Florida Agricultural and Mechanical University
Board of Trustees

Academic and Student Affairs Committee Meeting
Date: June 6, 2018
Time: 2 pm
Location: Grand Ballroom

Committee Members: Matthew Carter, Chair
Thomas Dortch; Bettye Grable; David Jackson, III; David Lawrence;
Nicole Washington; and Robert Woody

REVISED AGENDA

I. Call to Order

II. Roll Call

III. Approval of Minutes for March 7, 2018 Meeting

ACTION ITEMS

IV. Tenure

V. Honorary Doctoral Degree – LTC David E. Pollard, Sr. (Posthumous)

VI. Honorary Doctoral Degree – Dr. Shelia A. McClure

VII. Revised Master of Science – Systems Engineering Degree Program

VIII. Request for a New Degree Program (Bachelor of Science in Biomedical Engineering)

IX. MOA – FAMU/FSU College of Engineering

X. Accountability Plan

XI. Four Year Graduation Rate Improvement Plan
INFORMATION ITEMS

XII. Academic and Student Affairs Update
    - New BOG Regulation – 8.006 Civic Literacy
    - Industrial Hemp Research Project
    - Anti-Hazing Update
    - Update - 2 + 2 Program

Interim Provost Rodner Wright
Interim Provost Rodner Wright
Dr. Timothy Moore
Mr. Bryan Smith
Dr. William Hudson, Jr.

XIII. Adjournment
Subject: Minutes for March 7, 2018

Rationale: In accordance with the Florida Statutes, a governmental body shall prepare and keep minutes or make a tape recording of each open meeting of the body.

Attachment: Minutes for March 7, 2018

Recommendation: It is recommended that the Board of Trustees approve the minutes of March 7, 2018.
The meeting was called to order by Trustee Matthew Carter. Ms. Valeria Singleton called the roll and the following committee members were present: Matthew Carter, Thomas Dortch, Bettye Grable, David Lawrence, Nicole Washington, and Robert Woody. A quorum was established.

Trustee Washington moved to approve the minutes for the meeting on November 29, 2017. The motion was seconded by Trustee Dortch and the motion carried.

**Tenure Upon Appointment for Dean Henry Talley** – The request for tenure upon appointment for Dean Henry Talley was presented and discussed. Tenure Upon Appointment is a condition of employment that is offered to a faculty member who has previously held a tenured position. The request for tenure upon appointment is approved by the provost and the president.

Trustee Grable moved to approve the tenure upon appointment for Dr. Henry Talley. The motion was seconded by Trustee Dortch and the motion carried.

**Sabbatical and Professional Development Leave** – The seven recommendations for sabbatical leave for the 2018 – 2019 academic year were presented and discussed.

Trustee Dortch moved to approve the sabbatical leave for the following faculty members:

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>College/School</th>
<th>Semester(s)</th>
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<tbody>
<tr>
<td>Egwu Kalu</td>
<td>Professor</td>
<td>College of Engineering</td>
<td>Spring 2019</td>
</tr>
<tr>
<td>Mtenga Primus</td>
<td>Professor</td>
<td>College of Engineering</td>
<td>Spring 2019</td>
</tr>
<tr>
<td>Mary Ellen Graham</td>
<td>Professor</td>
<td>School of Nursing</td>
<td>Spring 2019</td>
</tr>
<tr>
<td>Huberta Jackson-Lowman</td>
<td>Professor</td>
<td>College of Social Sciences, Arts and Humanities</td>
<td>Fall 2018</td>
</tr>
<tr>
<td>Nan Liu</td>
<td>Associate Professor</td>
<td>College of Social Sciences, Arts and Humanities</td>
<td>Fall 2018 and Spring 2019</td>
</tr>
<tr>
<td>Enn Ots</td>
<td>Professor</td>
<td>School of Architecture and Engineering Technology</td>
<td>Fall 2018</td>
</tr>
<tr>
<td>Alfred D. Ridley</td>
<td>Professor</td>
<td>School of Business and Industry</td>
<td>Spring 2019</td>
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The motion was seconded by Trustee Grable and the motion carried.
Request for New Degree Program – Dr. Murray Gibson, Dean of the College of Engineering, discussed the new degree program – Master of Science in Systems Engineering.

Trustee Dortch moved to approve the Master of Science in Systems Engineering degree program and the motion was seconded by Trustee Grable. The motion carried.

Research Foundation - The Bylaws of the FAMU Research Foundation was approved by the Board of Trustees on September 6, 2017, but did not include the category from which two directors of the Research Foundation would be appointed. The Administration suggested that the Vice President for Academic Affairs be authorized to appoint two members to the Board of Directors of the Research Foundation from the ranks of the University’s tenured faculty.

Trustee Dortch moved to approve the revised by-laws and the motion was seconded by Trustee Grable. The motion carried.

Academic and Student Affairs Updates – The following informational updates were provided:

- Provost Rodner Wright provided an update on the executive searches that is being conducted by Greenwood Asher & Associates.
- Dr. Murray Gibson provided an update on the Memorandum of Agreement for the management of FAMU-FSU College of Engineering.
- Dr. Jennifer Collins provided an overview of the Quality Enhancement Plan.
- Mr. Bryan Smith provided an update on the hazing prevention initiatives.
- Dr. William Hudson, Jr., provided an update on the 2+2 program.

There being no further discussion, the meeting was adjourned at 3:28 pm.

Respectfully submitted,

Matthew Carter, Committee Chair
Subject: Approval of Tenure Recommendations

Rationale: Applications for tenure were reviewed by the departments, the colleges/schools, the University Tenure and Promotion Committee, Interim Provost Wright, and President Robinson. The applicants were evaluated based on their professional experiences, teaching effectiveness, university service, public service, demonstrated contributions to their teaching discipline, technical and performance competencies, records of publications and research, certifications and exceptional scholarly or creative activities.

Recommendation: The following applicants are recommended for approval of tenure:

<table>
<thead>
<tr>
<th>Name</th>
<th>College/School</th>
<th>Rank</th>
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</thead>
<tbody>
<tr>
<td>Edward Agyare</td>
<td>COPPS</td>
<td>Associate</td>
</tr>
<tr>
<td>Bridgette Israel</td>
<td>COPPS</td>
<td>Assistant</td>
</tr>
<tr>
<td>Tonya Martin</td>
<td>COPPS</td>
<td>Assistant</td>
</tr>
<tr>
<td>Arlesia Mathis</td>
<td>COPPS</td>
<td>Associate</td>
</tr>
<tr>
<td>Juan Mosley, II</td>
<td>COPPS</td>
<td>Associate</td>
</tr>
<tr>
<td>Lillian Smith</td>
<td>COPPS</td>
<td>Associate</td>
</tr>
<tr>
<td>Rima Tawk</td>
<td>COPPS</td>
<td>Assistant</td>
</tr>
<tr>
<td>Syreeta Tilghmann</td>
<td>COPPS</td>
<td>Associate</td>
</tr>
<tr>
<td>Mark Butler</td>
<td>CSSAH</td>
<td>Assistant</td>
</tr>
<tr>
<td>Kwasi Densu</td>
<td>CSSAH</td>
<td>Assistant</td>
</tr>
<tr>
<td>Scott Reinfield</td>
<td>CSSAH</td>
<td>Assistant</td>
</tr>
<tr>
<td>Larry Rivers</td>
<td>CSSAH</td>
<td>Professor (Tenure Upon Appointment)</td>
</tr>
<tr>
<td>Ramesh Katam</td>
<td>CST</td>
<td>Assistant</td>
</tr>
<tr>
<td>Richard Long</td>
<td>CST</td>
<td>Associate</td>
</tr>
<tr>
<td>LeeShawn Thomas</td>
<td>CST</td>
<td>Assistant</td>
</tr>
<tr>
<td>Olivier Chamel</td>
<td>SAET</td>
<td>Assistant</td>
</tr>
<tr>
<td>Mary Simmons</td>
<td>SAHS</td>
<td>Associate</td>
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<tr>
<td>Sarah Mbiza</td>
<td>SAHS</td>
<td>Assistant</td>
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</tbody>
</table>
Subject: Honorary Doctoral Degree (Posthumous) – LTC David E. Pollard, Sr.

Rationale: Other than the earned doctorate, the greatest recognition the University can award is the honorary degree. An honorary doctoral degree is granted for the purpose of honoring those who exemplify the ideas of the University through significant achievements and contributions to society. The awarding of honorary doctoral degrees by the University is an extension of its role as a unique institution in our society devoted to the discovery, transmission, and preservation of knowledge.

Summary: The late David E. Pollard, Sr., graduated from FAMU in 1963 with a Bachelor of Science degree in Chemistry. In addition, he was the Distinguished Military Graduate (top graduate) of the FAMU Army ROTC (Reserved Officers’ Training Corps) class. In 1964, he was inducted into the FAMU ROTC Hall of Fame. In 1975, he earned a Master of Arts degree in Education Administration from Michigan State University. A lifelong learner, LTC Pollard became a doctoral student at the age of 75 in the Education Leadership program at Nova Southeastern University.

LTC Pollard’s professional career had two distinct phases: active duty service in the Army for 24 years and service as a Senior Army Instructor in the U.S. Army JROTC (Junior Reserved Officers’ Training Corps) for 21 years. Within the educational arena, he had a “can do” spirit that evolved into his educational philosophy that all students can learn, learning should be fun; and students must participate in the learning process. He received several awards/accolades during his tenure as an instructor.

Attachments: Biography and Curriculum Vitae

Recommendation: It is recommended that the Florida A&M University Board of Trustees approve the honorary doctoral degree (Doctor of Humane Letters) for the late LTC David E. Pollard, Sr.
EXECUTIVE SUMMARY:

LTC (R) David E. Pollard, Sr. was the ninth of eleven children born to Dock and Rosetta Pollard on a farm in Ellenton Florida. Educated in the Manatee County Public School System, he graduated as Salutatorian from Lincoln Memorial High School in 1959.

He was the first member of his family to graduate from college. In June 1963, he graduated from FAMU with a BS in Chemistry. Concurrently, he graduated Number One in his FAMU Army ROTC Class and as a Distinguished Military Graduate. A year later, he was inducted into the FAMU ROTC Hall of Fame. In August 1975, he earned a MA in Education Administration from Michigan State University. A lifelong learner, he became a Doctoral student at 75 years of age within Nova Southeastern University’s Education Leadership program. He planned to use his PhD as a platform and example to motivate and encourage American youth to pursue educational excellence.

His professional career had two distinct phases: active duty service in the Army for 24 years and service as a Senior Army Instructor in the US Army JROTC Program for 21 years. A proud Veteran of the Vietnam War, his service in Vietnam from 1965-1966 with the First Cavalry Division (Airmobile) anchored his “can do” spirit undergirding his professional career.

Within the educational arena, this “can do” spirit evolved into his educational philosophy that all students can learn; learning should be fun; and students must participate in the learning process. His students thrived and significant accomplishments followed, including his JROTC Program’s feature in Fortune Magazine in February 1993; recipient of Miami-Dade County Proclamation for Outstanding Service in November 1999; and selection as Miami Northwestern Senior High School Teacher of the Year 2002 and subsequent selection as Region 3 Finalist Teacher of the Year 2002.

Success is intentional and isn’t accomplished in isolation. Determined to provide pathways of knowledge and support to successive generations, LTC(R) David E. Pollard began finalizing his autobiography in 2015 to share his wisdom keys for successful living. The same year, he founded a college scholarship fund for Miami-Dade public high school graduates in memory of his wife, Mary Mann Pollard, a fellow FAMU alumnus and Miami-Dade educator.

Prior to his passing, he chose to make a lasting demonstration of his gratitude and support for FAMU. FAMU was where he discovered his affinity for military service; experienced profound nurturing of his talent and character; and met and married the love of his life. FAMU true, his trust agreement directed creation of an endowment funding an annual scholarship for a deserving FAMU student.

FAMU proud, LTC (R) David E. Pollard’s life and legacy exemplify FAMU’s values of scholarship, excellence, and service.
EXECUTIVE SUMMARY:

- Consummate Leader and Educator, possessing expertise in leading self and organizations of all types in accomplishing goals under harshest of conditions
- Retired Army Lieutenant Colonel with expertise in medical logistics and medical materiel management and possession of 45 years of experience in leading and building inclusive, high-performing teams

PROFESSIONAL EXPERIENCE:

*Lifetime Learning Institute Member/Doctoral Student, Nova Southeastern University* (2015-Passing):
  - First student to pursue a Doctorate in education from Nova Southeastern University while being a member of its Lifetime Learning Institute
  - Completed 3 consecutive semesters of coursework while battling chronic medical conditions

*Philanthropist* (2015-Present):
  - Founded a college scholarship fund in 2015 for Miami-Dade public high school graduates in memory of his wife, Mary Mann Pollard, a fellow FAMU alumnus and Miami-Dade educator. To date, this college scholarship fund has supported 23 students of which 4 were FAMU students
  - His trust agreement directed creation of an endowment funding an annual scholarship for a deserving FAMU student, beginning one year after his passing

*Caretaker* (2008-2015)
  - Provided comprehensive care and advocacy of wife through most intense phases of cancer battle

  - Led and mentored thousands of high school students (from Miami Northwestern and Miami Killian Senior High Schools) in being quality citizens, modeling the principles of leadership, character development, and discipline

*Active Duty Military Officer* (1963-1987)
  - Led and mentored hundreds of Soldiers in providing comprehensive medical logistical support to diverse units in peace and combat environments; managed medical supply accounts and projects up to $200 million
  - Served in Vietnam in 1965-1966 with the First Cavalry Division (Airmobile)
EDUCATION & US ARMY PROFESSIONAL MILITARY TRAINING:

M.A., Education Administration, Michigan State University, 1975

B.S., Chemistry, Florida Agricultural and Mechanical University (FAMU), 1963

Numerous US Army advanced courses, including Medical Supply and Services, Patient Administration Course, Command and General Staff College, Industrial College of the Armed Forces, and Health Care Administration

DISTINCTIONS:

Distinguished Military Graduate

Honor College Graduate in Chemistry

Induction to FAMU ROTC Hall of Fame

Top graduate in ROTC class

Numerous awards, medals, and letters of commendation

Promoted to rank of Lieutenant Colonel

Certified professional in Healthcare Materiel Management

Feature of his Miami Northwestern Senior High School JROTC Program in the February 1993 edition of Fortune Magazine

Recipient of Miami-Dade County Proclamation for Outstanding Service in November 1999

Selection as Miami Northwestern Senior High School Teacher of the Year 2002 and subsequent selection as Region 3 Finalist Teacher of the Year 2002
Subject: Honorary Doctoral Degree – Dr. Shelia McClure

Rationale: Other than the earned doctorate, the greatest recognition the University can award is the honorary degree. An honorary doctoral degree is granted for the purpose of honoring those who exemplify the ideas of the University through significant achievements and contributions to society. The awarding of honorary doctoral degrees by the University is an extension of its role as a unique institution in our society devoted to the discovery, transmission, and preservation of knowledge.

Summary: Sheila A. McClure, Ph.D., is the senior associate dean for Research Development at the Morehouse School of Medicine, where she directs and facilitates collaborative research and knowledge transfer activities locally, regionally, and internationally. She is an award-winning, distinguished scientist who has made a national impact on cell biology and cancer research. Dr. McClure has been recognized for her commitment to promoting health among minority and underserved communities. She has been exemplary in serving as a role model for minority biomedical researchers across the country. Moreover, Dr. McClure’s expertise in grantsmanship has helped guide and direct the FAMU research faculty to secure prominent research grants (P20, R25, SC1, SC2 and others). The College of Pharmacy and Pharmaceutical Sciences has been honored of the working relationship to mentor and develop its dynamic research faculty over the past 25 years.

Dr. McClure received her bachelor’s degree in biology from Savannah State University and her doctorate in cellular and developmental zoology from the University of California – Berkeley.

Attachment: Bio and Curriculum Vitae

Recommendation: It is recommended that the Florida A&M University Board of Trustees approve the honorary doctoral degree (Doctor of Science) for Dr. Shelia A. McClure.
SUMMARY:

Sheila A. McClure, Ph.D., is the senior associate dean for Research Development at the Morehouse School of Medicine, where she directs and facilitates collaborative research and knowledge transfer activities locally, regionally, and internationally. She is an award-winning, distinguished scientist who has made a national impact on cell biology and cancer research.

McClure has been recognized for her commitment to promoting health among minority and underserved communities. She has been exemplary in serving as a role model for minority biomedical researchers across the country. Moreover, Dr. McClure’s expertise in grantsmanship has helped guide and direct the FAMU research faculty to secure prominent research grants (P20, R25, SC1, SC2 and others). The College of Pharmacy and Pharmaceutical Sciences has been honored of the working relationship to mentor and develop its dynamic research faculty over the past 25 years. The National Institutes of Health (NIH) has honored her numerous times for her work in several fields, including the 2017 research Centers in Minority Institutions’ Program Director’s Distinguished Achievement Award, the 2015 NIH Office of the Director’s Honor Award, and the 2015 Merit award for Leadership and mentorship in advancing Minority Health and Health Disparities research. McClure also served as a leader at the NIH in various capacities from 2001-2016, including serving as the chief of the Office of Research Training and Capacity Building at the National Institute on Minority Health and Health Disparities.

The Bush Foundation and the United Negro College Fund have also honored McClure for her work in faculty development and teaching excellence, respectively.

McClure received her bachelor’s degree in biology from Savannah State University and her doctorate in cellular and developmental zoology from the University of California – Berkeley.
Shelia A. McClure, Ph.D.
162 Castlebar Court
Mableton, GA 30126
770-941-6679 (home)
404-752-1055 (work)
770-712-8626 (cell)
sheliamcclure1@gmail.com

Education/Training:
Savannah State University, Savannah, GA
B.S. Biology

University of California, Berkeley, CA
Ph.D. Cellular and Developmental Zoology

Post-doctoral Research and Training:
Cell Biology, University of California, Berkeley, CA
Tumor Biology/Cancer Research, the Upjohn Company, Kalamazoo, MI

Other Specialized Training/Certifications:
Appropriations Law Certification
Certification in Conflict Resolution/Alternate Dispute Resolution
Senior Leadership Training, George Washington University, Washington, DC
Acquisitions and Project Officer Certification, National Institutes of Health
Congressional Operations Training, Georgetown University, Washington, DC
Department of Health and Human Services, Office of Disabilities Section 508 Training
Evaluating Health Communications Certification

Professional History:

March 2016-present Sr. Associate Dean for Research Development, Office of Sponsored Research Administration, Morehouse School of Medicine, Atlanta, GA

Roles and Responsibilities:
- Work in conjunction with the Vice President and Executive Dean for Research and Academic Administration to cultivate collaborative, extramurally funded research programs.
- Actively seek, identify and recognize external sources that present viable funding opportunities that align with institutional strategic goals, and expand the research portfolio of the institution.
- Provide technical support and guidance to faculty, students, post-docs and residents in the development of grants, contracts and agreements in support of research at the institution.
- Direct project planning and proposal development activities including grant writing assistance, editing services and research media.
Facilitate external collaborative research and knowledge transfer activities locally, regionally, nationally and internationally.

Assist in the development and implementation of institutional strategies, policies and procedures related to research development.

**July 2015-March 2016 - Chief, Office of Research Training and Capacity Building**
Division of Scientific Programs (DSP), National Institute on Minority Health and Health Disparities (NIMHD), National Institutes of Health (NIH)

2012-June 2015- Acting Chief, Office of Research Training and Capacity Building and Program Official, DSP, NIMHD, NIH

**Roles and Responsibilities:**

- Provided leadership and guidance in planning, developing, implementing and managing grants, cooperative agreements and contracts in the portfolio of the Office of Research Training and Capacity Building (ORTCB). This portfolio included: public health research programs that span a broad range of scientific topics across the translational continuum related to improving minority health and reducing health disparities; programs that build research infrastructure and capacity in academic institutions and in community settings; resource-related research program cooperative agreements; international and national research training programs; loan repayment contracts; career development awards; fellowships; and science education initiatives.

- Developed and managed the annual ORTCB budget of ~$100 million for extramural grants

- Supervised, mentored, coordinated and assessed the work of twelve professional staff (medical officers, program directors and program analysts) in the ORTCB, and administrative staff in the Division of Scientific Programs (DSP). These activities included but were not limited to: developing criteria and guidelines for monitoring and evaluating grants, contracts and cooperative agreements; providing timely and appropriate communications with extramural stakeholders through teleconferences, staff visits, list serves and webinars; and serving as principal author or reviewer of funding opportunity announcements and other communications relative to the DSP scientific portfolio.

- Managed a portfolio of grants and cooperative agreements including Research Centers in Minority Institutions (RCMI- G12, U54 and R25 mechanisms); Building Research Infrastructure and Capacity (BRIC- P20 mechanism); Centers of Excellence (COE- P20 mechanism); Resource-Related Research Project Cooperative Agreements (U24 mechanism); Community-based Participatory Research Grants (R24 mechanism); and Science Education awards (R25 mechanism). Also served as the Project Scientist for a Transdisciplinary Collaborative Center (TCC-U54 mechanism), U13 Conference grants, and RCMI
Infrastructure for Clinical and Translational Research (RCTR) and the RCMI Translational Research Network (RTRN) cooperative agreements.

- Advised the Division of Scientific Programs Director and NIMHD Director, recommending actions regarding the identification of scientific research program areas to develop new initiatives, staffing, staff performance management, portfolio assignments, policy development and implementation, strategic planning and budget priorities for the division.

- Developed technical reports and provided program information and scientific updates for the NIMHD Director, the NIH Office of the Director and the Office of the Secretary DHHS; prepared responses to congressional inquiries; and developed scientific and programmatic highlights for press releases, congressional justifications, fact sheets, report cards, briefing cards and other documents to communicate the return on investment and public health impact of NIMHD research programs.

- Collaborated with other NIH institutes and centers (ICs), other Federal agencies, and the private sector on big data, precision medicine and minority health and health disparities research and training initiatives.

Selected Accomplishments:
- Received the NIH Merit and NIH Collaboration and Teamwork Awards in 2015
- Received an NIH Office of the Director Honor Award in 2015 for the Program Leadership Committee’s Workforce Diversity Workshops.
- Received Performance Awards in 2014 and 2013 for activities related to:
  - establishing the first Office of Research Training and Capacity Building at NIMHD; expanding the training/career development portfolio to include fellowships, career development awards and institutional training grants;
  - organizing and chairing a panel on Obesity and Related Health Disparities at the Health Disparities Summit in Washington, DC convened by DHHS, the Department of Transportation, Department of Education and the Department of Housing and Urban Development;
  - developing management procedures in DSP and providing technical training/mentoring for program staff.
- Received the NIH Director’s Award in 2012 for leadership in the successful realignment and integration of programs and staff from NCRR to NIMHD.

