credit hours for students who enter the program with an approved master's degree or 72 semester credit hours for students who enter the program without an approved master's degree (p. 24).

B. System-Level Analysis and Evaluation in accordance with BOG Regulation 8.011:

The proposal provides alignment of the program with the State University System strategic plan. The program will increase the number of advanced degrees awarded in a STEM discipline, strengthen the quality and reputation of scholarship, research, and innovation in the state as well as enhance research productivity through collaboration with IHMC. Per the proposal, there is substantial grant funding potential for this degree program (p. 9) and local organizations would benefit from the research activities and program graduates (p. 10).

The proposed program also aligns with the mission at UWF to:

- provide high-quality undergraduate and graduate education,
- conduct teaching and research that services the body of knowledge, and
- contribute to the needs of professions and society.

The Ph.D. in Intelligent Systems and Robotics was included for consideration on the 2017 UWF University Work Plan Report.

Need for Graduates in the Labor Market

The proposal documents, and Board staff confirmed, the U.S. Bureau of Labor Statistics report that economic projections point to a need for approximately 1 million more STEM professionals than the U.S. will produce at the current rate over the next decade if the country is to retain its historical preeminence in science and technology (p. 5).

A search of Intelligent Systems and Robotics on the U.S. Bureau of Labor Statistics website, returns employment data for closely related occupations as described in Table 1. The table also includes data for postsecondary teachers.

Table 1. U.S. Job Projections 2016 - 2026

	% Change	Number of Job Openings	Median Salary	Entry-Level Education
Computer and Information Research Scientists	19%	27,900	$114,520	Master's
Computer Hardware Engineers	5%	73,600	$115,120	Bachelor's
Mechanical Engineers	9%	288,800	$85,800	Bachelor's
Software Developers	24%	1,256,200	$103,560	Bachelor's
Architectural and Engineering Managers	6%	180,100	$137,720	Bachelor's
Computer Science Postsecondary Teachers (O*Net)	5-9%	3,400	$78,630	Master's or Higher

Sources: National Center for Education Statistics CIP 2010 to SOC 2010
https://nces.ed.gov/ipeds/cipcode/resources.aspx?y=55151

Occupational Outlook Handbook, Bureau of Labor Statistics https://www.bls.gov/ooh/
O*Net OnLine https://www.onetonline.org/link/summary/25-1021.00

The Florida Department of Economic Opportunity projects statewide employment growth of 6.9% to 19.4% from 2017-2025 for careers related to intelligent systems and robotics. The specific data are reflected in Table 2.

Table 2. Florida Job Projections 2017 - 2025

	% Change	Number of Job Openings	Median Hourly Wage	BLS Entry-Level Education
Computer and Information Research Scientists	6.9%	295	$45.61	Master's
Computer Hardware Engineers	8.9%	1,334	$45.58	Bachelor's
Mechanical Engineers	12.6%	5,147	$41.22	Bachelor's
Software Developers, Applications	19.4%	26,204	$41.79	Bachelor's
Software Developers, Systems Software	16.1%	11,442	$47.22	Bachelor's
Architectural and Engineering Managers	12.2%	4,609	$60.54	Bachelor's
Computer Science Postsecondary Teachers	12.7%	1,763	$43.88	Master's or Higher

Source: Employment Projections, Florida Department of Economic Opportunity
http://www.floridajobs.org/labor-market-information/data-center/statistical-programs/employment-projections
Occupational Outlook Handbook, Bureau of Labor Statistics https://www.bls.gov/ooh/

Board staff conducted a search for jobs requiring a Ph.D. in Intelligent Systems and Robotics on August 28, 2018. An earned Ph.D. was a required or preferred qualification for positions listed with Amazon, Google, IBM, and Microsoft, as well as faculty positions, confirming opportunities listed in the proposal.

Student Demand for the Program

The University of West Florida surveyed students (n=149) currently enrolled in degree programs in the departments of Electrical and Computer Engineering, Mechanical Engineering, and Computer Science to determine interest in the proposed program. Per the proposal, 65.8% expressed interest in a Ph.D. in Intelligent Systems and Robotics (p. 11).

At the present time, only three universities in the United States offer a Ph.D. program in artificial intelligence (CIP 11.0102): Carnegie Mellon University, the University of Pittsburgh, and Georgia Institute of Technology. Within the State University System of Florida, this would be the first program offered with CIP code 11.0102. While no other program is offered, the enrollment and degrees awarded for a similar CIP (11.0101, Computer and Information Sciences, General) are included below.

