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

Program: Ph.D. in Materials Science and Engineering **CIP Code:** 40.1001
Institution: Florida State University **Proposed Implementation Date:** Fall 2011
Staffed By: Lynda Page, Richard Stevens **Initial Review Date:** 04/29/11 **Last Update:** 05/16/11

Estimated Costs:

	Total	% & $ Current Reallocated	% & $ New Recurring	% & $ New Non-Recurring	% & $ C&G	Cost per FTE	SUS 09-10 Average Cost per FTE
Year 1	$460,185	85% $390,375	0% $0	0% $0	15% $69,810	$72,292	$23,267 14 CIP
Year 5	$2,785,415	39% $1,078,807	0% $0	0% $0	61% $1,706,608	$27,876	$27,711 40 CIP

Projected FTE and Headcount are:

	Student Headcount	Student FTE
First Year	6	5.4
Second Year	14	12.6
Third Year	23	20.7
Fourth Year	33	29.7
Fifth Year	43	38.7

On March 29, 2007, the Florida Board of Governors approved Regulation 8.011, which sets forth criteria for authorization and implementation of new doctoral programs by the Board of Governors, as well as criteria for authorization and implementation 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 of Governors Accountability and Readiness criteria for implementation of this degree program.

Proposal Page Numbers:

INTRODUCTION		ACCOUNTABILITY		READINESS				
Program Description	**System Analysis**	**Overall**	**Budget**	**Mission and Strength**	**Program Quality**	**Curriculum**	**Faculty**	**Resources**
8	9	10	23	31	37	37	48	57

A. Program Description:

Florida State University is proposing to offer an interdisciplinary Doctor of Philosophy in Materials Science and Engineering (MS&E) degree program. This field involves the study of relationships among the processing, structure, properties, and performance of materials. The program will be administered by the Graduate School and will involve a minimum of 54 post-baccalaureate credits, including at least 27 credits of letter-graded courses and at least 24 credits of dissertation research. Utilizing faculty members spanning nine departments that are spread across two colleges, the University anticipates that the interdisciplinary approach will position students to work and conduct world-class research on materials. The nine affiliated departments are Biological Science, Chemistry and Biochemistry, Physics, and Scientific Computing within the College of Arts and Sciences, as well as Chemical and Biomedical Engineering, Civil and Environmental Engineering, Electrical and Computer Engineering, Industrial and Manufacturing Engineering, and Mechanical Engineering within the FAMU/FSU College of Engineering.

The program is designed so that students may complete both the course work and dissertation in five years. It includes check points of passing a written qualifying exam and the presentation and defending of a prospectus. Throughout the program, students will have the opportunity to participate in the interdisciplinary seminar series designed for students to obtain information on advances in materials research. The seminar series will involve presentations from visiting scientists and from MS&E faculty.

According to the proposal, the program will emphasize research and anticipates supporting research assistants through research grants. Current faculty have been very successful in obtaining outside research grants from federal and private agencies such as the National Science Foundation, Department of Defense agencies, NASA, National Institutes of Health, and others. This research focus should prepare graduates of the program for cutting-edge innovation as they move into the MS&E area as professionals.

B. System-Level Analysis and Evaluation in accordance with Board of Governors Regulation 8.011:

Florida State University believes that the proposed program addresses the four State University System Strategic Planning Goals, positioning its graduates to assist in the development of a "New Florida." MS&E is found within the science, technology, engineering, and mathematics (STEM) area of focus and will help to produce a high-skilled workforce in these critical areas. The program will also assist in meeting the FSU mission statement for "promoting excellence in graduate education and research and encouraging the dissemination and transfer of knowledge by providing broad access to institutional resources and services to the community and to the State." The proposed program falls within the STEM Area of Programmatic Strategic Emphasis as

adopted into the Board of Governors 2005-2013 Strategic Plan and updated in November 2008. It is also aligned with strategic guidance provided in the plan for the development of new doctoral programs in research with regard to being aligned with the University and System missions and being in a targeted discipline.

A strong argument of need is made for the program based upon economic development goals of the state. By building upon an active research-based faculty and resources already in place, the program will be able to assist in meeting the increased demand for materials scientists and will assist in bringing industry into the Northwest region. This region, one of the 10 included in the Enterprise Florida Roadmap, has an urgent need for high-tech companies and jobs.