2003-2011: Special Assistant to the Associate Director of Research Infrastructure, National Center for Research Resources (NCRR), National Institutes of Health and Program Director, Research Centers in Minority Institutions Program

Roles and Responsibilities:
- Formulated and operationalized national RCMI program goals and strategic plans; coordinated program activities; planned and coordinated program evaluations; and
developed and implemented the funding plan for the program budget of ~ $60 million per year. The 26 grants and cooperative agreements in the RCMI portfolio ranged from basic biomedical and behavioral research on minority health and health disparities, to community-based research, educational, health promotion and wellness projects. This portfolio included 15 graduate schools in 7 states and the District of Columbia; Schools of Pharmacy (Florida A&M University and Texas Southern University); a School of Veterinary Medicine (Tuskegee University); and Schools of Medicine (Meharry Medical College, Morehouse School of Medicine, Charles R. Drew University of Medicine and Science, the University of Hawaii, John A. Burns School of Medicine and the University of Puerto Rico, Medical Sciences Campus.

- Supervised professional staff comprised of medical officers, program officials and program analysts and managed a portfolio of grants and cooperative agreements.

- Served as project scientist for Clinical and Translational Science Awards (CTSA) at Emory University, Morehouse School of Medicine, and Georgia Tech; Vanderbilt University and Meharry Medical College; Weill Cornell and Hunter College; and UCLA and Charles R. Drew University.

- Principal advisor to the Director of the Division of Research Infrastructure (DRI) and Director of NCRR; collected, analyzed and implemented inputs from a variety of internal and external stakeholders to develop organizational plans and facilitate on-going strategic planning for DRI and NCRR; and served as the Acting Director of DRI on an ad hoc basis.

- Convened meetings of extramural stakeholders to provide technical assistance, and gather input on program planning; facilitated workshops that enabled collaborations between the RCMI program and other major Federal research programs including the Clinical and Translational Science Awards (CTSA), AHRQ’s Practice-based Research Networks and CDC’s Prevention Research Centers; facilitated relationships with Internet 2, Howard Hughes, Los Alamos National Lab and other entities to broaden collaborative opportunities for research.

- Reviewed research core consolidation, T1/T2 translational research, community engagement and workforce development grants and cooperative agreements submitted in response to the American Recovery and Re-investment Act (ARRA) solicitations.

- Monitored inclusion of women and minorities in clinical research protocols funded by NCRR grants, contracts and cooperative agreements; and authored the NCRR biennial report to the NIH Director on inclusion of women and minorities in clinical research.
• Developed technical reports and general information on the public health impact of the research programs for NIH, DHHS, the National Advisory Research Resources Council and the general public.

Selected Accomplishments:
• Received the NIH Director’s Award, the NIH Merit Award, and 9 Merit Performance Awards for work related to:
  o promotion, evaluation, re-organization and development of programs within NCRR that resulted in doubling of the RCMI budget;
  o establishing NCRR as a lead institute in the inclusion of women and minorities in NIH-supported clinical research;
  o contributions to the NIH Strategic Plan for HIV/AIDS Research;
  o developing trans-NIH initiatives related to clinical research education and career development with NEI, NIA, NIAMS, NIDDK, NHLBI, NICHD and NCI;
  o facilitating collaborations across NIH for research program development in reproductive health, neuroscience, stroke, diabetes management, HIV prevention using faith-based initiatives, cancer prevention and improving cardiovascular health;
  o securing co-funding from NCMHD, NIMH and NIAID averaging $3 million per year for NCRR initiatives;
  o facilitating collaborations with other federal agencies including HRSA, AHRQ, CMS and CDC.
• Selected for the NIH Leadership Class of 2006.
• Represented NIH at a Poster Session on Capitol Hill focused on prevention and health promotion through community partnered initiatives.

2001-2003: Program Official, Division of Research Infrastructure, National Center for Research Resources, National Institutes of Health

Roles and Responsibilities:
• Scientific manager of grant programs designed to assist institutions in developing an infrastructure to conduct biomedical and behavioral research and research training.

• Identified research areas of high programmatic interest; developed funding opportunity announcements; and provided technical advice and consultations to prospective grant applicants and grantees with respect to project conceptualization and project implementation.

• Monitored research progress of awarded grants and cooperative agreements; resolved issues related to the award process; served as a resource at scientific review group meetings.
• Provided input on program planning and division and center strategic planning; and developed sessions for National Advisory Council meetings.

Selected Accomplishments:
• Developed the NCRR Biennial Report on Inclusion of Women and Minorities in Clinical Research.
• Facilitated the first successful application for an RCMI International Symposium on Health Disparities.
• Assumed leadership of the Clinical Research Education and Career Development Awards co-funded by seven NIH Institutes and Centers.

1995 -2001: Program Director, Research Infrastructure in Minority Institutions Program (RIMI) Spelman College, Atlanta, GA

Roles and Responsibilities: Secured funding to develop institutional biomedical research infrastructure and enhance professional development of biomedical and behavioral research faculty.

Selected Accomplishments:
• Founding Director of the Center for Biomedical and Behavioral Research at Spelman College which included administrative offices, laboratory management services, grants management staff, and core laboratory facilities and technical staff;
• Developed and implemented the first strategic plan for research development;
• During the period 1996-2001, extramural biomedical research funding increased five-fold and Spelman College was the only undergraduate institution ranked in the top 5 institutions in the state of Georgia receiving extramural research funding from NIH.

1992-2001: Associate Professor, Department of Biology, Spelman College, Atlanta, GA

Roles and Responsibilities: Taught and developed course materials for General Biology-lecture, lab and recitation sections, Cell and Developmental Biology, Biology Senior Seminar, and independent study; secured funding for new course development; secured federal and non-federal funding for research, research infrastructure development, and research capacity building activities for students and faculty; supervised undergraduate research training; served on thesis committees of graduate students at Clark Atlanta University; and mentored early stage investigators.

Selected Accomplishments:
• Received a Bush Foundation Faculty Award for innovative pedagogy; served as co-PI on a grant from the Ford Foundation to develop a course on women’s health in collaboration with the Spelman College Women’s Center.
- Howard Hughes Foundation Award Team Member for biology curriculum development and Scholar-Teacher Post-doc Initiative.
- Received the Tenneco Teaching Award of Excellence from the United Negro College Fund for course modules developed at Spelman College in Biological Chemistry, Developmental Biology and Biomolecules.
- Secured funding from the Upjohn Company, NIH, and NSF to conduct research focused on tumor progression in two model systems: an established mammary adenocarcinoma cell line and a primary uterine leiomyoma cell line established in my laboratory.
- Trained fifty undergraduate research students, of which 95% obtained graduate or professional degrees in the biomedical sciences and the health professions, or work in biomedical fields.
- Established collaborations with researchers at Morehouse School of Medicine, Clark Atlanta University, Emory University, Massachusetts Institute of Technology, Georgia Institute of Technology, Harvard University, Brown University, New York University, the Centers for Disease Control and Prevention, the University of Alabama, Amgen and the Upjohn Company, and facilitated student and faculty research development and training at these and other major research universities and laboratories.
- Developed white papers and presentations instrumental to the Board of Trustee’s decision to construct a new science facility with dedicated research space, and helped to facilitate the first major corporate contribution for the $90 million Capital Campaign for Science Initiatives at Spelman College from the Upjohn Company, followed by multi-million dollar contributions from Amgen and Merck.
- Facilitated research and training efforts that led to support from foundations (Ford, Howard Hughes, Porter and Bush) and industry (Upjohn and Amgen) for endowed chairs, faculty development opportunities, recruitment of post-doctoral fellows and research opportunities for students.
- Secured funding to establish and/or equip research laboratories from several extramural sources including the National Institutes of Health, National Science Foundation, Howard Hughes Medical Institute, the Amoco Foundation, the National Aeronautics and Space Administration, and the Upjohn Company.
- Received the Spelman College Presidential award for Distinguished Service in 2000.

1992-1994 Program Director, Minority Biomedical Research Support (MBRS)

Roles and Responsibilities: Provided direction for the MBRS program which included principal investigators, associate investigators, undergraduate student researchers, technical support staff and two advisory committees. Managed the program budget; coordinated student recruitment and mentoring; coordinated program evaluation; coordinated seminars and established the William B. Leflore Lecture; organized the Summer Research Symposium; prepared program reports; and served as the program spokesperson to the funding agency.
1988-1989: Acting Chairperson, Department of Biology, Spelman College  
*Roles and Responsibilities:* Led the activities of the Biology Department. Specific responsibilities included faculty recruitment, faculty evaluation and recommendation for tenure and promotion; administration of departmental budget; review and implementation of the departmental curriculum; coordination of the departmental self-study and strategic plan; research proposal development for the department; development of position papers for science facility needs; and coordination of the day-to-day operations of the department.

1986-1987: Scientist, the Upjohn Company, Kalamazoo, MI  
*Roles and Responsibilities:* Researcher in the Cancer and Viral Diseases Unit of the company; performed research on locally recurrent mammary adenocarcinomas in a rat model and successfully identified a cell surface glycoprotein which correlated with the metastatic potential of mammary adenocarcinomas, that was used as a cancer drug target; prepared internal technical reports and presentations on research outcomes to unit Directors.

1985-1991: Assistant Professor, Department of Biology, Spelman College, Atlanta, GA  
*Roles and Responsibilities:* Developed and implemented plans for enhancing institutional biomedical research capacity; secured funding for research development activities for undergraduate students and faculty; and taught courses in General Biology, Cell and Developmental Biology and Independent Study.

1884-1985: Postdoctoral Fellow, University of California, Berkeley, CA  
*Responsibilities:* Developed, applied and modified techniques and procedures necessary for studies in molecular biology of skeletal muscle leading to cellular characteristics of dystrophic muscle; developed expertise in isolating, labeling in vitro and in vivo protein and RNA; RNA hybridization; in vitro radioisotope labeling, thin layer and cellulose chromatography; and Western, Southern and Northern blotting techniques.

1979-1984: Graduate Teaching Assistant, University of California, Berkeley, CA  
*Responsibilities:* Taught Cytology laboratory and Cell Biology discussion and lecture sections; lectured in the Regulation in Cells and Cell Systems course; and developed and taught a biology course for minority middle and high school students for the Equals Program at U. C. Berkeley in the Saturday Academy.

**Honors and Awards:**
- Research Centers in Minority Institutions’ Program Directors Distinguished Achievement Award, 2017
- NIH Office of the Director’s Honor Award, 2015
- NIH Merit Award for Leadership and Mentorship in Advancing Minority Health and Health Disparities Research, 2015
- NIMHD Teamwork and Collaboration Award, 2015
- NIMHD Merit Performance Awards, 2013 and 2014
- NIH Director’s Award, 2012
- NCRR Merit Performance Awards, 2003 through 2012
o NIH Merit Award, 2009
o NIH Director’s Award, 2009
o Featured in *Women at NIH* publication, 2007
o NIH Leadership Class, 2006
o Elected Diplomat, Georgia Academy of Sciences, 2001
o Spelman College Presidential Award for Distinguished Service, 2000
o UNCF Tenneco Teaching Award of Excellence, 1999-2000
o Bush Foundation Faculty Development Award
o National Association for Equal Opportunity in Higher Education, Distinguished Alumni Award
o Tri Beta Biology Honor Society
o Beta Kappa Chi Scientific Honor Society
o Alpha Epsilon Delta National Medical Honor Society
o University of California, Berkeley Graduate Honor Society
o University of California, Berkeley Equals Program Role Model Award

**Committees/Working Groups:**
- Atlanta University Center Research Development Working Group 2016-present
- NIMHD Science Visioning Steering Committee Member, 2015
- Trans NIH Workgroup on Decreasing Investigators Age for Reaching Research Independence, 2015
- Program Leadership Committee- Biomedical Workforce Group, 2013-2014
- NIH Workgroup on Tracking of Trainees, 2013
- NIH Inclusion Policy Working Group, 2011-2012
- NIH Complex Grant Mechanisms Working Group, 2011-2012
- NIH Population Tracking and Inclusion Committee, 2007-2011
- NCRR Cultural Change Leadership Team, 2006
- Trans-NIH Electronic Population Tracking User Group, 2005-2012
- Founding Member, NIH Special Populations Research Forum, 2003-present
- NIH Coordinating Committee for Research on Women’s Health, 2002-2011

**Selected Professional Activities:**
- Lecturer and Case Study Facilitator, NIMHD Health Disparities Course
- Session Moderator, Opportunities for Research in Centers Panel, Hispanic-serving Health Professions School’s Annual Professional Development Workshop, June 2015
- Scientific Planning Committee for the NIMHD Grantees Meeting and Symposium on Minority Health and Health Disparities, December 2014
- Scientific Planning Committee for the final RCMI International Symposium on Health Disparities, December 2012
- Session Organizer and Moderator, Obesity and Related Health Disparities Panel, NIMHD Health Disparities Summit 2012
- Advisory Committee Member, Minority Scholars Program, Academy Health, January 2010-present
Co-Chair, Abstract Review Committee for the NIH 3rd International Congress on Leiomyoma Research, June, 2010

External Reviewer, National Cancer Institute’s Community Networks Program, April 2009

Session Moderator, Developing Community Capacity for Conducting Health Disparities Research, the NIH Health Disparities Summit, December 2008

Session Moderator and Panelist, Office of Behavioral and Social Science Research Workshop on Behavioral and Social Sciences at NIH: Advancing the Science Together, November 2008

Planning Committee for the NIH Health Disparities Summit sponsored by the National Center on Minority Health and Health Disparities, 2006-2008

Member, Global HIV/AIDS Alliance Coordination Team June-December, 2006

Co-chair, Abstract Review Committee for the 2nd International Congress on Advances in Uterine Leiomyoma Research sponsored by the Office of Research on Women’s Health, NIH February 24-25, 2005


Advisory Member, Georgia Institute of Technology Bioengineering Research Initiative 1999-2001

Reviewer, NIGMS Minority Access to Research Careers Sub-Committee and NCRR RCMI Special Emphasis Panel, 1999-2001

Treasurer, Research Infrastructure in Minority Institutions (RIMI) Program Directors Organization 1997-2001

Chairperson, Biomedical Sciences Section, Georgia Academy of Sciences 1997-98

Advisory Committee Member, NASA Space Medicine and Life Sciences Training Program, Morehouse School of Medicine 1995-1997

Advisory Committee Member, Office of Research Careers, Morehouse College, 1995-97

Secretary, Georgia Academy of Sciences, Biomedical Sciences Section 1995-96

Steering Committee Member, National Institutes of Health, National Minority Biomedical Research Support Symposium, 1995

Test item Writer and Reviewer for the Biology Subject Test, Graduate Record Exam (GRE), 1991-1995

Peer Reviewer, Public Health Services Centers for Disease Control and Prevention, Shepard Science Awards, 1989-91

Professional Organizations:

- National Organization of Research Development Professionals
- American Association for the Advancement of Science
- American Society for Cell Biology (Women in Cell Biology and Minority Affairs Committees)
- Diplomat, Georgia Academy of Sciences
- Delta Sigma Theta Sorority, Inc.
**Publications:**


Welch, D.R., McClure, S.A., Aeed, P.A., Bahner, M.J., and Adams, L.D. *Tumor Progression-Associated and Metastasis-Associated Proteins Identified Using a Model of*


**Scientific Abstracts/Presentations:**


**Invited Lectures:**


Department of Surgery, Morehouse School of Medicine, Grand Rounds Speaker at Grady Memorial Hospital. Topic: Research Development: From Conception to Completion, January 2017.

Hispanic-serving Health Professions School’s Annual Professional Development Workshop, Speaker. Topic: Trends in Hispanic Heath Research and Reflections from Hispanic Research Centers, June 2015


Quality Education for Minorities Network-Professional Development Session Topic: Opportunities for Careers in Science and Technology, June 2014

National Institute on Drug Abuse, Clinical Trials Network Principal Investigators Meeting, Topic: Opportunities for Engaging Investigators in Research on Minority Health and Health Disparities, March 2014

Quality Education for Minorities Network-Professional Development Session Topic: NIH’s Role in Improving Health for All-Let’s Focus on Prevention and Health Promotion, June 2013

Hunter College-Department of Biological Sciences’ International Symposium, New York, NY, Topic: Autism: Integrating Genes, Brain and Behavior, January 2010

Spelman College, Atlanta, GA-Keynote Speaker for Science Day, Topic: Research Opportunities at the National Institutes of Health, April 2009

American Association for Cancer Research, Annual Conference, Atlanta, GA Topic: Cancer Health Disparities in Racial/Ethnic Minorities and the Medically Underserved, a Role for NCRR Programs, November 2007

Centers for Disease Control and Prevention (CDC)-Prevention Research Centers Program Town Hall Session, Atlanta, GA, Topic: NCRR’s Role in Building Capacity to Conduct Prevention Research, March 2007

City College, CUNY-Research Day Keynote Speaker, New York, NY, Topic: Research and Research Capacity Building Opportunities at NIH, January 2007

National Institute on Disability and Rehabilitation Research (NIDRR), Washington, DC Topic: Efforts and Approaches to Addressing Research Capacity Building in Minority and other Developing Institutions, July 2006
- Jackson State University - Keynote Speaker, International Symposium on Environmental Health, Jackson, MS, Topic: Research Centers to Address Environmental Health Disparities, September 2005


- University of Texas - Keynote Speaker, RCMI Symposium, San Antonio, TX, Topic: The RCMI Program, Building Capacity to Improve Health, April 2003

- Bowie State University - Division of Natural Sciences, Bowie, MD, Topic: Strengthening Infrastructure at Historically Black Colleges and Universities to Conduct Health Services Research, August, 2002

- Morgan State University - Department of Biology, Baltimore, MD, Topic: Type I Collagen Expression and Secretion in Human Uterine Leiomyoma Cell Lines, June 1999


- National Science Foundation - Quality Education for Minorities Workshop, Atlanta, GA, Topic: Research in Undergraduate Institutions, July 1998

- Morehouse School of Medicine - Department of Biochemistry, Atlanta, GA, Topic: The Role of the Extracellular Matrix in Tumor Cell Migration, 1994


- Emory University - Howard Hughes Medical Institute Lecture, Atlanta, GA, Topic: A Characterization of Primary Human Uterine Leiomyoma Cell Lines, 1992

- Savannah State University - Department of Biology, Savannah, GA. Topic: Extracellular Matrix Secretion in Cultured Uterine Leiomyoma Cell Lines, 1991

- The Upjohn Company - Cancer and Viral Diseases Director’s Presentation, Kalamazoo, MI, Topic: Metastasis Associated Proteins in Breast Cancer Cell Lines, November 1990

- Bethune- Cookman College - Department of Biology, Daytona Beach, FL, Topic: Tests for an Ionic Basis for the Regulation of the Heat Shock Response in Drosophila, October 1990
Hampton University-Department of Biology, Hampton, VA, Topic: Changes in Intracellular pH and the Regulation of Protein Synthesis in Drosophila, May 1989
Subject: MS Systems Engineering (CIP Code 14.2701)

Rationale: A Master of Science degree in Systems Engineering is being proposed by the FAMU-FSU College of Engineering, Department of Industrial and Manufacturing Engineering, in cooperation with the College of Applied Studies at the FSU-Panama City campus. Systems Engineering is an interdisciplinary field that focuses on how to design and manage complex engineering systems over their life cycles. The curriculum will emphasize autonomous (e.g., robotic, driverless), marine, and cybersecurity systems, each of which is of special importance to entities, such as the Department of Defense as well as a growing number of private industries engaged in research and development. To ensure that the curriculum meets the need and demand of industry personnel, program faculty have consulted with entities, such as the Naval Surface Warfare Center, who employs a large number of scientists and engineers that would benefit from this type of degree.

The original proposal for the proposed MS Systems Engineering degree was approved by the FAMU Board of Trustees at its March 7-8, 2018 meeting. Since then additional changes have been made to the proposal for your review and approval. The proposed program will continue to be offered face-to-face with courses available between the main campus in Tallahassee and also the Panama City campus via iTV. The current plan includes adding new faculty lines to several College of Engineering departments to support the program. However, the shifting in existing faculty efforts and reallocation of instructional resources can be largely accommodated and will have minimal impact to existing programs. Thus, resulting in the need for fewer faculty resources. Lastly, the Board’s approval to implement does not obligate the University to provide the resources requested; any resource request will be reviewed as part of the annual allocation of resources.

Attachment: FAMU MS Systems Engineering Proposal (revised)

Recommendation: It is recommended that the Florida A&M University Board of Trustees approve the revised MS Systems Engineering (CIP Code 14.2701) in the FAMU-FSU College of Engineering, effective Fall 2018.
Board of Governors, State University System of Florida

Request to Offer a New Degree Program

Florida Agricultural and Mechanical University and Florida State University

Universities Submitting Proposal

FAMU-FSU College of Engineering
Name of College(s) or School(s)

Systems Engineering
Academic Specialty or Field

14.2701
Proposed CIP Code

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

Date Approved by the University Board of Trustees

Signature of Chair, Board of Trustees

Provide headcount (HC) and full-time equivalent (FTE) student estimates of majors for Years 1 through 5. HC and FTE estimates should be identical to those in Table 1 in Appendix A. Indicate the program costs for the first and the fifth years of implementation as shown in the appropriate columns in Table 2 in Appendix A. Calculate an Educational and General (E&G) cost per FTE for Years 1 and 5 (Total E&G divided by FTE).

<table>
<thead>
<tr>
<th>Implementation Timeframe</th>
<th>Projected Enrollment (From Table 1)</th>
<th>Projected Program Costs (From Table 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HC</td>
<td>FTE</td>
</tr>
<tr>
<td>Year 1</td>
<td>10</td>
<td>7.50</td>
</tr>
<tr>
<td>Year 2</td>
<td>20</td>
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<td>24.38</td>
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<tr>
<td>Year 5</td>
<td>40</td>
<td>27.50</td>
</tr>
</tbody>
</table>
INTRODUCTION

I. Program Description and Relationship to System-Level Goals

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

The degree program under consideration is a Master of Science in Systems Engineering (MSSE). Systems engineering (SE) is an interdisciplinary field of engineering that focuses on how to design and manage complex engineering systems over their life cycles. The degree program has three areas of focus: autonomous systems, maritime systems, and cybersecurity systems. The Department of Industrial and Manufacturing Engineering of FAMU-FSU College of Engineering (COE) will be the home department of the program. Participating departments include Mechanical Engineering, Electrical and Computer Engineering of FAMU-FSU College of Engineering, and Department of Computer Science of Florida State University (FSU), and FSU Panama City campus (FSU-PC). The degree program and courses will be available to graduate students at both FAMU and FSU. The curriculum consists of thirty-three (33) credit hours. The purpose of the MSSE program is to provide an opportunity for students to pursue an advanced degree in an interdisciplinary area of broad relevance to the private sector and the Department of Defense (DoD) [1]. This new program will target skills required in the national workforce for growing areas of research and development in the technology-driven global economy, and in the DoD and its industrial base, to address capability gaps forecast in the engineering of systems related to Autonomy [2], Marine Systems [3], and Cyber Security [4]. The MSSE program is expected to facilitate innovation and economic development in the Florida panhandle area.