Table 3. Enrollments in Ph.D. in Computer and Information Sciences, General (CIP 11.0101)

	2013	2014	2015	2016	2017
FAU	33	33	35	39	40
FIU	79	68	65	74	71
FSU	26	58	56	62	71
UCF	113	125	140	154	168
UF	-	-	1	54	64

Source: Florida Board of Governors, Enrollment by CIP, retrieved August 28, 2018

Table 4. Degrees Awarded in Ph.D. in Computer and Information Sciences, General (CIP 11.0101)

	11-12	12-13	13-14	14-15	15-16
FAU	2	2	3	2	4
FIU	5	8	11	15	8
FSU	7	8	7	9	6
UCF	16	11	6	13	9
UF	-	-	-	-	7

Source: Florida Board of Governors, Degree by CIP, retrieved August 28, 2018

The projected headcount enrollment is 7 for the first year and 35 by year 5. The primary source of students for the program are individuals from agencies/industries in the service area of the university. Other sources of students indicated include individuals who graduated from other degree programs at the University of West Florida and other Florida public universities, additional in-state residents, additional out-of-state residents, and additional foreign residents.

External Consultant's Report
Dr. Ronald Arkin, Regents' Professor and Director of Mobile Robot Laboratory, College of Computing at Georgia Institute of Technology, reviewed the University of West Florida's proposal and provided recommendations. Based on Dr. Arkin's recommendations, an affiliation agreement between UWF and IHMC was established and formalized with documentation provided in Appendix E. Dr. Arkin recommended "hammering out" the specific details of the structure of the program which was accomplished with the review and approval of the curriculum through all stages of the internal curriculum coordination review process (p. 3). In addition, during the first year of the Intelligent Systems and Robotics degree program, the director and IHMC will form an industry advisory council to provide guidance and insight in the program and a direct link between the program and local and regional industries (p. 29). Based on Dr. Arkin's recommendations, the Department of Intelligent Systems and Robotics was created (p. 3), and students may enter the program with an approved master's degree and without an approved master's degree (p. 4 and p. 24).

Summary
The University of West Florida is proposing to develop a Ph.D. in Intelligent Systems and Robotics. This will be the first degree program with CIP 11.0102 in the State University System which would allow students to pursue this degree opportunity at a public university. The program will be an affiliation between the University of West Florida and the Florida Institute for Human and Machine Cognition (IHMC) which will provide students the opportunity to gain expertise and hands-on, leading edge research in intelligent systems and robotics. This program may enhance UWF's competitiveness for students in an area of strategic priority. There is ample evidence provided regarding the national and state needs in the labor market for graduates of the proposed program to fill faculty and industry positions.

C. Assessment of the University Review Process in accordance with BOG Regulation 8.011:

Due to the system of stair step accountability set in place by the Board of Governors in Regulation 8.011, it is now incumbent upon University Board of Trustees to verify that all doctoral programs coming before the Board of Governors have met the requirements of the regulation. The following is an assessment of the university review process to ensure that all criteria set forth have been considered by the university prior to submission to the Board of Governors office.

ACCOUNTABILITY
Check 'yes' or 'no' box, and make comments beneath criterion as appropriate.

1. ***Overall*** *– The proposal is in the correct format, includes all necessary signatures, and contains complete and accurate tables for enrollment projections, faculty effort, and the proposed budget.*

YES NO

☒ ☐ **The proposal has been approved by the university board of trustees and includes all required signatures.**

The proposed program was approved by the University of West Florida Board of Trustees on June 5, 2018.

☒ ☐ **The university has provided a proposal written in the standard SUS format which addresses new academic program approval criteria outlined in BOG Regulation 8.011.**

The academic program proposal was written in the standard SUS format and in accordance with the criteria set forth in Board Regulation 8.011.

☒ ☐ **The pre-proposal was reviewed by the Council of Academic Vice Presidents (CAVP) workgroup and any concerns identified by the group have been listed and addressed in the proposal.**

The pre-proposal was presented to the CAVP on September 25, 2015. As written in the proposal, there was no formal concern raised.

☒ ☐ **The university has provided data that supports the need for an additional program in the State University System as well as letters of support or concern from the provosts of other state universities with substantially similar programs.**

The proposed degree program will be the only program in the State University System with CIP Code 11.0102. The University of West Florida has provided data that supports the need and demand for a Ph.D. in the State University System.

☒ ☐ **The university has provided complete and accurate projected enrollment, faculty effort, and budget tables that are in alignment with each other.**

☒ ☐ **The university has included a statement in the proposal signed by the equity officer as to how this proposal will meet the goals of the university's equity accountability plan.**

University of West Florida's Equal Opportunity Officer reviewed and signed the proposal on May 8, 2018.