The proposal further provides that the Bureau of Labor Statistics states in its *Occupational Outlook Handbook, 2010-11 Edition,* that "…the employment of materials scientists is projected to grow by 12 percent as manufacturers seek to improve the quality of their products by using new materials and manufacturing processes." The University points to key economic sectors in the state, such as aerospace, defense, marine, and space, found to employ materials scientists. It is reported that several faculty members working closely with colleagues in military research located in the panhandle have learned that defense labs have been directed to increase the number of Ph.D.-level researchers, including materials scientists. The implementation of the proposed program will address an employment need in the community while increasing the opportunity for students to seek a Ph.D. in the area. Having the support of the three universities currently offering a Ph.D.in Material Science (i.e., University of Florida, University of Central Florida, and Florida International University) and Florida A&M University, their partner in the joint FAMU-FSU College of Engineering, the University proposes a program that will meet the needs of their students and community.

The program duplicates existing doctoral level MS&E programs at the University of Florida, University of Central Florida, and Florida International University. Materials science programs are interdisciplinary by nature, typically relying on the research strengths of affiliated departments. The proposed FSU program would follow a different administrative model than others in the state by being housed within the Graduate School rather than within a single department, with leadership rotating among affiliated departments. This model is similar to the model that was used when FSU implemented its program in computational science within an interdisciplinary center.

The proposal makes a strong argument for implementing the degree based upon existing faculty and research resources already in place within other programs. However, it should be noted that four of the nine affiliated programs are relatively new, and three of the older programs have experienced low enrollment and degree

productivity in the past five years. The question that might be asked of FSU is whether the proposed MS&E program may weaken these programs by reallocating resources or strengthens these programs through gained efficiencies in faculty effort.

As illustrated in the following tables, enrollment in the State University System's existing doctoral materials science and engineering programs has shown some decline over the past four years, and it would appear that implementation of the FIU program in 2007 may have had a marginal impact on enrollments at UF and UCF. However, degree production does not appear to have been significantly affected at existing programs when FIU implemented its program, but this may be a result of prior enrollees finishing their dissertations. Beginning on page 13, the proposal provides a comparison of the proposed program with existing programs, identifying gaps and overlap in areas of concentration. FSU has gathered letters of support for the proposed program from the universities with the three existing programs; copies of these letters can be found in Appendix C.

Materials Science and Engineering Doctoral Enrollments

	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
FIU	0	0	0	0	0	0	2	2	9	22
UCF	13	16	21	38	39	36	42	35	37	29
UF	116	146	146	140	132	132	150	145	122	106
Total	*129*	*162*	*167*	*178*	*171*	*168*	*194*	*182*	*168*	*157*

SOURCE: Board of Governors Online Interactive Data Tool

Materials Science and Engineering Doctoral Degrees

	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
FIU	0	0	0	0	0	0	0	0	3	1
UCF	1	6	3	3	1	6	5	6	8	7
UF	25	20	16	35	43	35	19	26	40	43
Total	*26*	*26*	*19*	*38*	*44*	*41*	*24*	*32*	*51*	*51*

SOURCE: Board of Governors Online Interactive Data Tool

C. Assessment of the University Review Process in accordance with Board of Governors 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 boards 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 each 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 FSU Board of Trustees approved the proposal at their meeting on March 4, 2011. A signature coversheet with all required signatures is provided.

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

The proposal is written in the standard SUS format, addressing the required academic program approval criteria.

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

All tables are added correctly and correlate 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.**

The proposal notes that the program anticipates actively recruiting students from FAMU in science and mathematics, plus FAMU engineering students in the FAMU-FSU College of Engineering. It also specifies that faculty members will be encouraged to have minority students in the Research Experiences for Undergraduates summer internship programs at the National High Magnetic Field Laboratory at FSU to get first-hand research experiences on materials.

A letter of support is provided from Dr. Cynthia Hughes-Harris, FAMU Provost and Vice President for Academic Affairs; however, she does note that FAMU would not want the initiation of the FSU program to preclude FAMU from initiating its own future MS and Ph.D. program in Materials Science in niche areas that do not duplicate the FSU research efforts.

2. Budget – *The proposal presents a complete and realistic budget for the program consistent with university and Board of Governors 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.**

Budget tables were included in the proposal approved by the University Board of Trustees.

☒ ☐ **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 projected cost per FTE is slightly higher than the State University System average for doctoral Engineering, totaling $27,876 per student FTE in Year Five versus the $27,711 SUS average for 2009-10. However, the System average is calculated at the two-digit CIP Code level across all universities and programs, so it cannot be considered anything more than a "ballpark" estimate for what a new program should cost.