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

The pre-proposal was presented to CAVP on February 10, 2017. No concerns were noted. There was support from the entire group.

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

Not applicable, this is a master’s level program.

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

The proposed program directly and indirectly supports eight out the nine directional goals for the state universities defined in the SUS Strategic Planning Goals.

In the priority area of Teaching and Learning, the proposed program will directly support: 1) Increase degree productivity and program efficiency. The MSSE program will be offered to the naval base workforce in Panama City and other nearby Naval and Air Force bases, as well as the local workforce in the Florida Panhandle region. This increases access and degree completion for adult students and distance-learning students. The program will be offered through both FSU and FAMU – one of the largest historically black colleges and universities (HBCU) in the nation, and will increase access and degree completion for students from underrepresented groups. 2) Increase the number of degrees awarded in
STEM and other areas of strategic emphasis. The proposed degree program is a graduate-level engineering degree.

Systems engineering is a relatively new discipline with great growing potential. Currently within the SUS, only the University of Florida has an MSSE program with a focus on manufacturing systems and industrial engineering topics. Our proposed program has a different focus: systems engineering processes and aspects of research and technology development for systems at somewhat earlier stages of the life cycle. The UF program has a healthy enrollment with 162 students as of Fall 2016. Our MSSE program will have synergy with that offered by UF and facilitate enhancing Systems Engineering education in the State of Florida. This will indirectly support the goal of strengthening quality and reputation of academic programs and universities.

In the area of Scholarship, Research, Innovation, the FAMU-FSU College of Engineering has identified Systems engineering as one of the strategic directions for the college, and the Dean has committed to hiring one senior faculty at the Associate Professor level in Systems engineering, and one tenure-track/tenured faculty in Autonomous Systems to support and enhance this effort, in addition to the faculty lines supported by the Dean of FSU-Panama City. Through the new faculty hires and their working with the existing research capabilities at FAMU-FSU COE in Robotics and Industrial Engineering, the proposed program will directly support: 1) strengthening the quality and reputation of scholarship, research and innovation; and 2) fostering close working relationships with the naval base in the Panhandle region. Through existing contacts and other potential DoD contacts in the future, we expect to greatly increase collaboration and external support for research activity. Efforts and outcomes from 1) and 2) will both directly and indirectly support the goal of increased research and commercialization activities.

In the area of Community and Business Engagement, the proposed program will directly support: 1) Strengthen the quality and recognition of commitment to community and business engagement; and 2) Increase the community and business workforce. The program will work closely with the Naval Surface Warfare Center (NSWC) in Panama City, which will initially be the main source of students in year one. Beginning in year two, we anticipate that growth will increase continuously in the Panama City service area as a result of the partnership with the NSWC. Additionally, by year two and through year five, we expect growth in enrollment due to enhanced marketing efforts within the FAMU-FSU College of Engineering.

If successful, the program may be expanded to offer educational opportunities to personnel at nearby Air Force bases, other Naval bases, and even the entire DoD. This will greatly improve our recognized commitment to the military community. Offering this degree program to the local workforce, as planned, would enhance our commitment to the Panhandle community. The program has a heavy focus on providing educational opportunities to the Panhandle local workforce, who will be gainfully employed after graduation in the region to contribute to the economic growth in the Panhandle area.

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

The Programs of Strategic Emphasis Categories:
1. Critical Workforce:
   - Education
   - Health
   - Gap Analysis
2. Economic Development:
   - Global Competitiveness
3. Science, Technology, Engineering, and Math (STEM)

Systems Engineering is an interdisciplinary field of engineering that focuses on how to design and manage complex engineering systems over their life cycles. The proposed program, Master of Science in Systems Engineering, belongs to the category Science, Technology, Engineering, and Math (STEM) within
the Programs of Strategic Emphasis as described in the SUS Strategic Plan.

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.

There are two educational sites for the proposed program. The Department of Industrial and Manufacturing Engineering of the FAMU-FSU College of Engineering at Tallahassee will be the home department of the proposed program, and the FSU Panama City campus will be a major partner of the program. The program will be implemented in stages. In the first stage, all courses will be offered as live classroom instruction with synchronized online delivery to remote students at the other site. Both Panama City and Tallahassee classrooms are equipped with appropriate audio/visual capability to deliver the course in class and through iTV. In the second stage, certificate programs will be developed based on completion of specifically-designed course modules.

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.

Systems Engineering (SE) studies systems, processes, and practices required to develop them. The International Council on Systems Engineering (INCOSE) defines systems engineering as an interdisciplinary approach and means to enable the realization of successful systems [5]. SE principles and practices are essential for the development of large, complex, and/or trustworthy systems. SE facilitates deep integration of technical systems and helps ensure the systems developed are coherent, effective, and sustainable solutions to fulfill the system needs.

Systems Engineering education has grown since the 1960s. Still SE is a relatively young engineering discipline that has become increasingly important in modern world. There are 31 master’s programs and 14 Ph.D. programs in SE in the US [6]. US government agencies, in particular Department of Defense (DoD), have been a major force in pushing forward SE education and research. For example, to address the national needs for SE research, DoD funded a large-scale University Affiliated Research Center (UARC) in Systems Engineering. The center includes 22 higher education institutions. It should be noted that none of the affiliated institutions are in the State of Florida.

Nationally, SE graduates are in high demand and command a high average salary. References [7-9] list the average salary for systems engineers respectively at $85,000, $86,220, and just under $90,000. According to [10], “In 2009, it was rated No. 1 out of the Top 50 careers in terms of salary and growth prospects over the next 10 years by CNNMoney.com and Payscale.com.” Furthermore, [10] states: “Here is what CNNMoney.com wrote as to why this career ranks so highly: Demand is soaring for systems engineers, as what was once a niche job in the aerospace and defense industries becomes commonplace among a diverse and expanding universe of employers, from medical device makers to corporations like Xerox and BMW.”

Considering the bright career prospects of the potential SE graduates and the scarce SE educational and research opportunities in the State of Florida, there is a great need for the State of Florida to expand the educational and research opportunities in SE.

Furthermore, there is an immediate and consistent need for SE education opportunities in the Florida Panhandle region, where there is a presence of Department of Defense laboratories and rapidly growing private industries engaged in research and development. Most notably, the Naval Surface Warfare Center (NSWC) is within five miles of the FSU Panama City campus, and has a workforce of over 1400 employees, of which over 950 are scientists and engineers. The program would be highly applicable to
the advanced work in NSWC’s mission areas and other Naval R&D establishments at a national level, as well as other DoD bases within the local area, such as Tyndall Air Force Base (AFB) and Eglin AFB. Administrators at both NSWC and FSU-PC have asked for the establishment of the proposed MSSE program in order to fulfill the need.

The resulting interaction between faculty, students, and management of these multiple organizations will provide opportunities for technical exchanges and research collaboration. The program will also serve as a recruiting pipeline to these organizations.

**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.

As stated in [10], “Systems engineers are in high demand by industry and government.” Since “Systems engineers are essential for the technical management, development, and acquisition of complex technology systems [10] and modern-day engineering systems are becoming increasingly complex, the demand for this field should only grow.”

Demand for the proposed MSSE program is high and immediate. The administrators at both NSWC and FSU-PC have promised substantial student demand. Student enrollments are expected to include 1) existing employees (sponsored by NSWC and eventually other Naval R&D establishments, and Tyndall and Eglin AFB) seeking to enhance core technical capabilities, 2) existing employees sponsored by the rapidly growing local private industries seeking to enhance core technical capabilities, and 3) talented Science, Technology, Engineering, and Math (STEM) students in the local community and in the FAMU-FSU College of Engineering.

We project 10 students (7.5 FTE) in Year 1, increasing to 40 students (27.50 FTE) in Year 5. These conservative numbers are based on extensive discussions between the FAMU-FSU College of Engineering and the NSWC in Panama City regarding their estimated needs for enrollment of Naval personnel. We expect to achieve higher enrollment with other target student groups after the program is implemented. The MSSE also will offer an attractive option for our regular pool of graduate applicants by offering them a choice of a degree that is in high demand and highly practical.

**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.**

The University of Florida (UF) offers a master’s program under CIP Code 14.2701 in Industrial and Systems Engineering, with emphases on manufacturing systems and industrial engineering topics. The proposed program is vastly different since the focus will be on the systems engineering processes and aspects of research and technology development for systems at somewhat earlier stages of the life cycle. We have had discussions with their program personnel at UF, and it was determined that the proposed program would not adversely impact their enrollment. On the contrary, the different yet complementary program emphases of the two degree programs will facilitate collaboration in research and instruction between the two programs. This will help promote SE education in the State of Florida, promote collaboration and synergy between the two programs, and encourage the pursuit of more education and research opportunities. This collaboration and synergy may result in the establishment of a Systems Engineering Research Center (SERC) in the State of Florida.

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

The projected student head count (HC), Full Time Equivalent (FTE), and HC/FTE ratio are shown in the following Table. The projected annual enrollments are based on extensive discussions between the FAMU-FSU College of Engineering and personnel at NSWC and their estimated needs for enrollment of Naval personnel.

<table>
<thead>
<tr>
<th>Year</th>
<th>HC</th>
<th>FTE</th>
<th>HC/FTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>7.50</td>
<td>1.33</td>
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<td>2</td>
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<td>24.38</td>
<td>1.44</td>
</tr>
<tr>
<td>5</td>
<td>40</td>
<td>27.50</td>
<td>1.45</td>
</tr>
</tbody>
</table>

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 FSU, 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.

The degree, with its home at the FAMU-FSU College of Engineering, will be offered at both FSU and FAMU, representing an excellent opportunity for a diverse student body, particularly in terms of underrepresented minority students. We plan to encourage students not only from within FAMU-FSU College of Engineering, but also from both universities to apply for this semi-professional MS degree to further our diversity effort.

III. Budget

A. Use Table 2 in Appendix A to display projected costs and associated funding sources for Year 1 and Year 5 of program operation. Use Table 3 in Appendix A to show how existing Education & General funds will be shifted to support the new program in Year 1. In narrative form, summarize the contents of both tables, identifying the source of both current and new resources to be devoted to the proposed program. (Data for Year 1 and Year 5 reflect snapshots in time rather than cumulative costs.)

Table 2 shows the projected costs and associated funding sources for Year 1 and Year 5 of the MSSE program operation. In year 1, $234,000 E&G funds will be needed for 7.5 annual student FTE, resulting an average E&G cost per FTE of $31,200. The primary costs are for faculty salary and benefits in the amount of $170,000. In addition, $24,000 is budgeted for a teaching assistant, and $20,000 is budgeted for half of an A & P personnel to help administer the program. Another $20,000 is budgeted to cover costs for essential items and activities to manage and ensure the quality of the program, such as travel, meetings and office supplies etc. As enrollment grows, the per-FTE cost will decrease. By year 5, the program will have 27.50 annual student FTE. The average E&G cost per FTE will be $15,127 and total E&G funding requirement of $416,000. The cost breakdown is the following: faculty salary and benefits $290,000, A&P personnel salary and benefits $25,000, Teaching assistant funds $71,000, and administrative expenses $30,000.
B. Please explain whether the university intends to operate the program through continuing education, seek approval for market tuition rate, or establish a differentiated graduate-level tuition. Provide a rationale for doing so and a timeline for seeking Board of Governors’ approval, if appropriate. Please include the expected rate of tuition that the university plans to charge for this program and use this amount when calculating cost entries in Table 2.

Not applicable.

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

Overall five new hires committed by the Deans of FAMU-FSU COE and FSU-PC (three tenure-track and/or tenured faculty and two teaching faculty) will be involved in the teaching of the courses for the proposed program. The shifting in existing faculty efforts and reallocation of instructional resources can be largely accommodated and will have minimal impact to existing programs.

On the other hand, there are many positive impacts from the proposed programs: 1) It will provide a greatly needed educational opportunity that is in great demand but currently lacking in the State of Florida. 2) It will help significantly increase the MS degree production in an important science and engineering discipline of which the demand is projected to grow rapidly. 3) It will help enhance the excellent existing research program e.g., Robotics, Advanced Materials and Manufacturing, Power Systems etc. at the FAMU-FSU COE and improve our national ranking. 4) It will foster collaboration with the Navy and other service branches of DoD, enhancing our recognition and increasing opportunities in future research and education with DoD. 5) It will help enhance the educational capabilities at the FSU Panama City campus. 6) The bright career prospects of SE will help attract existing undergraduate students at the FAMU-FSU COE to the MSSE program, further increasing graduate enrollment. Furthermore, it will also help recruit undergraduate students into the FAMU-FSU COE and the IME department, and help increase undergraduate enrollment. 7) It will help train the local area workforce in the Panhandle region and facilitate the economic development and growth in the rapidly growing region. 8) It will enhance educational opportunities to underrepresented minorities by offering the program through both FAMU and FSU.

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).

There is no other anticipated potential impact of the proposed degree program on related programs and departments.

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 proposed degree program is being developed by closely working with NSWC. Among other work, NSWC has been actively seeking funding opportunities within the Navy to enhance this program development effort. We are currently in active discussions with them on a Corporative Development proposal seeking a three year, ~$1 million funding commitment from the Navy to help the degree
IV. Projected Benefit of the Program to the University, Local Community, and State

Use information from Tables 1 and 2 in Appendix A, and the supporting narrative for “Need and Demand” to prepare a concise statement that describes the projected benefit to the university, local community, and the state if the program is implemented. The projected benefits can be both quantitative and qualitative in nature, but there needs to be a clear distinction made between the two in the narrative.

The proposed Master of Science in Systems Engineering (MSSE), if implemented, would generate many benefits to the university, local community and the State of Florida. The MSSE aligns well with the SUS strategic Planning Goals and mission of FAMU-FSU College of Engineering. The program will help boost the graduate enrollment and degree production in a rapidly growing engineering discipline with high earning capabilities and career growth potential. Offered through both FSU and FAMU, it will provide an excellent opportunity for underrepresented minorities. It will provide an excellent learning opportunity for local workforce training for advanced knowledge based work in Panama City and Tallahassee, facilitating the economic growth in the Panhandle region. It will facilitate the constructive collaboration with US Navy and other armed services branches in educational, training and research opportunities in the near term, and such opportunity will expand to other industries in the future. The proposed MSSE program will also play a vital role in increasing the national presence and visibility of the State of Florida in this promising engineering field and attracting educational and research opportunities to the state.

V. Access and Articulation – Bachelor’s Degrees Only (NOT APPLICABLE to the proposed program)

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

Not applicable.

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

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

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

Not applicable.

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

Not applicable.

INSTITUTIONAL READINESS

VI. Related Institutional Mission and Strength

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

The proposed degree program of MS in Systems Engineering will produce well-trained graduate students in a new discipline that is in high demand and well-paid. Working with the Naval base in the Panhandle region and FSU-PC campus, the program will also help train the local military and civilian workforce, and help grow FSU-PC campus’ capabilities and education portfolio. It will also spearhead collaboration with the Navy, and eventually other service branches both in and out of the State of Florida in educational and research opportunities. The degree will be offered through both FAMU and FSU, which will facilitate attracting students from diverse backgrounds, particularly those in under-represented minority groups. All of these factors align very well with the SUS institutional mission “to provide undergraduate, graduate and professional education, research, and public service of the highest quality through a coordinated system of institutions of higher learning, each with its own mission and collectively dedicated to serving the needs of a diverse state and global society” and to continue to “Support students’ development of the knowledge, skills, and aptitudes needed for success in the global society and marketplace; Transform and revitalize Florida’s economy and society through research, creativity, discovery, and innovation; Mobilize resources to address the significant challenges and opportunities facing Florida’s citizens, communities, regions, the state, and beyond; and Deliver knowledge to advance the health, welfare, cultural enrichment, and economy through community and business engagement and service.” The proposed degree program also aligns well with the mission of FAMU-FSU College of Engineering: “to provide an innovative academic program of excellence at both the undergraduate and graduate levels, judged by the highest standards in the field and recognized by national peers; to attract and graduate a greater number of minorities and women in professional engineering, engineering teaching and research; and to attain national and international recognition of the College through the educational and research achievements and the professional service of its faculty and students.”

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 degree program in systems engineering will have a synergistic effect with existing strengths and capabilities at the FAMU-FSU College of Engineering. Systems engineering is one of the areas of high priority identified during the college’s strategic planning initiative. One of the degree’s focus area is Autonomous Systems, which will benefit from the excellent existing faculty and research
capabilities at FAMU-FSU Center for Intelligent Systems, Control, and Robotics (CISCOR). On the other hand, the establishment of the MSSE will strengthen CISCOR graduate program in Robotics. Another focus area of the MSSE is Cybersecurity Systems. This aligns well with the recent COE strategic planning initiative, which lists cybersecurity as one of the areas of strategic importance. The program will benefit from the excellent existing faculty and research capabilities at IME Department, Electrical and Computer Engineering Department, and Center for Advanced Power Systems (CAPS), while the MSSE will help strengthen these departments and centers.

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 initial discussion of the program started in 2015 when NSWC personnel approached FSU-PC to explore the possibility of establishing the MSSE program. Discussions continued into 2016 when the Mechanical Engineering faculty at the College of Engineering (COE) were contacted and involved in the discussions. In early 2017, it was determined that the IME department would lead the development of the proposed degree while working closely with the Mechanical Engineering Department, Electrical and Computer Engineering Department of FAMU-FSU COE, and FSU Computer Science. The proposal to explore/feasibility study was developed in February 2017. It was approved by FSU GPC in March 2017, and by FAMU UPARC in May 2017. A one-day meeting with NSWC personnel was held at NSWC Panama City, after which development of this proposal started. The proposal was submitted to COE curriculum committee in September. The committee provided many comments and suggestions. The proposal was revised to include the suggestions and address the concerns and questions from the committee. The proposal was discussed a second time at COE curriculum committee meeting in October, and another set of questions and suggestions were provided by the committee. The proposal was subsequently revised again, after which the COE curriculum committee approved the proposal in early November 2017. Following is the timeline of planning process.
<table>
<thead>
<tr>
<th>Date</th>
<th>Participants</th>
<th>Planning Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>Theresa Shirley, FSU-PC personnel</td>
<td>Initial exploration</td>
</tr>
<tr>
<td>2016</td>
<td>NSWC: Dr. Theresa Shirey, COE: Dean Gibson, Dr. Emmanuel Collins</td>
<td>Feasibility discussion</td>
</tr>
<tr>
<td></td>
<td>FSU-PC: Dean Hanna, FSU: Associate VP Buchanan</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FAMU: Dr. Sundra Kincey</td>
<td></td>
</tr>
<tr>
<td>February 2017</td>
<td>NSWC: Dr. Shirey, COE: Dean Gibson, Dean Perry, Drs. Emmanuel Collins</td>
<td>Approval of CAVP Pre-proposal</td>
</tr>
<tr>
<td></td>
<td>FSU-PC: Dean Hanna, Arda Vanli, Changchun (Chad) Zeng, FSU: Associate VP</td>
<td>Development of Proposal to Explore</td>
</tr>
<tr>
<td></td>
<td>Buchanan</td>
<td></td>
</tr>
<tr>
<td>March 2017</td>
<td>COE: Dean Gibson, Dean Perry, Drs. Zeng, Okoli, FSU-PC: Dean Hanna, FSU:</td>
<td>Approval of Proposal to Explore, (feasibility study) by FSU Graduate Policy Committee (GPC)</td>
</tr>
<tr>
<td></td>
<td>Associate VP Buchanan</td>
<td></td>
</tr>
<tr>
<td>May 2017</td>
<td>COE: Dean Gibson, Dean Perry, Drs. Zeng, Okoli, FSU-PC: Dean Hanna, FAMU:</td>
<td>Approval of Proposal to Explore, (feasibility study) by FAMU UPARC</td>
</tr>
<tr>
<td></td>
<td>Interim Provost Wright, Dr. Sundra Kincey</td>
<td></td>
</tr>
<tr>
<td>June 2017</td>
<td>FSU Board of Trustees</td>
<td>Approval of Proposal to Explore by FSU BOT</td>
</tr>
<tr>
<td>June 2017</td>
<td>NSWC: Drs. Shirey, Matt Bays, Jeff Rish, Mrs. Jose Velez, Lanshava Booker,</td>
<td>Planning of the full degree proposal</td>
</tr>
<tr>
<td></td>
<td>Garrett Leavitt, Darryl Updegrove, Ms. Lori Zipes, COE: Dean Perry, Drs.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Zeng, Okoli, FSU: Ruth Feiock, Associate VP Buchanan, Dr. Zeng</td>
<td></td>
</tr>
<tr>
<td>September and</td>
<td>IME: Drs. Zeng, Vanli, Samuel Awoniyi, Richard Liang, Chiwoo Park, Mei Zhang,</td>
<td>Multiple IME department curriculum committee meetings</td>
</tr>
<tr>
<td>October 2017</td>
<td>Mr. John Taylor</td>
<td></td>
</tr>
<tr>
<td>September and</td>
<td>COE: Dean Perry, Drs. Zeng, Awoniyi, Michelle Rambo-Rodenberry, Mark</td>
<td>Multiple COE curriculum committee meetings</td>
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<tr>
<td>October 2017</td>
<td>Weatherspoon, Patrick Hollis, John Telotte</td>
<td></td>
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<tr>
<td>October 2017</td>
<td>Drs. Zeng, Vanli, Samuel Awoniyi</td>
<td>Revision of the full degree proposal</td>
</tr>
<tr>
<td>November 2017</td>
<td>Drs. Zeng, Vanli, Awoniyi, Okoli, Mei Zhang, Mr. John Taylor</td>
<td>Approval of IME curriculum committee</td>
</tr>
<tr>
<td>November 2017</td>
<td>COE: Dean Perry, Drs. Zeng, Awoniyi, Michelle Rambo-Rodenberry, Mark</td>
<td>Approval of COE curriculum committee</td>
</tr>
<tr>
<td></td>
<td>Weatherspoon, Patrick Hollis, John Telotte</td>
<td></td>
</tr>
<tr>
<td>November 2017</td>
<td></td>
<td>Approval by FSU GPC</td>
</tr>
</tbody>
</table>
VII. Program Quality Indicators - Reviews and Accreditation (NOT APPLICABLE)

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.

Not applicable.

VIII. Curriculum

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

The program and student learning outcomes are below.