☒ ☐ **The program does not substantially duplicate programs at FAMU or FIU or, if it does, evidence was provided that consultations have occurred with the affected university on the impact of the new program on existing programs.**

FAMU and FIU do not offer a program under CIP 11.0102 at any level and there were no concerns expressed by the institution representatives at the CAVP meeting on September 25, 2015.

***2. Budget** – The proposal presents a complete and realistic budget for the program consistent with university and BOG policy, and shows that any redirection of funding will not have an unjustified negative impact on other needed programs.*

YES NO

☒ ☐ **The University Board of Trustees has approved the most recent budget for this proposal.**

The current budget was approved by the University Board of Trustees on June 5, 2018.

☒ ☐ **The university has reviewed the budget for the program to ensure that it is complete and reasonable, and the budget appears in alignment with expenditures by similar programs at other SUS institutions.**

The proposal describes the faculty effort as measured in Person Years increasing proportionately from 1.73 in year 1 to 3.23 in year 5. The projected E& G cost per FTE in year 1 is $81,564 and in year 5 is $33,762. The costs for the program seem to be higher than the calculated average cost per FTE of $16,765.92 for CIP 11 as provided in the 2016-17 expenditure analysis report. However, the range of costs associated with the average E&G cost per FTE can vary considerably by university due to factors related to enrollment scale and diversity of programs in CIP 11.

☒ ☐ **The proposal indicates that the program will follow the cost-recovery or market-rate funding models. If so, details and timelines for getting approvals for these funding models are included in the proposal.**

The University will not offer the program on a cost-recovery basis and will not seek approval for market rate tuition.

☒ ☐ **In the event that resources within the institution are redirected to support the new program, the university has identified this redirection and determined that it will not have a negative impact on undergraduate education, or the university has provided a reasonable explanation for any impact of this redirection.**

The proposal indicates that the implementation of the Ph.D. in Intelligent Systems and Robotics will have no negative impact on other existing programs or services.

READINESS

Check 'yes' or 'no' box, and make comments beneath criterion as appropriate.

3. Program Quality *– The proposal provides evidence that the university planning activities have been sufficient and responses to any recommendations to program reviews or accreditation activities in the discipline pertinent to the proposed program have been addressed.*

YES NO

☒ ☐ **The university has followed a collaborative planning process for the proposed program in accordance with policies and procedures adopted by the University Board of Trustees.**

The proposal describes a collaborative planning process involving UWF faculty and administrators, IHMC, and an external reviewer. A chronological table outlining the collaborative planning process is included in the proposal (p. 20).

☒ ☐ **An external consultant has reviewed the proposal and supports the department's capability of successfully implementing this new program.**

Dr. Ronald Arkin, Regents' Professor and Director of Mobile Robot Laboratory, College of Computing at Georgia Institute of Technology, served as the external consultant for the proposed program. A review of the proposal was provided and the consultant noted recommendations for consideration for implementation of the program. The proposal provided UWF's responses and actions to the recommendations (p. 3).

☒ ☐ **The university has found the level of progress that the department has made in implementing the recommendations from program reviews or accreditation activities in the discipline pertinent to the proposed program to be satisfactory.**

Per the proposal, the Department of Computer Science conducted its program review in 2013-14. The program review committee recommended the department pursue disciplinary accreditation. The Bachelor of Science in Computer Engineering and the Bachelor of Science in Electrical Engineering are both accredited by the Accreditation Board for Engineering and Technology (ABET). ABET does not accredit doctoral programs.

☐ ☒ **The university has analyzed the feasibility of providing all or a portion of the proposed program through distance learning.**

Per the proposal, the program will be offered in traditional face-to-face format at the UWF main campus. The affiliation agreement with IHMC offers hands-on research opportunities for the students at the Pensacola facility.

☐ ☐ **If necessary, the university has made allowances for licensure and legislative approval to be obtained in a timely manner.**

N/A

4. Curriculum *– The proposal provides evidence that the university has evaluated the proposed curriculum and found that it describes an appropriate and sequenced course of study, and that the university has evaluated the appropriateness of specialized accreditation for the program.*

YES NO

☒ ☐ **The university has reviewed the curriculum and found that the course of study presented is appropriate to meet specific learning outcomes and industry driven competencies discussed in the proposal.**

The proposal identifies the curricular framework for students who enter the program with an approved master's degree to include 9 semester credit hours of core courses, 9 semester credit hours of specialization courses, and 24 semester credit hours for the dissertation (p. 24).

The proposal also describes the curricular framework for students who enter the program without an approved master's degree. The proposal identifies the 9 semester credit hours of core courses, 9 semester credit hours of

specialization courses, 30 semester credit hours in specialization or program-approved electives, and 24 semester credit hours for the dissertation (p. 24).