☒ ☐ **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.**

As an interdepartmentally administered program, the program will be supported by some reallocation of resources, but it is expected that graduate students in this program will also provide instructional and research resources back to the affiliate programs.

READINESS

Check 'yes' or 'no' box, and make comments beneath each 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 provides a timeline that shows initial discussions about the possibility of establishing a Ph.D. program in MS&E beginning in 2006. The interdisciplinary Master of Science in Materials Science was developed first. Extensive interdepartmental planning has since taken place, especially after 2009. The process also included communication with other state university MS&E programs, along with consideration of the involvement of FAMU students.

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

Dr. John D. Wiley, Chancellor Emeritus of the University of Wisconsin-Madison, reviewed the university proposal in order to judge compliance with the Board of Governors' new degree criteria. He notes that the interdepartmental, inter-college model that is proposed has been successfully implemented at other institutions, including Wisconsin. Additionally, he notes that because of the quality and quantity of excellent materials science research at FSU, the approval and implementation of the proposal "would almost immediately vault FSU into the very top ranks of Materials Science and Engineering PhD programs nationally."

☐ ☒ **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.**

The proposal responds as N/A to this section. This response may be due to the fact that the Master of Science in Material Science was newly approved in 2008 and will not come up for a Quality Enhancement Review until 2018 – 2019. However, as an interdisciplinary program, it would seem reasonable that there would be reviews associated with the affiliated departments.

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

The university indicates that the MS&E courses will be delivered on campus using traditional delivery methods. The research lab nature of this program does not readily lend itself to coursework being provided via distance learning.

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

Legislative approval is no longer necessary and would not have applied to this particular program.

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 University includes the specific learning outcomes for the program that tie back to student performance in core courses. It includes a detailed outline of degree program expectations along with a thorough description of the fundamental core courses of the program. Additionally, there are shorter descriptions of elective specialization courses included in the proposal.

The proposal notes that the program is a research-oriented degree program. The students will be supported on faculty members' research grants that add significant, cutting-edge research in areas important to the industry.

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

The university notes that Materials Science and Engineering is accredited at the undergraduate level by the Accreditation Board for Engineering and Technology; however, there is no agency or society that accredits such programs at the M.S. and Ph.D. level.

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.**

No new faculty will be hired in the establishment of the degree program. The workload for the program will be spread among 26 current faculty members found among 9 different departments.

☒ ☐ **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.**

The consultant notes that "…FSU already has a strong materials science and engineering faculty. They simply need authority to name the degree appropriately, in a way that is recognized by potential faculty, students, and recruiters." Many of the faculty members are already involved in teaching graduate level MS&E coursework through the master's program.

☒ ☐ **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.**

The proposal provides evidence that the faculty members bring with them an extensive breadth of experience in publications, funded research, and direction of student research. Only seven of the 26 are noted as not having previously directed student research. All have experience with being published and actively pursue grants. The group totals more than 31 million dollars in externally-funded grants received 2005 through 2010.

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

No new faculty will be hired through Year Five with the establishment of the proposed program. Faculty will, however, have an increased workload by that year. Funding for the faculty is based on reallocated funds and contracts and grants. The University notes that there will be no change in any department budget or the budgets of the College of Arts and Science or College of Engineering due to the reallocation.

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 University's extensive collection that already supports the nine departments involved with the proposed interdisciplinary program will be available to the MS&E

students. The University notes that an expansion of statewide electronic journal packages will be provide additional science journal content.

☒ ☐ **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.**

The Ph.D. program will be supported by current classroom and laboratory space spread throughout campus in buildings supporting the faculty from the nine different departments. Students will be provided with office space by their advisor's home department.

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

The MS&E faculty members already have their own research equipment. FSU has previously invested in shared equipment for materials research. There is no need for additional specialized equipment.

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

The proposal notes that the institution will start with the provision of six full fellowships ($20,000 each for the academic year) plus tuition waivers for first-year students. Already successful in obtaining outside research grants, MS&E will be actively seeking funds to support fellowships and research assistantships. Faculty members have a history of receiving outside research grants from a variety of federal and private agencies.

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

Although the program does not include clinical or internship experiences, it does include the opportunity for students to work with faculty members utilizing state-of-the-art resources while conducting cutting-edge research as identified by the scientific community.