Program Outcomes

Program Goal – Increase awareness for and enrollment in the degree program through targeted recruitment initiatives.

Objective – Grow enrollment to a minimum of 20 students by the end of year 2.

Student Learning Outcome #1

Upon completion of the degree program, students will demonstrate the ability to investigate how technical systems operate.

Assessment and evaluation process: This will be assessed by the faculty’s assessment of the artifacts produced by the students in two courses “Applying Systems Engineering” and “System Modeling and Simulation”. The goal is for at least 70% of the students to achieve 70% or higher on a rubric designed to measure the knowledge of technical systems.

Student Learning Outcome #2

Upon completion of the degree program, students will demonstrate the ability to design, develop and implement systems solutions.

Assessment and evaluation process: This will be assessed by the faculty’s assessment of the artifacts
produced by the students in the course “Fundamentals of Systems Engineering,” and the assessment of the capstone project reports from the capstone project course. The goal is for at least 70% of the students to achieve 70% or higher on a rubric designed to measure this capability from “Fundamentals of Systems Engineering,” and at least 70% of the students’ capstone project reports will meet the standard to be published on the IME department website as “Industrial and Manufacturing Engineering Department Systems Engineering Technical Report.”

**Student Learning Outcome #3**

Upon completion of the degree program, students will demonstrate the ability to effectively collaborate as a member of an interdisciplinary team.

**Assessment and evaluation process:** This will be assessed by the faculty’s assessment of the artifacts produced by the students in two courses “System Modeling and Simulation” and the capstone project course. Students will be peer evaluated using a survey to gauge the students’ performance in team assignments. The goal is for at least 70% of the students to achieve 70% or higher from both peer evaluations.

**Student Learning Outcome #4**

Upon completion of the degree program, students will demonstrate the knowledge of professional ethics.

**Assessment and evaluation process:** This will be assessed by the faculty’s assessment of the artifacts produced by the students in the course “Engineering Economics and Cost Estimation” and the capstone project course. The goal is for at least 70% of the students to achieve 70% or higher on a rubric designed to measure the knowledge of professional ethics.

**Student Learning Outcome #5**

Upon completion of the degree program, students will be able to apply professional ethics in decision-making and systems engineering practices.

**Assessment and evaluation process:** This will be assessed by the faculty’s assessment of the artifacts produced by the students in the course “Engineering Economics and Cost Estimation” and the capstone project course. The goal is for at least 70% of the students to achieve 70% or higher on a rubric designed to measure the incorporation of professional ethics consideration in making decisions in systems engineering practice.

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

The admissions requirements for the Master of Science in Systems Engineering (MSSE) degree program are:

- **Either**
  - A bachelor’s degree in engineering, computer science, mathematics, physics, or a related area as determined by the Director of Graduate Studies, with a minimum 3.0 (on a 4.0 scale) grade point average (GPA) in all coursework attempted while registered as an upper-division undergraduate student working towards a bachelor's degree; or
  - A graduate degree in engineering, computer science, mathematics, physics, or a related area as determined by the Director of Graduate Studies;

- **And**
  - Good academic standing in the last institution attended;
  - A minimum graduate record examination (GRE) score of at least 151 in the Quantitative section and at least 146 Verbal Reasoning section;
  - For international applicants, TOEFL score at least 80 or IELTS score at least 6.5;
  - Three letters of recommendation obtained from academics or professionals who can comment on the academic and research potential of the applicant;
Statement of purpose describing reasons for pursuing a Master of Science degree and a career in Industrial and Manufacturing Engineering.

The graduation requirements are:
- Complete all core courses, required courses, and elective courses for their focus area;
- Maintain an overall GPA above 3.0;
- Receive a grade of “B” or above for the capstone project course.

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

The proposed degree program is a course-based Master of Science degree and will not require a thesis. Instead, students will complete a culminating capstone project prior to completing the degree. The entire curriculum is thirty-three (33) credit hours. The curriculum has four Systems Engineering 3-hour Core Courses, three 3-hour industry/government sponsor Required Courses, and three 3-hour technical elective courses in the areas of focus. In addition, there is a one semester, 3-hour Capstone Project course, which requires group work.

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

Students need to complete four core courses: 1) Fundamentals of Systems Engineering; 2) Engineering Economics; 3) Model-based Systems Engineering & Simulation, and one of the following two courses: Applied Optimization, or Application of Systems Engineering. The industry/government sponsor required courses are necessary because SE deals with systems across all industries and government sectors with vastly different characteristics and, therefore, have their unique needs. These courses will be identified and developed from discussions with the specific industry/government sponsor. The three technical elective courses in the area of focus for an industry/government sponsor will also be identified and developed based on the need and feedback from the sponsor.

Following this curriculum framework, we will offer an MSSE degree program with coherent curriculum yet with sufficient flexibility to accommodate the vastly different requirement from potential sponsors’ need. The first offer will be launched to meet the needs from the Navy. They have needs to train their personnel for three areas of focus: Autonomous Systems (ATS), Cybersecurity Systems (CYS) and Maritime Systems (MAS). Each area of focus has its own set of elective courses. The envisioned course sequence is shown in the table below.
<table>
<thead>
<tr>
<th>FALL</th>
<th>SPRING</th>
<th>SUMMER</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Core and Required Courses</strong></td>
<td><strong>Core and Required Courses</strong></td>
<td><strong>Core and Required Courses</strong></td>
</tr>
<tr>
<td>Engineering</td>
<td></td>
<td>R3: Engineering Risk Analysis</td>
</tr>
<tr>
<td>C2: Engineering Economics &amp;</td>
<td>R1: System Test &amp; Evaluation</td>
<td></td>
</tr>
<tr>
<td>Cost Estimation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C4: Model-Based Systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engineering &amp; Simulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cyber Security Courses</strong></td>
<td><strong>Cyber Security Courses</strong></td>
<td></td>
</tr>
<tr>
<td>CYS1: Cyber Security 1</td>
<td>CYS2: Cyber Security 2</td>
<td></td>
</tr>
<tr>
<td><strong>Autonomous Systems Courses</strong></td>
<td>CYS3: Cyber Security 3</td>
<td></td>
</tr>
<tr>
<td>ATS1: Autonomous Systems 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Maritime Systems Courses</strong></td>
<td><strong>Maritime Systems Courses</strong></td>
<td></td>
</tr>
<tr>
<td>MAS1: Maritime Systems 1</td>
<td>MAS2: Maritime Systems 2</td>
<td></td>
</tr>
<tr>
<td><strong>Capstone Project Course</strong></td>
<td>MAS3: Maritime Systems 3</td>
<td></td>
</tr>
</tbody>
</table>

* Capstone project course is a one semester course and can be taken in any semester when the prerequisites are satisfied.

The courses will be taught by instructors from FAMU-FSU COE, FSU-PC, and FSU Department of Computer Science (CSI-1), and NSWC (NAVI-1). Two teaching faculty with IME as the home department and located at FSU-PC (IMEPCI-1 and -2) will teach the four core courses and three sponsor required courses. The two ME instructors (MEI-1 teaching faculty, MEI-2 tenure track faculty) will teach three elective courses in the area of emphasis on Autonomous Systems (ATS1 - ATS3). The ECE and Computer Science (ECEI-1 tenure track faculty and CSI-1 adjunct) instructors will teach the three elective courses in the area of emphasis on Cyber Security Systems (CYS1 - CYS3). The NSWC adjunct instructor (NAVI-1) will teach the three elective courses in the area of emphasis on Maritime Systems (MAS1 – MAS3). A detailed three-year implementation plan and the instructors’ teaching load are shown in the following two tables. The program will repeat itself after year two. The program will utilize existing faculty, as well as newly hired faculty, to teach the courses and also conduct other teaching and research duties within the college. At any semester, an instructor will teach no more than one course except for the two IMEPCI teaching faculty, who will teach two courses during some semesters.

Concurrent with meeting the Navy’s specific needs, we are currently also working to engage the interest from a variety of industries on the MSSE program. We expect to launch another offering to a different sponsor 18-24 months after the rollout of the Navy requested program.
## Detailed Three Year Implementation Plan

### Year 1

<table>
<thead>
<tr>
<th>Fall 2018 (Cohort 1) - Year 1</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>Faculty</td>
<td>9</td>
</tr>
<tr>
<td>Spring 2019</td>
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</tr>
<tr>
<td>Faculty</td>
<td>9</td>
</tr>
<tr>
<td>Summer 2019</td>
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<tr>
<td>Faculty</td>
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</tr>
<tr>
<td>Year total</td>
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<tr>
<td>C1 - Fundamental of SE</td>
<td>IMEPCI-1</td>
</tr>
<tr>
<td>C2 - Engineering Econ</td>
<td>IMEPCI-2</td>
</tr>
<tr>
<td>R2 - Speciality Eng</td>
<td>IMEPCI-2</td>
</tr>
<tr>
<td>R3 - Engin Risk Anal</td>
<td>IMEPCI-1</td>
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<tr>
<td>Total credit hours offered</td>
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</tr>
<tr>
<td>6</td>
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<tr>
<td>Total credit hours taken</td>
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<tr>
<td>6</td>
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### Year 2

<table>
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<th>Fall 2019 (Cohort 1) - Year 2</th>
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<tr>
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<td>Faculty</td>
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<td>Summer 2020</td>
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<td>Faculty</td>
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<tr>
<td>C4 - SE modeling &amp; Simulation</td>
<td>IMEPCI-2</td>
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<tr>
<td>ATS-2</td>
<td>MEI-1</td>
</tr>
<tr>
<td>CYS-1</td>
<td>CSI-1</td>
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<tr>
<td>MAS-1</td>
<td>NAVI-1</td>
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<tr>
<td>Subtotal credit hours offered</td>
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<tr>
<td>12</td>
<td></td>
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<tr>
<td>Total credit hours taken</td>
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### Year 3

<table>
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<th>Fall 2020 (Cohort 2) - Year 3</th>
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<td>Summer 2021</td>
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<td>Year total</td>
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<td>C4 - SE modeling &amp; Simulation</td>
<td>IMEPCI-2</td>
</tr>
<tr>
<td>ATS-1</td>
<td>MEI-1</td>
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<td>CYS-2</td>
<td>CSI-1</td>
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<td>MAS-2</td>
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<td>Total credit hours taken</td>
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Note: IMEPCI-1 & 2 will potentially have capstone course in any fall or spring semester, increasing the teaching load of that semester by 0.5 course per person.
E. Provide a one- or two-sentence description of each required or elective course.

Core courses (5)

**Fundamentals of Systems Engineering (C1):** What is a System? Systems Science, Systems Approaches, Systems Thinking. Introduces SE Technical Processes and Technical Management Processes as per INCOSE and DAU. Practical exercise applying the basic processes at a high level.


**Engineering Economics and Cost Analysis (C3):** Covers cost aspects of systems engineering, exploring cost from a decision-making perspective. Examines how cost is used to select alternatives and how the cost of systems can be measured. Concepts covered include economic analysis, cost behavior, cost allocation, system cost, life cycle costs, cost over time, cost estimating techniques, cost uncertainty, and cost risk. Aligns with current DoD Better Buying Power initiatives.

**Model-Based Systems Engineering and Simulation (C4):** Introduces a model based approach to SE practices. Discusses the benefits of MBSE and how to apply MBSE to system development. Covers Structured Analysis and Object Oriented approaches. Describes elements of DoDAF and Enterprise Architectures. Uses a systems modeling tool, such as MagicDraw or Rhapsody, for a practical exercises using SysML. Discusses advanced mathematical and computational techniques that find common application in systems engineering. Provides an introduction and practical exercise to MATLAB and/or ExtendSim for technical assessment.

**Applied Optimization (C5):** Covers the following topics in the area of systems optimization: a) how to formulate various engineering optimization problems as mathematical optimization problems; (b) how to develop or identify practical solution procedures for several classes of such optimization problems; and (c) how to compute or evaluate solutions for many optimization problems that frequently arise in the field of systems engineering.

Required courses (3)

**Systems Testing and Evaluation (R1):** Covers principles of test and evaluation (T&E) and the roles, purposes, functions, and techniques of T&E within the systems engineering process. Covers all aspects of T&E throughout the life cycle of a system to include test planning, test resources, development of test requirements, selection of critical test parameters, development of measures of effectiveness and performance, test conduct, analysis of test results, and determination of corrective action in the event of discrepancies. The course will emphasize the application of T&E through all phases of system development to include modeling and simulation (M&S) activities for enhancing the T&E process, developmental test and evaluation (DT&E), live fire test and evaluation (LFT&E), and operational test and evaluation (OT&E). Principles of experiment design and statistical analysis of test results will be reviewed. The course content will include case studies and lessons.

**Specialty Engineering (R2):** Covers the fundamentals of Reliability Engineering, Human Factors, and other topics relevant to successful SE implementation. Places these specialties in the context of SE practices with regard to defining proper requirements, performing technical assessments, implementing and verifying the system with the specialty areas in mind.

**Engineering Risk Analysis (R3):** This course covers three areas in the risk field - Qualitative Risk Analysis, Quantitative Risk Analysis, and Decision Risk Analysis. Qualitative Risk Analysis presents techniques for risk identification/evaluation, risk handling, risk monitoring and risk management.
Quantitative Risk Analysis includes Probabilistic Risk Assessment (RPRA) of system performance and project cost/schedule. Decision Risk Analysis gives the students an understanding of how to apply risk and cost benefit techniques in decision making when one must deal with significant risk or uncertainty. The course will present a framework for balancing risks and benefits to applicable situations. Typically, these involve human safety, potential environmental effects, and large financial and technological uncertainties. Concepts are applied toward representative problems resulting in risk and decision models that provide insight and understanding, and consequently lead to more successful projects/programs with better system performance within cost and schedule.

Courses for Areas of Emphasis on Autonomous Systems (3)

**Fundamentals of Autonomous Systems (ATS1):** Reasoning, learning, and optimal decision making methodologies for creating highly autonomous systems and decision support aids. Focus on principles, algorithms, and their applications, taken from the disciplines of artificial intelligence and operations research. Machine learning methodologies include expectation maximization and reinforcement learning. Optimal decision making paradigms include linear and integer programming, dynamic programming and Markov decision processes.

**Intelligent Sensing and Controls (ATS2):** Reasoning, learning, and optimal decision making methodologies for creating highly autonomous systems and decision support aids. Focus on principles, algorithms, and their application, taken from the disciplines of artificial intelligence and operations research. Machine learning methodologies include expectation maximization and reinforcement learning. Optimal decision making paradigms include linear and integer programming, dynamic programming and Markov decision processes.

**Autonomous Behavior and Interaction (ATS3):** Comprehensive overview including technical aspects and state-of-the-art algorithms and methods. Bio-inspired artificial intelligence, cognitive robotics, sensor networks, and cooperative behavior.

Course for Areas of Emphasis on Cybersecurity Systems (3)

**Network Security, Active & Passive Defenses (CYS1):** Defense of computer networks, use of cryptography for implementing network security, investigation of threats to computer networks, network vulnerabilities, techniques for strengthening passive defenses, tools for establishing an active network defense, and policies for enhancing forensic analysis of attacks on computer networks. Also, briefly covers firewalls and intrusion detection systems and possibly other related topics such as secure DNS as time permits.

**Data and Computer Communication (CYS2):** Overview of networks; data communications principles; data link layer; routing in packet switched networks; flow and congestion control; multiple access communication protocols; local area network protocols and standards; network interconnection; transport protocols; integrated services digital networks (narrowband and broadband); switching techniques and fast packet switching. Layered network architectures, applications, network programming interfaces (e.g., sockets), transport, physical media, data link protocols, local area networks and network routing. Examples will be drawn primarily from the Internet (e.g., TCP, UDP, and IP) protocol suite. Throughout the course, investigate not only what decisions are made in the design of the Internet, but also why such decisions are made.

**Computer Security (CYS3):** Covers threats and attacks (such as computer viruses and Trojan horses), access control, entity authentication, covert channels, inference and database security, secure operating systems, network security, legal and ethics aspects, administering security, physical security, and TEMPEST.

Course for Area of Emphasis on Maritime Systems (3)

**Marine Vehicles (MAS1):** Systems, Dynamics & Control. Specific topics include marine vehicle systems (vehicle form, propulsion, control fins, electronics, navigation, inertial systems), weight, buoyancy, static stability, payloads, dynamic stability, hydrodynamic controls, resistance & powering, power & energy sources, and modeling & simulation for design. Stability of vehicles and towed systems,
yaw stability for sonar design, and stability for magnetic sensors.

**Maritime Environment and Sensing (MAS2):** Properties, Dynamics, Sensors & Sensing. Physical conditions and physical processes of the oceans (waves, currents & ocean dynamics; chemical, corrosion, thermal, optical and sonar characteristics), ocean instrumentation & environmental sensors, intelligent sensing and controls (vehicle feedback), and life cycle and system sustainment impacts. Relationship of system to the dynamics of the environment.

**Marine System Integration (MAS3):** Sensor (payload) integration into platform systems, intelligent mission planning (modeling & simulation), enterprise wide (Navy) view of System of Systems (SOS) – (DODAF flavor), marine/maritime operations research fundamentals. Consider relevant systems engineering issues, such as states and modes of the system and subsystems, payload performance requirements, relationship of specific system to the mission and higher-level perspective toward Family of Systems (FOS).

**Capstone Project**
Group project utilizing knowledge from course learning to design, derive and implement solutions to select problems in the specialized areas in autonomous systems, cybersecurity systems, or maritime systems.

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

The proposed curriculum is the result of many in-depth discussions with Navy personnel, particularly the technology leaders in Systems Engineering at NSWC and their colleagues at other naval bases and other DoD branches. Through these discussions, DoD-driven as well as industry-driven competencies were identified and incorporated into the curriculum. We plan to form an advisory committee, which consists of faculty from FAMU-FSU College of Engineering, FSU-PC, and technical personnel from NSWC and other naval bases, to continue to provide input for curriculum development and student assessment.

**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.

NOT APPLICABLE.

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

NOT APPLICABLE. This is a master’s 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 2 in Appendix A. Provide a narrative describing the feasibility of delivering the proposed program through collaboration with other universities, both public and private. Cite specific queries made of other institutions with respect to shared courses, distance/distributed learning technologies, and joint-use facilities for research or internships.
There are two sites for course offering: FAMU-FSU College of Engineering at Tallahassee and FSU Panama City campus. We anticipate that the three specialized course in Maritime Systems will be offered at FSU-PC campus, and the remainder of the courses will be offered at FAMU-FSU COE. The capstone project course will be offered at both sites. All courses will be offered as live classroom instruction with synchronized online delivery to remote students at the other site. Both Panama City and Tallahassee classrooms are fully equipped with appropriate audio/visual capability to deliver the course in class and through iTV. In the future, individual courses will be offered online via distance learning.

IX. Faculty Participation

A. Use Table 4 in Appendix A to identify existing and anticipated full-time (not visiting or adjunct) faculty who will participate in the proposed program through Year 5. Include (a) faculty code associated with the source of funding for the position; (b) name; (c) highest degree held; (d) academic discipline or specialization; (e) contract status (tenure, tenureearning, 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 existing and anticipated full-time faculty who will participate in the proposed MSSE program through Year 5 are identified in Table 4 of Appendix A.

B. Use Table 2 in Appendix A to display the costs and associated funding resources for existing and anticipated full-time faculty (as identified in Table 4 in Appendix A). Costs for visiting and adjunct faculty should be included in the category of Other Personnel Services (OPS). Provide a narrative summarizing projected costs and funding sources.

Table 2 in Appendix A shows the cost and associated funding resources for existing and anticipated full-time faculty, A&P personnel and Teaching Assistant personnel. Reallocated E&G funding is the funding resource. In year 1, $234,000 E&G funds will be needed for 7.5 annual student FTE, resulting an average E&G cost per FTE of $31,200. The primary costs are faculty salary and benefits in the amount of $170,000. In addition, a $24,000 fund is budgeted for teaching assistants, and $20,000 is budgeted for half of an A & P personnel to help administer the program. Another $20,000 is budgeted to cover costs for essential items and activities to manage and ensure the quality of the program, such as travel, meetings and office supplies etc. As enrollment grows, the per-FTE cost will decrease. By year 5, the program will have 27.50 annual student FTE. The average E&G cost per FTE will be $15,127 and total E&G funding requirement of $416,000. The cost breakdown is the following: faculty salary and benefits $290,000, A&P personnel salary and benefits $25,000, Teaching Assistant funds $71,000, and administrative expenses $30,000.

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

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 home department of the proposed Master of Science in Systems Engineering program will be the Industrial and Manufacturing Engineering (IME) department of FAMU-FSU College of Engineering (COE). Department of Mechanical Engineering (ME) of Department of Electrical and Computer Engineering (ECE) of COE will also participate in the program.

The Department of Industrial and Manufacturing Engineering currently has 11 faculty members: 10 tenure-track or tenured and one specialized teaching faculty. Each faculty has an average teaching load of three courses per academic year. The IME department offers three service courses to the College of Engineering – EGN 2123 Computer Graphics for Engineers, EGN 3443 Statistical Topics, and EGN 3613 Principles of Engineering Economy. The faculty members are highly productive in research being ranked 4th among all US IE programs in per faculty research US dollars expended (data from American Society of
Our active areas of research lie in quality control, machine learning, optimization of manufacturing and service systems, as well as the manufacturing of and characterization of advanced materials. The IME Department is the home of the High-Performance Materials Institute and offers an extensive research environment, providing students and faculty with laboratory and research facilities in several different areas of interest. Due to the interactive and diverse nature of this major, we work closely with other departments within and outside the College of Engineering. A major strength of the IME department is its close working relationships with various sectors of industry and government. Our research is funded through many corporations and governmental agencies such as Boeing, Lockheed Martin, Northrup Grumman, Orbital ATK, Solvay, AFOSR, ARO, DoE, NASA, NSF, ONR, amongst others. Over the six academic years from 2011-2012 thru 2016-2017, the average annual research expenditure has been $3.6M. Our BS program in Industrial Engineering is ABET accredited with 175 students. We offer MS and PhD programs in Industrial Engineering with an average annual enrollment of 54, and annual graduation rate of 20, over the five academic years 2012-2013 thru 2016-2017. Our average PhD student supervised per faculty is 4. We also offer a 4+1 BS-MS degree.