The sequences course of study is provided (pp. 25-26) and well as a description for each course offered (pp. 26-29).

☐ ☒ **The university anticipates seeking accreditation for the proposed doctoral program, or provides a reasonable explanation as to why accreditation is not being sought.**

There are no specialized accreditation agencies specific to Intelligent Systems and Robotics. According to the proposal, the program may pursue learned societies including International Symposium on Electronics and the Environment's Computational Intelligence Society and Institute of Electrical and Electronics Engineers' Robotics and Automation Society. The proposal describes specific competencies to be attained including content, critical thinking, communication, integrity/values, and project management.

5. Faculty *– The proposal provides evidence that the university is prepared to ensure a critical mass of faculty will be available to initiate the program based on estimated enrollments, and that faculty in the aggregate have the necessary experience and research activity to sustain a doctoral program.*

YES NO

☒ ☐ **The university has reviewed the evidence provided and found that there is a critical mass of faculty available to initiate the program based on estimated enrollments.**

According to Table 4 in Appendix A, 10 faculty members will be affiliated with the program. The existing faculty on a regular line includes four professors, one associate professor, and one assistant professor, and the new faculty to be hired on a new line includes one professor and three associate professors. Two new faculty members will be hired to support the program in Fall 2019, one faculty member will be hired in Fall 2020, and one faculty member will be hired in Fall 2021.

☒ ☐ **The university has reviewed the evidence provided and found that the faculty in aggregate has the necessary experience and research activity to sustain the program.**

Table 4 in Appendix A of the proposal identifies the academic disciplines for current and proposed faculty to include Electrical Engineering; Engineering; Curriculum and Instruction for Math, Statistics, and Science; and Computer

Science. All current faculty have earned a terminal degree with the proposed faculty anticipated to have earned their Ph.D.

According to the proposal, faculty in the Hal Marcus College of Science and Engineering generated close to $2 million in grant funding from 2016-2018 (p. 32). The faculty are actively conducting research (pp. 35-36), have peer-reviewed publications (pgs. 36-38) and supervise student research (pp. 33-34).

☒ ☐ **The university has reviewed the evidence provided and found the academic unit(s) associated with this new degree to be productive in teaching, research, and service.**

According to the proposal narrative on pages 31-39, the faculty who will contribute to the program have been active in teaching, research, and service. The curriculum vitaes for existing faculty members were included in the proposal (Appendix G).

☒ ☐ **If appropriate, the university has committed to hiring additional faculty in later years, based on estimated enrollments.**

According to Table 4 in Appendix A, a tenured program director will be hired on a new line beginning Fall 2019. Three tenure-earning associate professors will be hired on new faculty lines. The initial dates for participation in the program will include one new hire for Fall 2019, one new hire for Fall 2020, and one new hire for Fall 2021.

6. Resources *– The proposal provides evidence that the university has ensured the available library volumes and serials; classroom, teaching laboratory, research laboratory, office space, equipment, clinical and internship sites, fellowships, scholarships, and graduate assistantships will be sufficient to initiate the program, and that if applicable, funding has been secured to make more resources available as students proceed through the program..*

YES NO

☒ ☐ **The university has provided a signed statement from the Library Director verifying that the library volumes and serials available are sufficient to initiate the program.**

The Dean of University Libraries submitted a signed statement dated May 8, 2018 (Appendix B). The proposal includes a listing of resources available to faculty, staff, and students related to intelligent systems. Resources include, but are not limited to, print titles, journals, abstracting and full-text databases, and full-text dissertations. The existing collections have been

identified as sufficient to implement and sustain this program through year 5 (p. 42).

☒ ☐ **The university has ensured that the physical space necessary for the proposed program, including classrooms, laboratories and office space, is sufficient to initiate the program.**

According to the proposal, additional space is not needed to support this program (p. 43).

☒ ☐ **The university has ensured that necessary equipment is available to initiate the program.**

According to the proposal, the program will use specialized equipment that is currently available at UWF and IHMC. No additional or specialized equipment is needed for the proposed program (p. 43).

☒ ☐ **The university has ensured that fellowships, scholarships, and graduate assistantships are sufficient to initiate the program.**

Endowment and/or foundation funds will be available to award up to five 25,000 assistantships in year 1 and up to 20 assistantships at $25,000 each in year 5. Students awarded assistantships will provide teaching and/or research assistance.

☒ ☐ **If applicable, the university has ensured that the department has arranged a suitable number of clinical and internship sites.**

Per the proposal, IHMC will provide internship opportunities and more opportunities will become available with the establishment of the local industry advisory council in year 1 of the program.