The Department of Mechanical Engineering currently has 28 faculty members: 24 tenure-track or tenured and 4 specialized teaching faculty. The faculty members are highly productive in research, as evidenced at https://www.eng.famu.fsu.edu/me/achievements/. One faculty member is a member of both the National Academy of Engineering and the National Academy of Inventors, five current faculty members are fellows of national or international organizations, three have received other national or other international awards, five are early career award winners, and five currently hold research professorships. Over the six academic years from 2011-2012 thru 2016-2017, the average annual research expenditures have been $6.17M. The undergraduate program is ranked as one of the top 10 (out of 104) at FSU. It has steadily increased in size over the last 15 years, and the average undergraduate population in the Fall 2013 thru Fall 2017 semesters has averaged 394 students. If pre-engineering students who plan to major in Mechanical Engineering are counted, this number increases to about 600 students. The average number of graduates in the five academic years 2012-2013 thru 2016-2017 is 95. The graduate program is equally prosperous. The PhD program is ranked 27th by PhDs.org using the National Research Council S-rankings. The average graduate enrollment over the five academic years 2012-2013 thru 2016-2017 is 72 with an average spring graduation rate during this time period of over 10 students.

The ECE department presently has 28 dedicated and diverse faculty members with strong research capabilities, including two National Academy of Inventors (NAI) Fellows. Active areas of research include energy storage materials and devices, renewable energy, advanced power systems, robotics, embedded systems, solid state and electromagnetic simulations, photonics, computer security, smart grids, resilient power networks, digital signal and image processing, wireless communications, and intelligent systems. The department offers ABET-accredited BS-degree programs in electrical engineering and computer engineering with over 450 undergraduate students, and M.S. and Ph.D. programs in electrical engineering with over 100 graduate students. We also offer a 4+1 BS-MS degree and international BS-MS programs with China, Nigeria, India and Upper Austria. The Department has strong research ties with several research centers, such as the Center for Advanced Power Systems (CAPS), the Aeropropulsion, Mechatronics, and Energy (AME) Center, Center for Intelligent, Systems, Control, and Robotics (CISCOR), High-Performance Materials Institute (HPMI), National High Magnetic Field Laboratory (NHMFL), and Applied Superconductivity Center (ASC). Each faculty has an average teaching load of 3 courses (including one required course) per academic year. The average FTE productivity per faculty is about 12 contact hours. We teach one service course, EEL3003 Intro to Electrical Engineering for the other non-ECE engineering majors. Our annual research expenditures exceed $8M with the majority of the external funding coming from ONR, DOE, NSF and DoD. Each faculty graduates about 1 PhD student per year and produces about 2 journal papers annually.

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 core and most relevant library resources to the proposed MSSE program are available at both FSU and FAMU libraries. FAMU and FSU have extensive collections of books on systems engineering and related fields such as industrial engineering, cybersecurity and autonomous systems etc. FAMU and FSU also have up-to-date subscriptions to a comprehensive collection of research and instruction journals in the area of systems engineering and related fields, to which students will have full access. Select major journals available are listed below:

- Naval Research Logistics
- Expert Systems with Applications
- Reliability Engineering and System Safety
- Risk Analysis
- IEEE Transactions on Systems, Man, and Cybernetics
- Institute of Industrial and Systems Engineers Transactions
- International Journal of Robotics
- IEEE Transactions on Robotics
- Journal of Field Robotics
- Autonomous Systems
- Robotics and Autonomous Systems
- TISSEC-ACM Transactions on Information and System Security
- IEEE Security & Privacy
- IEEE Transactions on Information Forensics and Security
- IEEE Transactions on Dependable and Secure Computing

B. Describe additional library resources that are needed to implement and/or sustain the program through Year 5. Include projected costs of additional library resources in Table 2 in Appendix A. Please include the signature of the Library Director in Appendix B.

No additional library resources are needed to implement and/or sustain the program through Year 5.

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.

All needed class rooms and other types of space to implement the proposal program through Year 5 are available.

D. Describe additional classroom, teaching laboratory, research laboratory, office, and other space needed to implement and/or maintain the proposed program through Year 5. Include any projected Instruction and Research (I&R) costs of additional space in Table 2 in Appendix A. Do not include costs for new construction because that information should be provided in response to X (E) below.

No additional classroom and other space is needed to implement and maintain the proposed program 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 2 in Appendix A includes only Instruction and Research (I&R) costs. If non-I&R costs, such as indirect costs affecting libraries and student services, are expected to increase as a result of the program, describe and estimate those expenses in narrative form below. It is expected that high enrollment programs in particular would necessitate increased costs in non-I&R activities.

No capital expenditure is required.
F. Describe specialized equipment that is currently available to implement the proposed program through Year 5. Focus primarily on instructional and research requirements.

iTV equipment necessary for synchronized delivery of class lecture to remote site is fully available at both sites (Tallahassee and Panama City) for the proposed program.

G. Describe additional specialized equipment that will be needed to implement and/or sustain the proposed program through Year 5. Include projected costs of additional equipment in Table 2 in Appendix A.

No additional specialized equipment is required.

H. Describe any additional special categories of resources needed to implement the program through Year 5 (access to proprietary research facilities, specialized services, extended travel, etc.). Include projected costs of special resources in Table 2 in Appendix A.

No additional resources are needed.

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

Multiple teaching assistantships will be allocated to the proposed program through Year 5, and the projected cost is included in Table 2 in Appendix A.

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.

FAMU-FSU College of Engineering administrators and faculty are currently in active discussions with the Naval Surface Warfare Center (NSWC) at Panama City to establish sites for internships and practicum in the Navy. We plan to seek more opportunities for internships and practicum experience for the MSSE program through close collaboration with NSWC, Navy Engineering Education Consortium (NEEC) and other potential industrial collaborators in the future.

REFERENCES:


<table>
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<tr>
<th>Source of Students</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
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<td>Additional out-of-state residents***</td>
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<td>Totals</td>
<td>10</td>
<td>7.5</td>
<td>20</td>
<td>13.5</td>
<td>35</td>
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</tbody>
</table>

* Do not include individuals counted in any prior category in a given column.

** 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.

**proj ected annual headcount of students enrolled in the degree program. List projected yearly cumulative ENROLLMENTS instead of cumulative ENROLLMENTS.**

| Table 1 | PROJECTED HEADCOUNT FROM POTENTIAL SOURCES | Appendix A |
### Table 2

**Projected Costs and Funding Sources**

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<td><strong>Projected Costs</strong></td>
<td></td>
<td></td>
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<td>Educational Materials</td>
<td>$20,000</td>
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<tr>
<td>Travel and Accommodation</td>
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<td>Equipment and Supplies</td>
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<tr>
<td>Total Projected Cost</td>
<td>$28,000</td>
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</table>

**Funding Sources**

<table>
<thead>
<tr>
<th>Source</th>
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<th>Year 2</th>
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<td>Internal</td>
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<td>$12,000</td>
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<tr>
<td>External</td>
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<td>$8,000</td>
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Total Funding: $25,000 Year 1; $20,000 Year 2
<table>
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<th>Program and/or E&amp;G account from which current funds will be reallocated during Year 1</th>
<th>Base before reallocation</th>
<th>Amount to be reallocated</th>
<th>Base after reallocation</th>
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<td>058000-110 (Provost)</td>
<td>$5,995,164</td>
<td>$170,000</td>
<td>$5,825,164</td>
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<tr>
<td>217000-110 (Industrial &amp; Manufacturing Engineering)</td>
<td>$1,141,826</td>
<td>$32,000</td>
<td>$1,109,826</td>
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<tr>
<td>212000-110 (Engineering Dean)</td>
<td>$1,024,404</td>
<td>$32,000</td>
<td>$992,404</td>
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</table>

**Totals**

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

**TABLE 3**

ANTICIPATED REALLOCATION OF EDUCATION & GENERAL FUNDS*

**APPENDIX A**
<table>
<thead>
<tr>
<th>Year 5</th>
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</tbody>
</table>

**Table 4**

**Appendix A**
APPENDIX B

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

[Signature of Equal Opportunity Officer]

Date

[Signature of Equal Opportunity Officer]

2/5/2018

[Signature of Library Director]

11.21.17

Date

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

The Dean of the FAMU-FSU College of Engineering has reviewed the proposal for the

**MS Systems Engineering** and recommends it for consideration.

Signed by:  
J. Murray Gibson  
Dean  
January 31, 2018  
Date

The College Curriculum Committee of the College/School in which the program resides has reviewed the proposal and affirms that it is consistent with the policies of that Committee.

Signed by:  
Reginald Perry  
Chair, College Curriculum Committee  
January 31, 2018  
Date

The University Program Authorization Review Committee (UPARC) has reviewed the proposal and affirms that it is consistent with the policies of that Committee.

Signed by:  
Janet King  
Chair, UPARC  
January 31, 2018  
Date

The Curriculum Committee of the Faculty Senate has reviewed the proposal and affirms that it is consistent with the policies of that Committee.

Signed by:  
Kyle Eidahil  
Chair, Curriculum Committee of Faculty Senate  
January 31, 2018  
Date

The Faculty Senate has reviewed the proposal and affirms that it is consistent with the policies of the full body and recommends approval.

Signed by:  
Betty Grable  
President, Faculty Senate  
January 31, 2018  
Date

---

**Graduate Programs Only:**

The Chair of the Graduate Council has reviewed the proposal and affirms that it is consistent with the policies of that Council.

Signed by:  
David Jackson  
Chair, Graduate Council  
January 31, 2018  
Date

Signature of Provost and Vice President for Academic Affairs

[Signature]

Date: 2/1/20
5 Year Curriculum Vitae
Changchun Zeng
May 22, 2017

General Information
University address: Industrial and Manufacturing Engineering
FAMU-FSU College of Engineering
2525 Pottsdamer Street A-254
Florida State University
Tallahassee, Florida 32310
Phone: (850)410-6273; Fax: (850)410-6342

E-mail address: zeng@eng.fsu.edu

Professional Preparation (Highest Degree Only)
2004 Ph.D., Ohio State University. Major: Chemical Engineering.

Professional Experience
2014–present Associate Professor, Florida State University.
2007–2014 Assistant Professor, Industrial and Manufacturing Engineering, Florida State University.

Honors, Awards, and Prizes
Developing Scholar Award, Florida State University (2016).
Research Excellence Award, FAMU-FSU College of Engineering (2013).
Special Award in InNOLEvation Challenge (with Chase Knight), Florida State University (2013). ($5,000).
NSF Fellowship for Additive Manufacturing Workshop, National Science Foundation (2013).
Third Place, REU: RETREAT Entrepreneurship Competition (with Stuart Cooper), Florida State University (2012).
Current Membership in Professional Organizations

Materials Research Society
Society for the Advancement of Material and Process Engineering
Society of Plastic Engineers

Teaching

Courses Taught

Leadership and Communications (EIN 5931)
Engineering Economic Analysis (EIN5353)
Polymeric Materials: Manufacturing and Processing (EIN5930)
Dissertation (EIN 6980)
Engineering Management (EIN5182)
Introduction to Engineering Management (EIN3104)
Selected Topics in Industrial Engineering (EIN4936)
Thesis (EIN 6901)

Curriculum Development


Doctoral Committee Chair

Knight, C. C., graduate. (2013). Recycling of Carbon Fiber Composite Materials Using Supercritical Fluids.
Wang, H., doctoral candidate. Preparation and Application of Piezoelectric Foams Based on Cyclic Olefin Copolymers.
Liu, Z., doctoral student. Flexible Piezoelectric Foams and Device Applications.
Wang, X., doctoral student. Unconventional Assembly of Nanomaterials Superstructures.

Doctoral Committee Member

Micah, Mccrary-Dennis, doctoral candidate. Development of the Displaced Foam Dispersion
Technique for the Manufacturing of Multiscale Composites.
Yang, Ming-chia, doctoral candidate. Process Modeling and Improvement of Carbon Nanotubes in Aqueous Based Suspension.
Armbrister, C., doctoral student. Multi-scale Composites Processing.

Doctoral Committee University Representative
Fung, K., doctoral student. Biomechanics of Older Drivers to Mitigate Injury in Automobile Accidents.

Master's Committee Chair

Bachelor's Committee Chair

Bachelor's Committee Member
Sales Ancines, C., student. Multiscale Composites Manufacturing.

Supervision of Student Research Not Related to Thesis or Dissertation
Goldberg, T. (Sep 2015–present).
Wekezer, J. (Sep 2011–Apr 2013).


**Research and Original Creative Work**

**Publications**

**Refereed Journal Articles**


**Invited Book Chapters**


**Refereed Proceedings**


**Presentations**

**Invited Presentations at Conferences**


Composites Conference & Exhibition (ACCE), Society of Plastic Engineers (SPE). (International)


Refereed Presentations at Conferences


Invited Lectures and Readings of Original Work


Zeng, C. (2014, October). Unconventional Porous Polymeric Materials and Their Applications. Delivered at Department of Chemical and Biomedical Engineering, FAMU-FSU College of Engineering. (Local)


Patented Inventions


Contracts and Grants

Contracts and Grants Funded


Postdoctoral Supervision


Service

Florida State University

FSU University Service

Department representative, University Graduate Policy Committee (2012–present).

FSU College Service

Member, College of Engineering Library Committee (2008–2012).

FSU Department Service

Director, Graduate Program (2016–present).

Member, Department Graduate Committee (2012–present).

The Profession

Editorial Board Membership(s)


Guest Reviewer for Refereed Journals


Journal of Supercritical Fluids (2015–present).


Polymer (2013–present).


Macromolecular Materials and Engineering (2012–present).


Nanotechnology (2011–present).


Composites Science and Technology (2008–present).


Polymer International (2008–present).

Reviewer for Textbooks


Chair of a Symposium

Zeng, C. (Chair). (2016). Thermoplastic Materials and Foams of ANTEC 2016. Symposium conducted at the meeting of Society of Plastic Engineers (SPE), Indianapolis, IN.
Reviewer or Panelist for Grant Applications

National Science Foundation (2011–present).

Service to Professional Associations

Board of Director, Division of Thermoplastic Materials and Foams, Society of Plastic Engineers (2014–present).

Interviews


Service to Other Universities


Consultation


5 Year Curriculum Vitae
Okenwa O. I. Okoli
November 08, 2017

General Information
University address: Industrial and Manufacturing Engineering
FAMU-FSU College of Engineering
2525 Pottsdamer Street A-256
Florida State University
Tallahassee, Florida 32310
Phone: (850)410-6352; Fax: (850)410-6342
E-mail address: okoli@eng.fsu.edu

Professional Preparation (Highest Degree Only)


Professional Credential(s)
2011–present Performance Enterprise System Certification.
2005–present Chartered Scientist Great Britain (UK).
2001–present Chartered Engineer, Great Britain (UK).
1999–present ISO 9000 Lead Auditor Certification.

Professional Experience
2013–present Chair, Industrial & Manufacturing Engineering, Florida State University.
2013–present  Professor, Industrial & Manufacturing Engineering, Florida State University.

2012–present  Associate Director, High-Performance Materials Institute, Florida State University.

2012–2013  Interim Chair, Industrial & Manufacturing Engineering, Florida State University.

2005–2013  Associate Professor, Industrial and Manufacturing Engineering, Florida State University.

2007–2012  Director of Graduate Studies, Industrial and Manufacturing Engineering, Florida State University.

Honors, Awards, and Prizes

Dr. Martin Luther King, Jr. Distinguished Service Award, Center for Leadership & Social Change, Florida State University (2017). ($1,000).


Composites and Advanced Materials Expo (CAMX) Poster Competition (3rd Runner up), SAMPE and ACMA (2014).

Guardian of the Flame Award, FSU Burning Spear Society (2014).


Current Membership in Professional Organizations

American Ceramics Society, Member
Engineering Council, Chartered Engineer
Institute of Industrial Engineers, Member
Institute of Materials, Minerals and Mining Member (MIMMM)
Society of Manufacturing Engineers, Senior Member
Society of Plastics Engineers, Member
The Science Council, UK, Chartered Scientist

Teaching

Courses Taught

Characterization of Perovskite (EIN5905)
Characterization of UHMWPE mat (EIN5905)
Industrial Engineering Senior Design Project II (EIN4892)
Optimizing CNT yarns for PV ce (EIN5905)
Optimizing pressing parameters (EIN5905)
Understanding the behavior of (EIN5905)
Understanding the failure beha (EIN5905)
Industrial Engineering Senior Design Project I (EIN4890)
RPD (EIN5905)
Adv Materials in O&P (EIN5930)
Teaching methods in industrial (EIN5905)
Advanced Materials in O&P (EIN5930)
Review Paper Directed Study (EIN5905)
Understanding Luminescence in E (EIN5905)
Understanding Luminescence in E (EIN5905)
Lumi of Rare Earth Metal Compl (EIN5905)
Syn & Charac of Crystalline Sy (EIN5905)
Develop of Photovoltaic Sensor (EIN3905)
Introduction to ISO 9000 (ESI5228)
Specimen Prep for Eng Material (EIN5905)
Homotopy Methods (EIN5905)
MILESTONES IN RESEARCH (EIN5905)
Rsch Methods in Engineered Mat (EIN3905)
Directed Individual Study (EIN5905)
Honors Thesis (EIN4934)
IE Dissertation (EIN 6908-5)
Industrial Engineering Senior Design Project (EIN4891)
Industrial Engineering Senior Design Project II (EIN4891)
Review Pap. DIS (EIN 5905-1)
Selected Topics in Industrial Engineering (EIN4936)
Special Topics - Introduction to ISO 9000 (EIN4936)

New Course Development

Advanced Materials in O&P (2014)

Curriculum Development

Development of the "Engineering Management of Orthotics and Prosthetics (MSIE-EMOP)"
Major within Existing Engineering Management MS Degree Program in Department of
Industrial and Manufacturing Engineering (2012)

Doctoral Committee Chair

Dispersion Methodology for the Manufacture of Multiscale, Hybrid Composites.
Yan, J., graduate. (2016). Conception and Development of 3-D Sensing using Wire-Shaped
Hybrid PV Sensor as a Tool in Triboluminescent-Based SHM System.
Adams, G. R., doctoral candidate.
Dessureault, Yourri-Samuel, doctoral candidate.
Scheiner, M. V., doctoral candidate.

Doctoral Committee Member


Doctoral Committee University Representative


Master's Committee Chair

Ajayi, T., student.
Master's Committee Cochair


Master's Committee Member


Jamal, S., student. *Nano Carbon Foam/Polymer Composite.*

Oluwalowo, A., student. *Fabrication of Metal Matrix Composite Reinforced with Carbon Nanotubes (Buckypaper).*

Bachelor's Committee Member


Kliewer, K., graduate. (2013).

Supervision of Student Research Not Related to Thesis or Dissertation

Thomas, C. (Jan 2017–present).


Campa, J. (Jan 2016–present).

Parker, H. (Jan 2016–present).

Ndebele, T. (Jan 2012–present).

Research and Original Creative Work

Publications

Invited Journal Articles

Refereed Journal Articles


additional Gas Phase Oxygen. *International Nano Letters, 3(1)*, 10. 
doi:10.1186/2228-5326-3-16

Solid-State Dye Sensitized Photovoltaic Micro-Wires (DSPMS) with Carbon Nanotubes 
Yarns as Counter Electrode: Synthesis and Characterization. *Solar Energy Materials and 

ZnS:Mn Concentrated Vinyl Ester Matrices under Flexural Loading on the 
http://dx.doi.org/10.1016/j.jlumin.2012.01.056

**Edited Books**

*Triboluminescence - Theory, Synthesis, and Applications*. Springer.

**Invited Book Chapters**

*Triboluminescence: Theory, Synthesis, and Application* (pp. 1-16). Springer International 

Sensors for Cement-Based Composites. In O.D. Olawale, I.O.O. Okoli, S.R. Fontenot, 
A.W. Hollerman (Ed.), *Triboluminescence: Theory, Synthesis, and Application* (pp. 

Triboluminescent Nanophase for Use in Advanced Structural Materials: A Smart Premise 
with Molecular and Electronic Definition. In O.D. Olawale, I.O.O. Okoli, S.R. Fontenot, 
A.W. Hollerman (Ed.), *Triboluminescence: Theory, Synthesis, and Application* (pp. 

Solid-State Wire-Shaped Photovoltaic Sensor in TL-Based Structural Health Monitoring. 
In O.D. Olawale, I.O.O. Okoli, S.R. Fontenot, A.W. Hollerman (Ed.), *Triboluminescence: 
Theory, Synthesis, and Application* (pp. 351-378). Springer International Publishing, 
Cham.
Refereed Book Chapters


Refereed Proceedings


Presentations

Invited Papers at Conferences


Refereed Papers at Conferences


**Refereed Presentations at Conferences**


Nonrefereed Presentations at Conferences


Invited Workshops


Nonrefereed Workshops


Invited Lectures and Readings of Original Work


Okoli, O. I. (2014, October). The Manufacturability of Multifunctional Composites. Delivered at ISE Dept. The Ohio State University. (National)


Patented Inventions


**Contracts and Grants**

**Contracts and Grants Funded**


Okoli, Okenwa (Co-PI), Strouse, Geoffrey F (Co-PI), Zhu, Lei (Co-PI), Oates, William (Co-PI), Guan, Jingjiao (Co-PI), Hanson, Kenneth G. (Co-PI), Ma, Biwu (PI), & Gao, Hanwei (Co-PI). (May 2017–May 2018). *EIEG: Quantaurus-QY Absolute Photoluminescence Quantum Yield Spectrometer*. Funded by FSU EIEG Award. Total award $41,500.


Okoli, Okenwa (PI), Awoniyi, Samuel A (Co-PI), Liang, Zhiyong (Co-PI), Dickens, Tarik J (Co-PI), Zeng, Changchun (Co-PI), Liu, Tao (Co-PI), Zhang, Mei (Co-PI), Vanli, Omer Arda (Co-PI), & Park, Chiwoo (Co-PI). (May 2014–Apr 2017). *REU Site: Research Experience for Undergraduates: Retaining Engineers through Research Entrepreneurship and Advanced-Materials Training*. Funded by National Science Foundation. (1359235). Total award $360,000.


Contracts and Grants Pending

Contracts and Grants Denied


Collins, Emmanuel (Co-PI), Okoli, Okenwa (Co-PI), Liang, Zhiyong (PI), Liu, Tao (Co-PI), & Xu, Chengying (Co-PI). (Oct 2013). *NNMI: Digital Rapid Composites Manufacturing*. Submitted to University of Florida.

Postdoctoral Supervision


Service

Florida State University

FSU University Service

Member, Diversity & Graduate Education Committee (2011–present).

Senator, Florida State University Faculty Senate (2012–2016).

Member, STEM Recruiting Initiative Committee (2014).

FSU College Service


Member, Graduate Committee (2007–2012).

FSU Department Service

Member, Graduate Studies (2000–present).

The Profession

Editorial Board Membership(s)


Guest Reviewer for Refereed Journals


*Smart Materials* (2011–present).


*Composites Science and Technology* (2007–present).


Reviewer or Panelist for Grant Applications


South Carolina Department of Defense/EPSCOR Program (2005–present).
National Science Foundation (2000–present).

Service to Professional Associations


Charter Faculty Advisor – Chapter S356, FAMU-FSU CoE, Society of Manufacturing Engineers (2004–present).

Service to Other Universities


The Community

Judge, Science Fair, Apalachee Tapestry Magnet School of the Arts (2015–present).

STEM Board Member, Conley Elementary School (2015–present).

Program Development to narrow the achievement gap, Apalachee Tapestry Magnet School for the Arts (2010–present).

Professional Engagements

5 Year Curriculum Vitae
Omer Arda Vanli
August 11, 2015

General Information

University address: Industrial and Manufacturing Engineering
FAMU-FSU College of Engineering
2525 Pottsdamer Street B-320
Florida State University
Tallahassee, Florida 32310
Phone: (850)410-6354; Fax: (850)410-6342

E-mail address: oavanli@eng.fsu.edu
Web site: http://www.eng.fsu.edu/~oavanli/

Professional Preparation (Highest Degree Only)


Professional Experience

2014–present Associate Professor and Director of Graduate Studies, Department of Industrial and Manufacturing Engineering, Florida State University, High Performance Materials Institute.

2008–2012 Assistant Professor, Department of Industrial and Manufacturing Engineering, Florida State University, High Performance Materials Institute.

Honors, Awards, and Prizes

Undergraduate teaching award (Nominated), Florida State University (2013).
Graduate of the Last Decade Award (Nominated), Penn State, Industrial and Manufacturing Engineering Department (2012).

Current Membership in Professional Organizations

American Society for Quality (ASQ), Member
Institute for Operations Research and the Management Sciences (INFORMS) Member
Institute of Industrial Engineers (IIE), Member

Teaching

Courses Taught

Engineering Data Analysis (ESI5243)
Engineering Experiments (ESI5247)
Quality Control and Reliability Engineering (ESI 4234)
Engineering Experiments (ESI5247)
Quality Control and Reliability Engineering (ESI 4234)
Simulation of Industrial Engineering Systems (ESI4523)
Graduate Seminar (EIN5936)
Design of Integrated Production Systems and Facilities Layout (EIN4333)
Response Surface Methodology and Process Optimization (EIN5930-04)

Curriculum Development

Master of Science in Industrial Engineering, with a specialization in Engineering Management of Orthotics and Prosthetics (MSIE-EMOP). Graduate program jointly offered by Florida State University and St. Petersburg College. This program offers students a foundation in the principles and application of advanced materials and engineering management principles with respect to formulating and solving O&P problems. The courses will be offered by FSU via distance learning (2013)
Doctoral Committee Chair

Omidvar, A., doctoral student. Highway safety and travel time reliability for aging populations.

Doctoral Committee Cochair


Doctoral Committee Member

Paruthyvalappil, B., doctoral candidate.
Wheaton, I. M., doctoral candidate.

Doctoral Committee University Representative

Langston, J. L., doctoral student.

Master's Committee Chair

Master's Committee Member

Jahan, M. D., graduate. (2014).
Das, T., student.
Roy, M., student.

Bachelor's Committee Chair

Parra, C., graduate. (2010). *Neural network based pattern recognition methods for hand writing image analysis (Honors thesis).*

Senior Design Project team advising


Research and Original Creative Work

Publications

Refereed Journal Articles


**Invited Book Chapters**


**Refereed Proceedings**


**Nonrefereed Journal Articles**


Presentations

Nonrefereed Presentations at Conferences


Vanli, O. A. (presented 2013, April). *A failure time prediction method for condition based maintenance*. Presentation at INFORMS Annual Meeting, INFORMS, Minneapolis, MN. (International)


**Invited Lectures and Readings of Original Work**


**Contracts and Grants**

**Contracts and Grants Funded**


Zhang, Chun (Co-PI), Wang, Hsu-Pin (Co-PI), Okoli, Okenwa (PI), Pignatiello, Joseph J (Co-PI), Liang, Zhiyong (Co-PI), Zeng, Changchun (Co-PI), Liu, Tao (Co-PI), Zhang, Mei (Co-PI), & Vanli, Omer Arda (Co-PI). (Jul 2010–Jun 2014). *REU Site: Non Participant Support -- Retaining Engineers through Research Entrepreneurship and Advanced - Materials Training*. Funded by National Science Foundation. (1005016). Total award $327,969.


**Contracts and Grants Pending**

Sobanjo, John O (Co-PI), Harvey, Bruce A (Co-PI), Moses, Ren (Co-PI), AbdelRazig, Yassir A (PI), Boot, Walter (Co-PI), Vanli, Omer Arda (Co-PI), & Ozguven, Eren Erman (Co-PI). (Jan 2014). *Enhancing Airport Wayfinding for the Elderly and Persons with Disabilities*. Submitted to Transportation Research Board.
Service

Florida State University

FSU College Service

Member, Information and Technology Committee, COE (2012–present).

Member, Council of Student Affairs and Curriculum, COE (2010–present).

FSU Department Service

Director of Graduate Studies, Graduate Program, IME Department (2012–present).

Faculty Advisor, Alpha Pi Mu, Honors Student Association (2010–present).

Member, Graduate Admissions Committee, IME Dept (2009–2012).

Member, Faculty Search Committee for new faculty hiring, IME Dept (2011).

The Profession

Guest Editing for Refereed Journals


Editorial Board Membership(s)


Guest Reviewer for Refereed Journals

IEEE Transactions of Semiconductor Manufacturing (Sep 2008–present).


Institute of Industrial Engineers (IIE) Transactions (Sep 2008–present).
Journal of Statistical Planning and Inference (Sep 2008–present).

Quality and Reliability Engineering International (Sep 2008–present).


Chair of a Symposium

Vanli, O. A. (Chair). (2013, October). Quality, Statistics and Reliability Track, Condition Monitoring and Prognostics Session, INFORMS Annual Meeting. Symposium conducted at the meeting of INFORMS, Minneapolis, MN.

Reviewer or Panelist for Grant Applications


NSF, CMMI Division, Manufacturing Enterprise Systems Program (2010).
5 Year Curriculum Vitae
Chiwoo Park
September 14, 2017

General Information

University address: Industrial and Manufacturing Engineering
College of Engineering
FAMU/FSU Engineering Building B319
Florida State University
Tallahassee, Florida 32306-2870
Phone: 850-410-6457

E-mail address: cpark5@fsu.edu

Web site: http://www.eng.fsu.edu/~chiwoo.park

Professional Preparation (Highest Degree Only)

Data Mining. Supervisor: Yu Ding.

(Doctoral dissertation, Texas A & M University). Retrieved from
ProQuest Dissertations & Theses,

Professional Experience

2017–present Associate Professor, Industrial and Manufacturing Engineering, Florida State
University.

2011–2017 Assistant Professor, Industrial and Manufacturing Engineering, Florida State
University.

Honors, Awards, and Prizes

Award for Research Excellence, FAMU-FSU College of Engineering (2014).
Best Application Paper Award in the IIE Transactions Focused Issue on Quality and Reliability
Engineering, Institute of Industrial Engineers (2014).
Ralph E. Powe Jr. Faculty Enhancement Award, Oak Ridge Associated Universities (2013).
Current Membership in Professional Organizations

Institute of Electrical and Electronics Engineers
Institute of Industrial Engineers
Institute of Operation Research and Management Science

Teaching

Courses Taught

Principles of Engineering Economy (EGN3613)
Data Mining (EIN5930)
Special Topics in Industrial Engineering (EIN5930)
Quality Control and Reliability Engineering (ESI4234)

Management of Multiple Course Sections

Engineering Economy (EGN3613)

Doctoral Committee Chair

Mu, C., doctoral candidate. *Analysis of three dimensional tomography data.*

Doctoral Committee Cochair

Li, Min-Yang, graduate. (2016). *Topological and electrical properties of carbon nanotube networks.* [co-chaired with Dr. Richard Liang]

Doctoral Committee Member

Master's Committee Chair

Ghadiyali, H. S., graduate. (2016). *Partial Gauss Siedel approach to solve large-scale linear systems.*
Esmaieeli-Sikaroudi, A., student.

Master's Committee Member


Bachelor's Committee Member

Vargas, E., student. *Analysis of sonication time on the filtration process for buckypaper manufacturing.* [Honors Thesis]

Supervision of Student Research Not Related to Thesis or Dissertation

Li, S. (Jun–Aug 2013).
Research and Original Creative Work

Publications

Refereed Journal Articles


**Refereed Proceedings**


Presentations

Invited Presentations at Conferences


Presentation at SPE Automotive Composites Conference & Exhibition, Society of Plastics Engineers, Novi, Michigan. (National)


Park, C., Huang, J., & Ding, Y. (presented 2012, October). Domain decomposition approach for fast Gaussian process regression of large spatial data sets. Presentation at INFORMS Annual Meeting, INFORMS, Phoenix, AZ. (National)

Invited Workshops


Invited Lectures and Readings of Original Work


Park, C. (2016, December). Inline monitoring of micro-macro dynamics of nanomaterial systems. Delivered at Pusan National University, Pusan National University. (Local)
Park, C. (2016, September). *Patching Gaussian processes for large-scale spatial regression*. Delivered at Florida State University (Statistics Department). (Local)

Park, C. (2015, October). *Scaling Gaussian process regression for large spatial datasets*. Delivered at Northwestern University, Evanston IL. (Local)


**Contracts and Grants**

**Contracts and Grants Funded**


Awoniyi, Samuel A (Co-PI), Okoli, Okenwa (PI), Liang, Zhiyong (Co-PI), Dickens, Tarik J (Co-PI), Zeng, Changchun (Co-PI), Liu, Tao (Co-PI), Zhang, Mei (Co-PI), Vanli, Omer Arda (Co-PI), & Park, Chiwoo (Co-PI). (May 2014–Apr 2017). *REU Site: Research


Contracts and Grants Pending

Park, Chiwoo (PI). (Sep 2017). CDS&E/Collaborative Research: Integrated Computational and Data-Driven Modeling of Nanoparticle Aggregation For Model-Predictive Control of Nanoparticle Production. Submitted to National Science Foundation.


Service

Florida State University

FSU University Service

Faculty Sponsor, Young Scholars Program (YSP) (2013–present).

Department Representative, FSU Commencement Ceremony (2015).

Department Representative, FSU Commencement Ceremony (2013).
FSU College Service

Committee Member, Search Committee, Associate Dean for Research (2013).

FSU Department Service

Member, Graduate Committee (2016–present).

Associate Chair, Undergraduate Committee (2014–present).

Editor, Department Newsletter (2014–present).

Member, Industrial Outreach Committee (2014–present).

Member, Faculty Search Committee (2016–2017).

Member, Departmental Grievance Committee (2013–2015).

Faculty Advisor, IIE Student Chapter (2013–2014).

The Profession

Editor for Refereed Journals

Associate Editor, IIESE Transactions on Quality and Reliability Engineering (2017–present).

Guest Reviewer for Refereed Journals


IEEE Transactions on Knowledge and Data Engineering (Jul 2015–present).


IIE Transactions (Jan 2012–present).


Neurocomputing (Jul–Sep 2013).

The Industrial and Systems Engineering Research Conference (Feb 2013).


Reviewer or Panelist for Grant Applications

National Science Foundation (2015).

The Office for Science & Technology (OST) of the Embassy of France in the United States of America (2013).

Service to Professional Associations

5 Year Curriculum Vitae

Hui Wang

November 03, 2017

General Information

University address: Industrial and Manufacturing Engineering
College of Engineering
FAMU/FSU Engineering Building B-373D
Florida State University
Tallahassee, Florida 32310-6046
Phone: 8504106387

E-mail address: hwang10@fsu.edu

Web site: https://www.eng.fsu.edu/ime/people/wang.html

Professional Preparation (Highest Degree Only)

2007 Doctoral Degree, Aca, UNIVERSITY OF SOUTH FLORIDA. Major:
Engineering, Industrial.

Professional Experience

2014–present Adjunct Assistant Research Scientist, Mechanical Engineering, University of
Michigan.

2013–present Assistant Professor, Industrial and Manufacturing Engineering, Florida State
University.

2011–2013 Research Faculty of Mechanical Engineering, Mechanical Engineering,
University of Michigan. Conduct research in manufacturing systems
engineering.

Honors, Awards, and Prizes

Blackhall Machine Tool and Gage Award, American Society of Mechanical Engineers (2017).
($1,000).
IIE Transactions, Best Application Paper Award, Institute of Industrial and Systems Engineers
(2017).
IIE Transactions Featured Article, Institute of Industrial Engineers (2015).
2014 ASME-MSEC Best Paper Award, 2nd Place, American Society of Mechanical Engineers
Current Membership in Professional Organizations

American Society of Mechanical Engineers
Institute of Industrial Engineers
Institute of Operations Research and Management Sciences

Teaching

Courses Taught

Computer Graphics for Engineers (EGN2123)
Stochastic Proces for Eng Sys (EIN5930)
Assembly system design and opt (EIN5905)
Integrated Decision Making Bas (EIN5905)
Stochastic modeling of multi-d (EIN5905)
Assembly System Design & Optim (EIN5905)
Stochastic Process & Modeling (EIN5905)
Simulation of Industrial Engineering Systems (ESI4523)
Computer Graphics for Engineers (EGS2123)

New Course Development


Doctoral Committee Chair

Mostafa, G., doctoral candidate.
Jiang, Z., doctoral candidate.
Ren, J., doctoral candidate.

Doctoral Committee Cochair

Suriano, S., graduate. (2013). Process Variation Monitoring Using Multi-resolution Data. [A doctoral graduate at the University of Michigan]
Nguyen, H., graduate. (2012). Surface Variation Characterization and Control Using High-definition Metrology. [A doctoral graduate at the University of Michigan]
Doctoral Committee Member

Ufodike, C., doctoral candidate. [A FAMU enrolled engineering student]
Frketic, J. B., doctoral candidate. *ASSESSMENT OF ADDITIVE MANUFACTURING: PRELIMINARY INVESTIGATION OF AUTOMATED MANUFACTURING AND PROCESSING OF POLYMER COMPOSITES.*

Master's Committee Chair

Shireen, T., graduate. (2016).

Master's Committee Member

Symum, H., graduate. (2015). *MULTISTAGE PROCESS MONITORING USING GROUP EXPONENTIAL WEIGHTED MOVING AVERAGE CONTROL CHART.* [The student graduated on time]
Bade, S. G. R., student.
Tawakalt, A., student. *Additive Manufacturing Based on Boron-doped CNTs.*
Rohit, S. G., student.

Supervision of Student Research Not Related to Thesis or Dissertation

Research and Original Creative Work

Program of Research and/or Focus of Original Creative Work

Two research focuses: 1) Complex engineering system design and optimization enabled by cyber-physical systems and 2) data-fusion based big data modeling for engineering process control.

Publications

Refereed Journal Articles


doi:10.1016/j.jmsy.2013.04.012

doi:10.1115/1.4024290


**Refereed Proceedings**

Presentations

Refereed Papers at Conferences


**Refereed Presentations at Conferences**


**Invited Lectures and Readings of Original Work**

Wang, H. (2014, May). *An Introduction to the Opportunities in Industrial and Manufacturing Engineering at Florida State University*. Delivered at East China University of Science and Technology, Shanghai, China. (Local)

Wang, H. (2014, May). *An Introduction to the Opportunities in Industrial and Manufacturing Engineering at Florida State University*. Delivered at Donghua University, Shanghai, China. (Local)


Wang, H. (2013, May). *Big Data Enabled Cyber-Physical Systems for Advanced Manufacturing*. Delivered at Xi'an Jiao Tong University, Xi'an, China. (Local)

**Contracts and Grants**

**Contracts and Grants Funded**


Wang, Hui (PI). (Jul 2016–Sep 2016). *PEPI: Big Data Analytics For Cost-Effective Load Control In Wind Farm Based On Distributed ITOFPRESS Sensors*. Funded by Georgia Institute of Technology. (T8145-G1). Total award $6,000.


5 Year Vita for Hui Wang


**Contracts and Grants Pending**


**Contracts and Grants Denied**


Wang, H. (Sep 2016). *Statistical-Physical Surface Mating Modeling and Stochastic Diagnosis for Improving Surface Assembly Quality in Powertrain Manufacturing*. Submitted to FSU CRC.


Park, Chiwoo (Co-PI), & Wang, Hui (PI). (Sep 2015). *GOALI: Statistical-Physical Surface Mating Modeling And Coordinated Process Control For Improving Surface Assembly*. Submitted to National Science Foundation.


**Reviews of My Research and Original Creative Work by Other Authors**

**Reviews Appearing in Magazines or Newsletters**

Service

Florida State University

FSU College Service
Judge, Graduate student poster judge in College of Engineering (2014).

FSU Department Service
Participant, HPMI annual Open house (2015–present).
Participant, Senior design project development (2015–present).
Organizer, Industrial Outreach Committee (2014–present).
Member, Undergraduate Advisory Committee (2014–present).
Presenter, Student recruitment presentation at international universities (2014–present).
Co-organizer, International 3+1+1 exchange program (2014–present).

The Profession

Guest Editing for Refereed Journals

Editorial Board Membership(s)


Guest Reviewer for Refereed Journals


IIE Transactions (2009–present).


Reviewer for Textbooks

Biofuels and Biorefineries (2014).

Judge for an Exhibition


**Chair of a Symposium**


**Reviewer or Panelist for Grant Applications**

National Science Foundation (2012–present).

**Service to Other Universities**

Consultation

5 Year Curriculum Vitae
Emmanuel G. Collins
Last Revised: October 05, 2015

General Information

University address:  Mechanical Engineering
College of Engineering
2525 Pottsdamer Street A-229
Florida State University
Tallahassee, Florida 32310
Phone: (850)410-6373; Fax: (850)410-6337

E-mail address:  ecollins@eng.fsu.edu

Web site:  http://www.eng.fsu.edu/~ecollins/

Professional Preparation (Highest Degree Only)

1987 Ph.D., Purdue University. Major: Aeronautics and Astronautics.

Professional Experience

2011–present  Professor/Chair, Mechanical Engineering, Florida State University. Chairman of the Mechanical Engineering Department.

2004–present  John H. Seely Professor, Mechanical Engineering, Florida State University.

2003–present  Professor, Mechanical Engineering, Florida State University. Director of the Center of Intelligent Systems, Controls and Robotics (CISCOR).

1999–present  Professor, Mechanical Engineering, Florida State University.

2010–2011  Associate Chair, Florida State University.

Visiting Professorship(s)

2012–present  Guest Professorship - Anhui University of Technology, Ma'anshan China.
Honors, Awards, and Prizes

Black Engineer of the Year Award, FAMU-FSU College of Engineering (2015).
Nominated Graduate Faculty Mentor Award, FAMU-FSU College of Engineering (2013).
Guest Professorship, Anhui University of Technology, Ma'ansan, China (2012).
AFRL Campus Challenge IV Competition, FAMU-FSU College of Engineering (2012).
Best Paper in Session "Robotics I", American Society of Mechanical Engineers (2012).

Current Membership in Professional Organizations

American Society of Mechanical Engineers (ASME)
Institute of Electrical and Electronics Engineers (IEEE) – Senior Member
Phi Beta Kappa
Pi Tau Sigma
Tau Beta Pi

Teaching

Courses Taught

Advanced Design and Analysis of Control Systems (EML4316)
Advanced Design and Analysis of Control Systems (EML5317)
Multivariable Control (EML5361)
Introduction to Mobile Robotics (EML4830)
Mechatronics I (EML4811)
Special Topics in Mechanical Engineering (EML4930)
Analysis in Mechanical Engineering II (EML5061)
Special Topics in Mechanical Engineering (EML5930)
Dynamic Systems I (EML3013-C)
Dynamic Systems I (EML3013C)

Doctoral Committee Chair

Gupta, N., doctoral candidate.
Reese, B. M., doctoral candidate.
Francis, G., doctoral student.
Shill, J., doctoral student.
Doctoral Committee Cochair
Sharma, A., doctoral student.

Doctoral Committee Member
Leng, S., graduate. (2012).
Miller, B. D., doctoral candidate.
Eziyi, I. L., doctoral candidate.

Doctoral Committee University Representative
Morris, M. J., doctoral candidate.
Stanovich, M. J., doctoral candidate.
Arshad, M., doctoral student.

Master's Committee Chair

Master's Committee Cochair
Mann, T. F., graduate. (2011).
Bates, I., student.

Master's Committee Member
Morton, J. T., graduate. (2012).
Research and Original Creative Work

Publications

Refereed Journal Articles


**Refereed Book Chapters**


**Refereed Proceedings**


Presentations

Refereed Papers at Conferences


**Invited Presentations at Conferences**


Collins, E. G. (presented 2013, March). "Terrain-Dependent Wheelchair Driver Assistance,". Poster presentation at Florida State University's Fellows Forum, Florida State University. (Local)


Collins, E. G. (presented 2011, March). "Momentum Based Trajectory Generation for a One Link Manipulator with Heavy Loads". Presentation at The Third Annual ARTSI Student Research Conference, Florida A&M University, Tallahassee FL. (International)

Patented Inventions


Contracts and Grants

Contracts and Grants Funded


**Contracts and Grants Pending**

Collins, Emmanuel (Co-PI), Okoli, Okenwa (Co-PI), Liang, Zhiyong (PI), Liu, Tao (Co-PI), & Xu, Chengying (Co-PI). (Oct 2013). *NNMI: Digital Rapid Composites Manufacturing*. Submitted to University of Florida.


Camilo Ordonez

Teaching Faculty I
FAMU-FSU College of Engineering
Department of Mechanical Engineering
Aero-Propulsion, Mechatronics and Energy Center
Florida State University
2003 Levy Ave., Tallahassee, FL 32310
co04d@my.fsu.edu

Office: (850) 645-1014
Cell: (850) 980-1296

(a) Education

2010 Florida State University, Tallahassee, FL
Ph.D. in Mechanical Engineering

2006 Florida State University, Tallahassee, FL
M. S. in Mechanical Engineering

2004 Universidad Nacional, Medellin, Colombia
M.S. student in Systems Engineering

2003 Pontificia Bolivariana University, Medellin, Colombia
B. Sc. in Electronics Engineering

2001 Ecole Polytechnique de Montreal, Canada
Visiting student in Electrical Engineering

2001 Concordia University, Montreal, Canada
Exchange student in Electrical and Computer Engineering

(b) Academic Information

Graduate GPA: 4.0

(c) Research Experience

2013 – 2015: Assistant Scholar Scientist at CISCOR (Center for Intelligent Systems, Control and Robotics) and STRIDE (Scansorial and Terrestrial Robotics and Integrated Design Lab), Tallahassee, FL.

2010 – 2013: Postdoctoral Research Associate at CISCOR (Center for Intelligent Systems, Control and Robotics) and STRIDE (Scansorial and Terrestrial Robotics and Integrated Design Lab), Tallahassee, FL.

2004 – 2010: Research Assistant at CISCOR (Center for Intelligent Systems, Control and Robotics), Tallahassee, FL.

2001: Research Assistant at GRPR Groupe de Recherche en Perception et Robotique, Montreal, Canada.

(d) Teaching Experience

2015: Instructor of Mechanical Engineering Tools Lab, FAMU-FSU College of Engineering (EML 3002L).

2014: Instructor of Introduction to Design and Analysis of Control Systems, FAMU-FSU College of Engineering (EML 4312/5311).

2010 - 2013: Laboratory instructor of Introduction to Mobile Robotics, FAMU-FSU College of Engineering (EML 4830/5831)

2000: Teaching Assistant of Ordinary Differential Equations at Universidad Pontificia Bolivariana.

(e) Industrial Experience


(f) Publications

Book Chapters:


Journals:


Dissertation:


Theses:


Providing appropriate grades of service to fixed and mobile users in a non-geo satellite-fixed cell system. Undergraduate Honors Project, Pontificia Bolivariana University, Medellin, Colombia, 2003.
Conference Publications:


**Invited Talks:**


**Workshops:**


**(g) Patents**


**(h) Educational outreach tools**

Canadian TV special of the series Innovation Nation on artificial intelligence (Episode VI). Partners in Motion, Canada, 2010.

**(i) Reviewer Work**

Journal of Remote Sensing (ISSN 2072-4292).

Journal of the IMechE, part D: Journal of Automobile Engineering.


IEEE Transactions on Control Systems Technology.

Robotics and Autonomous Systems.


(j) Awards


Best robotics paper in session award:

Best student talk in Mechanical Engineering graduate seminar:

(k) Synergistic Activities

Member, ASME (American Society of Mechanical Engineers).

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

Member, RAS (Robotics and Automation Society).

Member, AMA (Academy of Model Aeronautics).

(l) Volunteer and Outreach Work

Supervisor of visiting Master students (FSU-Anhui University of Technology) 2014
- Stunt jumping with a small robotic vehicle (Yuan Liu).

Mentor for NSF REU program (Research Experience for Undergraduates), Summer 2013
- Dynamic modeling of skid-steered vehicles (Dung Tran).
- Development of self contained laser mapping platform (Darren Tinker).

Mentor for high school students Young Scholars Program (YSP), Summer 2013
- Kinematic and power modeling of the XRL hexapedal robot (Charles McCarthy and Celia Yuxin).

Mentor for NSF REU program (Research Experience for Undergraduates), Summer 2012
- Robot design, control, and SLAM implementation (Lucas Aguiar).

Mentor for high school students to develop outreach modules (momentum based planning) for outreach program of CISCOR at NIMS, 2012.

Mentor for First Robotics Competition SAIL High School 2011.

Robotic demonstrations at Mary Brogan museum and Challenger Learning Center, Tallahassee, FL 2011.

Mentor for Nims Middle School robotics team for the First Robotics competition (first place and Judges Award at the New Orleans regional competition 2010).

Mentor for Nims Middle School Lego competition 2010.
Tour guide of the CISCOR Laboratory (tours for external visitors) 2011 – Present.

Subject: BS Biomedical Engineering (CIP Code 14.0501)

Rationale: A Bachelor of Science degree in Biomedical Engineering (BS-BME) is being proposed by the FAMU-FSU College of Engineering, Department of Chemical and Biomedical Engineering. Biomedical Engineering is the application of engineering principles to medical science for the development and creation of equipment, devices, computer systems, and software for use in healthcare. Currently, students have the option to major in Biomedical Engineering within the existing BS Chemical Engineering. However, students are choosing Biomedical Engineering as their major with increasing frequency. Therefore, the College is proposing to transition the major in Biomedical Engineering to a stand-alone degree. Offering this type of degree is consistent with the mission of Florida Agricultural and Mechanical University (FAMU) as it will not only increase the number of undergraduate degree offerings in STEM; an area of strategic emphasis by the Board of Governors, but will also enhance economic development within the State of Florida.

The proposed curriculum will total 131 credit hours, which is consistent with the average number of credit hours for other engineering programs in the SUS, and will include substantial content in cellular and tissue engineering, biomechanics and biomaterials, nanotechnology, and biomedical imaging. Within the degree, students will have the option to select from one of three majors: 1) Cell and Bioprocess Engineering, 2) Biomaterials and Polymers Engineering, and 3) Imaging and Signal Processing Engineering. Data from the Bureau of Labor Statistics suggests that employment outlook for graduates in this field is steady with a 7% percent anticipated growth nationally and mean salary of $88,040.

The BS-BME degree will initially be offered face-to-face beginning fall 2018 with the intent to seek accreditation by ABET at a later date. Additional resources are needed to support the program. However, the Board’s approval to implement does not obligate the University to provide the resources requested; any resource request will be reviewed as part of the annual allocation of resources. The estimated projections and program costs for years one to five are as follows:

<table>
<thead>
<tr>
<th>Implementation Timeframe</th>
<th>Projected Enrollment</th>
<th>Projected Program Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HC</td>
<td>FTE</td>
</tr>
<tr>
<td>Year 1</td>
<td>38</td>
<td>34.2</td>
</tr>
<tr>
<td>Year 2</td>
<td>92</td>
<td>82.5</td>
</tr>
<tr>
<td>Year 3</td>
<td>155</td>
<td>139.5</td>
</tr>
<tr>
<td>Year 4</td>
<td>193</td>
<td>173.7</td>
</tr>
<tr>
<td>Year 5</td>
<td>224</td>
<td>201.6</td>
</tr>
</tbody>
</table>

Attachment: FAMU BS Biomedical Engineering Proposal
Recommendation: It is recommended that the Florida A&M University Board of Trustees approve the BS Biomedical Engineering (CIP Code 14.0501) in the FAMU-FSU College of Engineering effective fall 2018.
Board of Governors, State University System of Florida

Request to Offer a New Degree Program

Florida A&M University

University Submitting Proposal

FAMU-FSU College of Engineering
Florida State University & Florida A&M University

Name of College(s) or School(s)

Biomedical Engineering

Academic Specialty or Field

14.0501

Proposed CIP Code

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

Date Approved by the University Board of Trustees

Signature of Chair, Board of Trustees

Date

President

Vice President for Academic Affairs

Date

Provide headcount (HC) and full-time equivalent (FTE) student estimates of majors for Years 1 through 5. HC and FTE estimates should be identical to those in Table 1 in Appendix A. Indicate the program costs for the first and the fifth years of implementation as shown in the appropriate columns in Table 2 in Appendix A. Calculate an Educational and General (E&G) cost per FTE for Years 1 and 5 (Total E&G divided by FTE).

<table>
<thead>
<tr>
<th>Implementation Timeframe</th>
<th>Projected Enrollment (From Table 1)</th>
<th>Projected Program Costs (From Table 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HC</td>
<td>FTE</td>
</tr>
<tr>
<td>Year 1</td>
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<td>173.7</td>
</tr>
<tr>
<td>Year 5</td>
<td>224</td>
<td>201.6</td>
</tr>
</tbody>
</table>

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 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.

Program Information

Institutions: Florida State University and Florida A&M University
Degree Program Title: Bachelor of Science degree in Biomedical Engineering
CIP Code: 14.0501
Proposed Delivery Mode: In Person/Traditional
Enrollment Projections (Headcount): Year 1: 20; Year 5: 90
Program Locations: Tallahassee (FSU and FAMU) and Panama City (FSU)
Proposed Implementation Date: Fall 2018

Program Summary

The FAMU-FSU College of Engineering at Florida State University and Florida A&M University proposes to offer a new Bachelor of Science in Biomedical Engineering (BS-BME) degree effective Fall 2018. The purpose of the program is to prepare biomedical engineers for immediate employment in the fields of bioengineering and biotechnology. Biomedical engineers are employed in diverse areas such as artificial tissue and organ development, genetic engineering research, development of drug delivery systems, cellular and tissue engineering, biomedical device design and manufacturing, bioinstrumentation development, and pharmaceutical manufacturing. The proposed BS-BME degree will provide an avenue for students who are interested in pursuing a career in these fields or alternatively in the related fields of biomedical device design, development, and manufacturing, pharmaceutical production, medicine and patient care, biomedical product sales and services, and biotechnological patent law. The total number of semester credit hours needed to obtain the BS degree will be 131, which is consistent with the average number of credit hours for other engineering BS degree programs.

Of the top 20 universities listed among the US News & World Report 2017 Ranking of Best Undergraduate Engineering Programs (Doctorate), only one university (Princeton University) does not offer a separate BS degree in either biomedical, biological, or bioengineering. The proposed curriculum uniquely will offer substantial content in cellular and tissue engineering, biomechanics and biomaterials, nanotechnology, and biomedical imaging. These disciplines are the priority areas of student employment in the biomedical industry, building upon existing strengths in the already established graduate BME program. Faculty in the Department have existing collaborations in magnetic resonance imaging with the National High Magnetic Field Laboratory and with the Department of Biomedical Sciences, both at FSU.
The Department of Chemical & Biomedical Engineering is committed to a process of continuous quality improvement, and self-assessment. This process identified a need for exploring the feasibility of a BS-BME degree. The program will be subject to external review by both universities in accordance with Board of Governors requirements for cyclic review, SACS, and ABET (the Accreditation Board for Engineering and Technology, Inc.) initially after three years and then every six years. The BS-BME program will be offered at 1) the Tallahassee campus of the FAMU-FSU College of Engineering (Florida State University and Florida A&M University), and 2) the Panama City campus of Florida State University. Three majors focusing on different aspects of the field of biomedical engineering will be created for the BS-BME degree: 1) Cell & Bioprocess Engineering, 2) Biomaterials and Polymers Engineering, and 3) Imaging and Signal Processing Engineering. All three majors will be offered at each of the two campuses Engineering – Tallahassee and FSU Panama City). The total number of semester credit hours needed to obtain the BS degree will be 131, which is consistent with the average number of credit hours for other engineering BS degree programs.

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

The pre-proposal for the BS Degree in Biomedical Engineering was presented to the Council of Academic Vice Presidents (CAVP) Academic Program Coordination review group on Thursday, November 10, 2016. According to the FSU and FAMU representatives, everyone on the Council was very supportive of the development a new degree program in biomedical engineering to meet the growing demand. No specific concerns were noted. The Department of Chemical and Biomedical Engineering was encouraged to proceed to develop the Proposal to Explore feasibility study.

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

Not applicable (this is a BS degree program).

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).

BS-BME – Linkage to State University System (SUS) Strategic Planning Goals

The proposed BS-BME program is consistent with the Florida Board of Governors’ targeted degree programs, the State University System Strategic Plan, and the goals approved by the Board
of Governors in November 2011 and as amended in 2016. As noted in the SUS Strategic Plan, "as Florida and the nation face economic competition on an unprecedented scale, the State University System must prepare graduates to excel in the global society and marketplace." Furthermore, "individually and collectively, state universities must advance innovation—new technologies, new processes, new products, new ideas—in their local and state economies; help Florida's employers prosper and grow through knowledge transfer and a steady stream of qualified graduates; and make community and business engagement an integral part of their institutional culture." (Board of Governors, 2012).

As noted in the SUS Strategic Plan, "as Florida and the nation face economic competition on an unprecedented scale, the State University System must prepare graduates to excel in the global society and marketplace." Furthermore, "individually and collectively, state universities must advance innovation—new technologies, new processes, new products, new ideas—in their local and state economies; help Florida's employers prosper and grow through knowledge transfer and a steady stream of qualified graduates; and make community and business engagement an integral part of their institutional culture." (Board of Governors, 2012). Through the provision of the BS BME degree, the FAMU-FSU College of Engineering at both the Tallahassee and Panama City campuses will directly support each of the following SUS 2025 Goals listed below while fulfilling Florida State University's unique institutional responsibilities.

To realize its mission and to meet the vision of the Florida Board of Governors, the FAMU-FSU College of Engineering will focus on three critical points of emphasis that will provide a framework for meeting the SUS targeted 2025 goals listed below: Excellence, Productivity, and Strategic Priorities for a Knowledge Economy. Through the initiation of the BS-BME degree, the FAMU-FSU College of Engineering will support each of the SUS 2025 Goals while fulfilling the universities' unique institutional responsibilities.

**SUS 2025 Goals**

1. **Excellence:**
   - Strengthen Quality and Recognition of Commitment to Community and Business Engagement.

2. **Productivity:**
   - Increase Degree Productivity and Program Efficiency.

3. **Strategic Priorities for a Knowledge Economy:**
   - Increase the Number of Degrees Awarded in STEM/Health and Other Programs of Strategic Emphasis.

*Goal 1 – Excellence: Strengthen Quality and Recognition of Commitment to Community and Business Engagement

A critical component of the missions of both FAMU and FSU is public service and engagement with Florida's communities and businesses. University engagement often serves to attract industry and spark or sustain economic development. Florida has more than 260 biotech companies specializing in therapeutics, diagnostics, and agricultural biotech and is home to more than 620 companies manufacturing a range of medical devices (Enterprise Florida, 2015). Florida is home to the nation's #2 largest medical device manufacturing industry, #3 largest pharmaceuticals
manufacturing industry, and #7 largest biotech R&D industry (Enterprise Florida, 2015).

The FAMU-FSU College of Engineering is headquartered in Tallahassee with the FSU College of Medicine and the FAMU College of Pharmacy and Pharmaceutical Sciences. Florida State University also has several regional campuses with close ties to major engineering and medical treatment facilities, including the Panama City campus. These academic and geographic linkages provide a foundation to build a sustainable and nationally ranked undergraduate Biomedical Engineering program. Offering the BS-BME degree is consistent with the SUS excellence goal of improving the quality and relevance of all academic programs in the community by strengthening the exchange of knowledge and resources between FAMU, FSU and the larger biotech and biomedical community in an effort to address critical societal issues in the State of Florida.
*Goal 2 – Productivity: Increase Degree Productivity and Program Efficiency*

Florida State University and Florida A&M University both currently offer various degrees in the Programs of Strategic Emphasis identified by the Board of Governors. A number of these programs reside within the FAMU-FSU College of Engineering. Specific contributions offered by the approval of this program would be an increase of BS degree production within the FAMU-FSU College of Engineering and enhanced undergraduate R&D (Honors in the Major). Based on the current strength of faculty and research related to the biomedical engineering degrees at the graduate (MS and PhD) level, we are confident that the program will achieve statewide recognition of excellence within five years.

High quality teaching and academic programming provide a foundation for FAMU's and FSU's efforts to expand the state's knowledge and innovation economy by increasing the educational attainment across all of Florida's demographics. By offering the curriculum in both Tallahassee and at the FSU Panama City campus, the program will provide access to post-secondary engineering education to African-American and adult undergraduates, students from traditionally underrepresented groups. FSU and FAMU recognize the important role that minorities and non-traditional students play in helping shape the future economic landscape in Florida. To increase program efficiencies, the faculty at the FAMU-FSU College of Engineering is broadening their use of technology to enhance educational program delivery. Offering the BS-BME degree is consistent with the SUS productivity goal to increase degree productivity and program efficiency by expanding educational opportunities and attainment levels of Florida's citizens and becoming more efficient in awarding degrees by maximizing outputs with existing infrastructure.

*Goal 3 – Strategic Priorities for a Knowledge Economy: Increase the Number of Degrees Awarded in STEM/Health and Other Programs of Strategic Emphasis*

To assess completions trends in biomedical engineering programs, Florida State University analyzed the five most recent years of data available through the National Center for Education Statistics (NCES). The NCES uses a taxonomic system of numeric codes to classify higher education programs known as the Classification of Instructional Programs (CIP). All institutions of higher education are required to submit conferral data, sorted by award level and CIP code, to the NCES's Integrated Postsecondary Education Data System (IPEDS). In considering program completion data obtained through IPEDS, it should be noted that institutions classify their programs independently, meaning that two programs that are identical in all respects could hypothetically be classified under different CIP codes, which can skew trends.

Florida State University relied on three statistical metrics when considering year-to-year national trends in completions data: Compound Annual Growth Rate (CAGR), Average Annual Change (AAC), and Standard Deviation (STDEV). CAGR is a theoretical indicator that demonstrates the percentage growth of the dataset from year to year, assuming a steady rate of growth between the first and final years. AAC is determined by calculating the average numerical year-to-year change, which helps to account for the volume of completions. STDEV measures the variance in yearly changes. To avoid misrepresenting market trends, Florida State University only calculated these figures for datasets that include at least five years of information.
National Biomedical Engineering Bachelor's Degrees by Headcount

<table>
<thead>
<tr>
<th>Degree Program</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>CAGR</th>
<th>AAC</th>
<th>STDEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.0501 Biomedical Engineering</td>
<td>3,766</td>
<td>3,854</td>
<td>4,105</td>
<td>4,537</td>
<td>4,931</td>
<td>7.0%</td>
<td>291.3</td>
<td>135.4</td>
</tr>
</tbody>
</table>

The State of Florida has limited capacity to train and graduate biomedical engineers. In 2014, there were 918 students enrolled in undergraduate biomedical engineering programs in the State University System (State University System of Florida Board of Governors, 2016). That same year, 90 BS-BME degrees were awarded within the State University System (State University System of Florida Board of Governors, 2016).

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

The Programs of Strategic Emphasis Categories:
1. Critical Workforce:
   - Education
   - Health
   - Gap Analysis
2. Economic Development:
   - Global Competitiveness
3. Science, Technology, Engineering, and Math (STEM)

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

The Board of Governors Strategic Plan 2005-2013 specifically identifies Science, Technology, Engineering, and Math (STEM) professionals as an area of programmatic strategic emphasis. Despite nearly a decade of efforts, shortages in STEM professions persist. The most recent Board of Governors Strategic Plan 2012-2025 notes that "Florida must become more competitive in the national and global economy. To accomplish this, the state must increase the educational attainment levels of its citizens and the state universities must respond by awarding more degrees in specific high demand programs" (Board of Governors, 2012). This program will produce graduates in a field that is both critical and high-wage.

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

The BS-BME will be offered through the FAMU-FSU College of Engineering at the
Tallahassee and Panama City campuses. The courses will be primarily offered on-site. When appropriate and to increase program efficiencies, the faculty at the FAMU-FSU College of Engineering will utilize technology to enhance educational program delivery and expand online instructional opportunities for students.


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.

Occupational projections demonstrate the broad-scale growth of the biomedical engineering profession. Biomedical engineering has a particularly high projected percentage change growth rate at 26.6% from 2012-2022 at the national level.

To provide a more geographically-specific picture of projected employment for graduates from the proposed biomedical engineering program from the FAMU-FSU College of Engineering, Florida State University analyzed employment projections from the State of Florida from 2015-2023. Although less than the projected percentage change in growth at the national level, the expected change in the State of Florida is a robust 21.5% (Florida Department of Economic Opportunity, 2016).

The job market for biomedical engineers in Florida is sustainable. According to the May 2015 Occupational Employment and Wages Survey, the average hourly wage for a biomedical engineer in the State of Florida is $36.97, or $76,900 annually (Bureau of Labor Market Statistics, 2015). In May of 2015, there were 720 individuals employed as biomedical engineers statewide (Bureau of Labor Market Statistics, 2015).

![Annual mean wage of biomedical engineers, by state, May 2015](image-url)
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 field of biomedical engineering exhibits high student enrollment demand nationally and regionally. According to data collected by the American Society of Engineering Education (ASEE), between 2005 and 2014 the annual growth rate of students majoring in biomedical engineering was 11.12% (Yoder, 2016). At some of the nation's top engineering schools, the majority of engineering students wish to enroll in biomedical engineering. In 2014, 4,500 students applied to the BME program at Johns Hopkins University, and only 120, or 2.7%, of applicants were accepted as students.

Regionally, Georgia Institute of Technology has the largest BME program in the country with more than 1300 undergrads and 200 graduate students supported by more than 50 faculty members (Georgia Institute of Technology, 2016). All of Georgia Institute of Technology's College of Engineering programs are ranked in the top 10 nationally by U.S. News and World Report, and the BME program at Georgia Tech is one of the highest NIH funded academic departments in the country (Georgia Institute of Technology, 2016). In addition, in 2015, there were more females enrolled in biomedical engineering than males in the program (Georgia Institute of Technology, 2016).

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.

Other BS-BME Programs in the State of Florida

Currently, within the State of Florida, there are four BS-BME programs. Three of the programs are within the public State University System (State University System of Florida Board of Governors, 2016). The program at Florida International University obtained ABET accreditation in 2006. The BS degree in Bioengineering at Florida Gulf Coast University obtained ABET accreditation in 2008. The University of Florida program was most recently established in August 2012. The University of Miami has the oldest and only private program in the State of Florida.

The northern and panhandle portions of the state are not served by either a public or private university offering a BS-BME degree. The two largest programs, Florida International University and the University of Miami, are located in the urban south. The University of Central Florida has notified the State University System Council of Academic Vice Presidents Academic Program Coordinator Work Group that the University is considering adding a BS-BME program (University of Central Florida, 2015).

Population density is not necessary to build a successful BS-BME program. Each fall the BS-
BME cohort at Georgia Institute of Technology is three times as large as the combined cohort at both Florida International University and the University of Miami. In fact, Georgia Institute of Technology's fall cohort each year is larger than the entire public and private university capacity in the State of Florida. Due to the lack of capacity in the State of Florida, students are leaving the state to study biomedical engineering.

**BS-BME – Linkage to Other SUS Universities**

Currently there are three BS-BME programs within the State University System of Florida: Florida International University, Florida Gulf Coast University, and University of Florida, and two programs at private Florida universities: University of Miami, and Florida Institute of Technology - Melbourne. The northern and panhandle portions of the state are not served by either a public or private university offering a BS-BME degree. The BS-BME degree will be unique because it serves a joint engineering college at two universities (one an HBCU), with the potential to increase diversity within the discipline. The proposed program is expected to attract a diverse student population including African-Americans, women, and other underrepresented groups to a critical STEM discipline.

Developing a BS-BME degree is consistent with both the mission and goals of FAMU and FSU, part of which include expanding and disseminating knowledge through teaching and research. Because there is already a biomedical engineering major at FSU and FAMU and since demand for biomedical engineering education is growing statewide, establishment of the BS-BME degree should not negatively impact current enrollment at other universities.

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

Table 1 in Appendix A (1-A for undergraduate and 1-B for graduate) shows the projected student headcount (HC) and Full Time Equivalents (FTE) according to primary sources. Most of the students will enroll in the BS-BME program at the Tallahassee campus of the FAMU-FSU College of Engineering. The Tallahassee campus will initially have about 35 students at its inception in Fall 2018, while the Panama City campus will not begin accepting students until Fall 2019.

As shown in the table below, undergraduate students in the Department of Chemical and Biomedical Engineering are choosing Biomedical Engineering as their major with increasing frequency (3 students in 2013 and 26 students in 2017). This trend is expected to continue based on statewide and national trends (see Section 1.D., and Sections II.A – C., above).
Graduation Numbers and Percentages –
Department of Chemical and Biomedical Engineering

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Grads</strong></td>
<td>19</td>
<td>44</td>
<td>60</td>
<td>77</td>
<td>80</td>
</tr>
<tr>
<td><strong>FSU #</strong></td>
<td>15</td>
<td>40</td>
<td>60</td>
<td>70</td>
<td>75</td>
</tr>
<tr>
<td><strong>FSU %</strong></td>
<td>79%</td>
<td>91%</td>
<td>100%</td>
<td>91%</td>
<td>94%</td>
</tr>
<tr>
<td><strong>FAMU #</strong></td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td><strong>FAMU %</strong></td>
<td>21%</td>
<td>9%</td>
<td>0%</td>
<td>9%</td>
<td>6%</td>
</tr>
<tr>
<td><strong>Majors (both univ.):</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemical #</td>
<td>14</td>
<td>29</td>
<td>37</td>
<td>50</td>
<td>53</td>
</tr>
<tr>
<td>Chemical %</td>
<td>74%</td>
<td>66%</td>
<td>62%</td>
<td>65%</td>
<td>64%</td>
</tr>
<tr>
<td>Biomedical #</td>
<td>3</td>
<td>13</td>
<td>23</td>
<td>23</td>
<td>26</td>
</tr>
<tr>
<td>Biomedical %</td>
<td>16%</td>
<td>30%</td>
<td>38%</td>
<td>30%</td>
<td>33%</td>
</tr>
<tr>
<td>Materials #</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Materials %</td>
<td>11%</td>
<td>5%</td>
<td>0%</td>
<td>5%</td>
<td>3%</td>
</tr>
</tbody>
</table>

Biomedical engineering majors currently earn a BS degree in Chemical Engineering. By creating the option to earn a BS degree in Biomedical Engineering, all of the current and future biomedical engineering majors are expected to switch to the BS-BME program. A few students in other majors within the Department of Chemical and Biomedical Engineering may be expected to switch to the BS-BME degree. Other disciplines from which the new degree may pull students are Biological Sciences, Chemistry and Biochemistry, Exercise Science, Interdisciplinary Biomedical Sciences, and other engineering departments, each of which is currently over-enrolled.

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.

The BS-BME degree will be unique because it serves a joint engineering college at two universities (one an HBCU), with the potential to increase diversity within the discipline. The proposed program is expected to attract a diverse student population including African-Americans, women, and other underrepresented groups to a critical STEM discipline.
The National Science Foundation (NSF) has argued that the large population of post-9/11 veterans represents a promising resource for fulfilling the national workforce shortages in STEM fields. According to NSF, "post-9/11 veterans offer the nation's engineering and science employers a diverse and pre-qualified pool of future talent." The NSF has outlined a series of recommendations for helping veterans to attain engineering degrees. The NSF's recommendations for programs to provide an enriching and supportive environment for veteran engineering students include:

- Programs should run for the full academic year, allowing veterans to complete their degrees needing only four years of financial support.
- Institutions should develop agreements with public-and private-sector organizations to provide paid internships and research opportunities specifically for veterans.
- Institutions should establish support structures for the particular needs of veterans, including financial aid information, disability services, student veterans' organizations, and family support services.
- Faculty members who will be involved in educating veterans should receive special training in recognizing and responding to veterans' unique needs.

A 2011 report by the Florida Senate made similar recommendations as those of the NSF and also recommended that higher education institutions establish a dedicated staff position "responsible for STEM outreach services targeting veterans." Florida State University has already launched special programs designed to attract and retain veterans. The Veterans Alliance, which encompasses Florida State University initiatives that ease the transition from military service to campus life, foster a community of past, present and future veterans, raise awareness of veterans issues among campus and local communities, and support student veterans through graduation and into rewarding careers and graduate-education programs. The FSU Veteran's Center's mission is to provide support to Florida State University students who are veterans, veteran-dependents, active duty personnel, Reserve and National Guard members, and ROTC cadets. The proposed program will implement several of the recommendations discussed above.
III. Budget

A. Use Table 2 in Appendix A to display projected costs and associated funding sources for Year 1 and Year 5 of program operation. Use Table 3 in Appendix A to show how existing Education & General funds will be shifted to support the new program in Year 1. In narrative form, summarize the contents of both tables, identifying the source of both current and new resources to be devoted to the proposed program. (Data for Year 1 and Year 5 reflect snapshots in time rather than cumulative costs.)

Table 2 in Appendix A shows the projected costs and funding sources for the proposed BS degree program in Biomedical Engineering at the FAMU-FSU College of Engineering (Tallahassee Campus). Faculty salaries and benefits ramp up from approximately $276,000 in Year 1 to $503,000 in Year 5. USPS salaries and benefits do not rise as much because all of the positions will be funded in Year 1. Costs for assistantships will rise in concert with new faculty hires. Expenses rise by year 5 due to the costs associated with running the undergraduate teaching labs and maintaining the graduate labs. OCO expenditures will also rise from Year 1 to Year 5 as teaching lab purchases increase with the rollout of the new lab courses. The proposed BS-BME program is designed to complement rather than supplant the existing BS in Chemical Engineering degree. Several faculty currently assigned to the BS in Chemical Engineering program will have their AORs changed to reflect their participation in the proposed BS-BME program (Appendix A, Table 3).

The success of this proposed program is dependent on securing adequate new resources; these resources will need to originate in multiple units on the university campuses. The Dean of the College of Engineering, Dr. Murray Gibson, will work with the Provosts at the two universities to secure the resources for the initiation of the program.

Recurring Cost Estimates (Table III.A.1)
Salary and benefits for five (5) tenure-track faculty.
Salary and benefits for two (2) specialized teaching faculty.
Salary and benefits for one (1) laboratory engineer.
Salary and benefits for two (2) academic and administrative staff.
Laboratory maintenance expenses.
Office operational expenses.

Non-Recurring Cost Estimates (Table III.A.2)
Teaching laboratory equipment for two (2) years.
Research space modification and infrastructure.

B. Please explain whether the university intends to operate the program through continuing education, seek approval for market tuition rate, or establish a differentiated graduate-level tuition. Provide a rationale for doing so and a timeline for seeking Board of Governors’ approval, if appropriate. Please include the expected rate of tuition that the university plans to charge for this program and use this amount when calculating cost
entries in Table 2.

The universities do not plan to operate the program through continuing education. The tuition rate for this program will be the same as for other engineering undergraduate degrees. The proposed program is undergraduate only; the existing graduate (MS and PhD) degree programs in Biomedical Engineering do not have differentiated graduate-level tuition. If the need arises in the future, one or more elective courses may be offered to students at the Tallahassee and Panama City campuses via distance learning delivery.

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).

A consensus among the faculty in the Department of Chemical and Biomedical Engineering is that the proposed BS-BME degree should be added to the Department while simultaneously sustaining and enhancing the existing BS degree program in Chemical Engineering. To achieve this goal, additional resources are required as specified in Tables 1 and 2, above. These new resources are crucial to ensure the quality of the proposed program for future accreditation, and to provide students with a superior educational experience leading to employment in the biomedical engineering field.

As shown below, the proposed BS-BME program includes several laboratory and design courses that will require substantial investment in space, specialized experimental apparatus, and technical support. These courses are central to the student learning experience and are required by the accreditation agency ABET. The FAMU-FSU College of Engineering will also see increased undergraduate research opportunities upon implementation of the proposed program.

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).

There will be a minimal impact on existing campus services at the Tallahassee campus. A potential positive impact that the proposed program will be the increased utilization of the infrastructure at the FSU Panama City, FL Campus. We have consulted with the administration and faculty at the Panama City Campus, as well as the directors of the departments of Police, Enrollment & Student Affairs, Finance & Administration, Advancement, and Development. These individuals have expressed and provided support for the development of the proposed BS-BME
program.

In the short run, the implementation of the BS-BME provides an opportunity to recruit as well as retain current faculty interested in biomedical engineering education, research, and service as the focus of their professional development activities. In the long run, the proposed BS-BME program will promote interdisciplinary teaching and research as well as provide a unique administrative collaboration opportunity between two universities and across two regions. The development and implementation of program of such an interdisciplinary program will promote an atmosphere of innovation in which faculty and administrators who value biomedical scholarship will be supported and valued.

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.

Support for faculty effort devoted to the development (FY17) and implementation (FY18) of the proposed BS-BME program is currently funded through FAMU-FSU College of Engineering and Panama City Campus reserves. The FAMU-FSU Engineering and Panama City Campus development staff will identify opportunities for securing additional funding through philanthropy and the faculty administration and proposed program leadership program will seek grant support. Funding sources will be used to support program development, implementation, program enhancements and special projects.
IV. Projected Benefit of the Program to the University, Local Community, and State

A. Use information from Tables 1 and 2 in Appendix A, and the supporting narrative for "Need and Demand" to prepare a concise statement that describes the projected benefit to the university, local community, and the state if the program is implemented. The projected benefits can be both quantitative and qualitative in nature, but there needs to be a clear distinction made between the two in the narrative.

Rationale for initiating a BS Degree in Biomedical Engineering (BME) at FAMU-FSU

Department and College
- Enrollment in the BME major constitutes at least 1/3 of the undergraduate CBE degrees awarded (2007-17).
- Of the current tenured or tenure-track faculty, 4 of the 18 faculty are aligned toward BME with 3 (17%) of the BME faculty currently having undergraduate teaching duties. The influx of faculty members required to support the establishment of the BS-BME degree would significantly distribute BME-related undergraduate teaching, advising, and research loads while providing critical mass for graduate level research and course development.
- The viability and growth of the BME graduate program will depend on the implementation of the BS-BME degree. Students from our own undergraduate population are known quantities with respect to preparation and performance, constituting the least amount of risk at the graduate level – particularly critical in light of limited resources.
- CBE is the only department in the FAMU-FSU College of Engineering capable of and invested in establishing an undergraduate degree in Biomedical Engineering (e.g., CBE is the only COE department that requires Biology for all of its undergraduates).
- Although the addition of BS-BME courses in the departmental curriculum will increase the number of total classes, it will decrease the number of students per class and alleviate some of our current issues with respect to large class sizes in the core curriculum.

State of Florida
- There are currently four Florida public higher educational institutions offering a BS degree in Biomedical Engineering or Bioengineering, with three additional Florida programs (including CBE) offering undergraduate tracks or minors in BME.
- The University of Central Florida has notified the State University System Council of Academic Vice Presidents Academic Program Coordinator Work Group that the University is considering adding a BS-BME program.
- There are significant enrollment figures for each of the three public universities in Florida offering a BS-BME degree.
- To remain competitive within the State of Florida in the field of BME, creating a BS-BME program at the FAMU-FSU COE is vital. Student demand for a BS degree in biomedical engineering is increasing. FSU and FAMU may lose students to other state or national universities if no BS degree is instituted.
- The northern and panhandle portions of Florida are not served by either a public or private university offering a BS-BME degree.
• Employment projections in the field of biomedical engineering within the State of Florida show an increase of 21.5% from 2015-2023 (ASEE data).

National
• Of the top 20 universities listed among the US News & World Report 2017 Ranking of Best Undergraduate Engineering Programs (Doctorate), only one university (Princeton University) does not offer a separate BS degree in either biomedical, biological or bioengineering. Nationally, most other engineering colleges offer a program in Biomedical Engineering.
• No HBCU offers a BS degree in Biomedical Engineering – such a program at the FAMU-FSU College of Engineering would be the first. Only one HBCU offers a BS degree in Bioengineering or Biological Engineering, namely North Carolina A&T University. Interestingly, NC A&T’s Bioengineering program is run out of the Department of Chemical, Biological, & Bio-Engineering.
• National Bureau of Labor Statistics Occupational Outlook Handbook 2015, Job Outlook for 2014-24: Average growth among all professions = 4%; Chemical Engineering = 2%; Biomedical Engineering = 23%. Biomedical Engineering is the engineering discipline and overall profession with the largest job growth potential nationally and regionally.
• ASEE Growth by BS degree, 2006-2015: Chemical Engineering = 2.04; Biomedical Engineering = 1.95. The only engineering disciplines that show larger increases are Petroleum = 4.32; Environmental = 3 and Mining = 2.79; however, these disciplines have much smaller total degree numbers. Enrollment nationally for both biomedical engineering and chemical engineering have increased by a factor of 2 over this period.
• In 2015, 40.9% of BS-BME degrees nationwide were awarded to women compared to 32.4% of degrees in chemical engineering. Women earned 19.9% of all BS degrees in all engineering disciplines in 2015.
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)

Florida Board of Governors Regulation 8.014 requires that any baccalaureate degree exceeding the state mandated 120 credit hours to degree be approved to do so by the university board of trustees and the Board of Governors. Florida State University and Florida A&M University will seek an exception for the proposed Bachelor of Science in Biomedical Engineering (CIP 14.0501) in order to accommodate the curriculum needed for the discipline and meet Accreditation Board for Engineering and Technology, Inc. (ABET) accreditation requirements for engineering programs.

The increase in credit hours is due to the multi-disciplinary curriculum requirements which call for proficiency in both engineering and a range of knowledge and skills relevant to the biomedical engineering practice. All existing engineering programs in the State University System have been approved to exceed 120 credit hours to degree, and the request by Florida State University and Florida A&M University to exceed this limit will be consistent with other statewide engineering programs. Currently, the BS degree in Chemical Engineering within which the existing major in Biomedical Engineering resides requires 131 credit hours to complete. The proposed BS-BME degree is being planned to require 131 credit hours.

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

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

The State of Florida has identified common program prerequisites for this university degree program (Bioengineering / Biomedical Engineering). Specific prerequisites are required for admission into the upper-division program and must be completed by the student at either a) a state college or community college in Florida, b) a state university in Florida, or c) FSU or FAMU prior to being admitted to this program. Students may be admitted into the University without completing the prerequisites, but may not be formally admitted into the program until completion of these prerequisites.

The following lists the common program prerequisites or their substitutions necessary for admission into this upper-division degree program. This program will be operated using the existing common program prerequisites:

1. MAC X311, MAC X312, and MAC X313
   or
   MAC X281, MAC X282, and MAC X283
2. MAP X302
3. CHM X045/X045L, or CHM X045C, or CHS X440/X440L, or CHM X095/X095L
4. CHM X046/X046L, or CHM X046C, or CHM X096/X096L
5. PHY X048/X048L or PHY X048C, or PHY X043 and PHY X048L
6. PHY X049/X049L or PHY X049C, or PHY X044 and PHY X049L
   *PHY X064L may substitute for PHYX048L and PHY X049L

Notes:
1. The Department will accept ECH 3301 – Process Analysis and Design as a substitute course for MAP X302 or MAP X305.
2. The Department recommends (but does not require) that students take the following courses at a community college or a state college before transferring to this upper-division program:
   • BSC X010 or BSC X044
   • CHM 2210 or CHMX217
   • CHM 2211
   Completion of these courses may be satisfied as graduation requirements in the upper division portion of the major.

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.

The proposed BS-BME is not envisioned to be a Limited Access program.
D. If the proposed program is an AS-to BS capstone, ensure that it adheres to the guidelines approved by the Articulation Coordinating Committee for such programs, as set forth in Rule 6A-10.024 (see link to the Statewide Articulation Manual on the resource page for new program proposal). List the prerequisites, if any, including the specific AS degrees which may transfer into the program.

The proposed BS-BME is not envisioned to be 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).

Mission and Goals

The mission statements for the Department of Chemical and Biomedical Engineering, FAMU-FSU College of Engineering, Florida State University, and Florida A&M University are shown in Appendix 1.

The proposed Bachelor of Science Degree program in Biomedical Engineering will support the missions of the 1) Department, 2) College of Engineering, 3) Florida State University and Florida A&M University, and 4) SUS with its strong STEM emphasis and a focus on enhancing FSU’s pre-eminence metrics and FAMU’s performance-based funding metrics. Developing a BS-BME degree is consistent with both the mission and goals of Florida State University and Florida A&M University. Part of the missions of both universities is to expand and disseminate knowledge through teaching and research.

The proposed BS-BME program at FSU and FAMU is also consistent with the goals of both institutions to enhance university-community partnerships as evidenced by partnerships with the FSU College of Business, the FSU College of Medicine, the Charlotte E. Maguire and Tallahassee Memorial Healthcare Center for Clinical Simulation, and the Isabel Collier Read Medical Education Center. The BS-BME program is also congruent with the Florida Board of Governors' targeted degree programs. (See also Section I.D., above.)

BS-BME — Linkage to College and University Goals

Adding a BS degree in Biomedical Engineering will build upon the Department’s traditional strengths in undergraduate chemical engineering education. The BS degree in Chemical Engineering was initiated in 1984, and the MS and PhD degrees were established in 1987 and 1988, respectively. The proposed BS-BME undergraduate degree is a natural extension of the existing undergraduate major in biomedical engineering, and it will complement and act as a vital feeder for the existing graduate (MS and PhD) degrees in BME. The graduate BME degrees are focused on the investigation of cellular and biochemical transformations in natural and synthetic environments, as well as quantitative and multi-dimensional analysis of living systems by advanced analytical and imaging technology. Furthermore, the increased number of faculty required to implement the BS degree in Biomedical Engineering will impact undergraduate research, graduate research, and scientific output significantly by generating a critical mass in strategic areas of biomedical engineering.
FSU and FAMU have distinguished themselves by providing educational opportunities in STEM fields for minorities, non-traditional students, first-generation students, and veterans. By offering the curriculum in both Tallahassee and at the FSU Panama City campus, the program will provide access to post-secondary education to African-American, female, and veteran undergraduates, traditionally underrepresented groups in engineering fields. The proposed BS-BME program will provide additional opportunities for scholarship in biomedical engineering, thereby advancing evidence-based practices in the medical care arena.

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.

In 2015, the Social Mobility Index ranked FAMU number twelve in the nation in improving economic standing for underserved students (College Net, 2015). Sixty-eight percent of FAMU's freshman receive a Pell grant (College Net, 2015). Faculty specializing in biomedical engineering have received national recognition and federal funding from the National Science Foundation (NSF) and the National Institutes of Health (NIH), as well as private foundations.

The FAMU-FSU College of Engineering has recently completed renovations and construction, which resulted in the commissioning of a large biomedical engineering teaching laboratory along with equipment and infrastructure enhancements. Additional laboratories to support the program are planned. Faculty in the Department of Chemical and Biomedical Engineering have ongoing collaborative relationships with:

At FSU: the College of Medicine, the Institute of Molecular Biophysics, the National High Magnetic Field Laboratory, and the Departments of Biological Sciences, Chemistry, and Physics.
At FAMU: the College of Pharmacy and Pharmaceutical Sciences.
At the College of Engineering: the Departments of Electrical and Mechanical Engineering.
Outside the University: the Mayo Clinic in Jacksonville, FL.

FAMU and FSU have distinguished themselves by providing development opportunities for minorities, non-traditional students, first-generation students, and veterans. The proposed BS-BME program will complement existing programs by providing additional opportunities for scholarship in biomedical engineering thereby advancing evidence-based practices in the medical care arena.

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.

Through a series of meetings with university administration and faculty in varying engineering disciplines within the FAMU-FSU College of Engineering, the proposal to implement was developed for the new program. On December 14, 2004 the proposed development of a BS-BME program was added to the FAMU Strategic Plan. Nearly a decade later on April 4, 2014, WFSU news reported that FSU was developing a biomedical sciences degree in conjunction with the
College of Medicine. University administrators from FAMU and both the FSU Tallahassee and Panama City campus, faculty members from the FAMU-FSU College of Engineering and FSU College of Medicine, university committee members, and community members were involved in the review and approval for the new program. The student learning and program outcomes are congruent with ABET and will be incorporated into the university’s institutional effectiveness system and academic program review process. The student learning and program outcomes are discussed further in a following section.

### Planning Process

<table>
<thead>
<tr>
<th>Date</th>
<th>Participants</th>
<th>Planning Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 14, 2004</td>
<td>CBE Department faculty and outside ABET reviewer.</td>
<td>BS-BME added to the FAMU Strategic Plan.</td>
</tr>
<tr>
<td>November 8 – 10, 2009</td>
<td>CBE Department faculty and outside ABET reviewer.</td>
<td>ABET review of the Department of Chemical &amp; Biomedical Engineering.</td>
</tr>
<tr>
<td>April 4, 2014</td>
<td>FSU Provost Garnet Stokes.</td>
<td>FSU announces it is considering developing a degree in biomedical engineering in conjunction with the FSU College of Medicine.</td>
</tr>
<tr>
<td>October 4 – 6, 2015</td>
<td>CBE Department faculty and outside ABET reviewer.</td>
<td>ABET review of the Department of Chemical &amp; Biomedical Engineering.</td>
</tr>
<tr>
<td>June 1, 2016</td>
<td>Provost Sally McRorie, Associate Dean George Bishop, Assistant Dean Jennifer Scoggins-Polous at the Panama City campus.</td>
<td>Reaffirmation of permission to submit Proposal to Explore.</td>
</tr>
<tr>
<td>June 22, 2016</td>
<td>CBE Department Chair Teng Ma, Associate Professor &amp; CBE Graduate Coordinator Samuel C. Grant, Senior Research Associate Wright C. Finney, FSU Associate Vice President for Academic Affairs Bruce R. Locke, FSU Panama City Campus Assistant Dean Jennifer Scoggins-Polous.</td>
<td>Planning meeting at FAMU-FSU College of Engineering.</td>
</tr>
<tr>
<td>July 2016</td>
<td>CBE Department faculty.</td>
<td>BS-BME pre-proposal reviewed by Department Curriculum Committee and Chair.</td>
</tr>
<tr>
<td>July 1, 2016</td>
<td>J. Murray Gibson.</td>
<td>First day as Dean of the College of Engineering.</td>
</tr>
<tr>
<td>August 1, 2016</td>
<td>Randy Hanna.</td>
<td>First day as Interim Dean of the Panama City Campus and the College of Applied Studies, FSU Panama City Campus.</td>
</tr>
<tr>
<td>September 27, 2016</td>
<td>CBE Department Chair Teng Ma, Associate Professor &amp; CBE Graduate Coordinator Samuel C. Grant, Senior Research Associate Wright C. Finney, FSU Associate Vice President for</td>
<td>Detailed planning meeting at FAMU-FSU College of Engineering. Discussion of CAVP and Proposal to Explore.</td>
</tr>
<tr>
<td>Date</td>
<td>Event</td>
<td>Status</td>
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</tr>
<tr>
<td>September – October 2016</td>
<td>CBE Department BS-BME working group.</td>
<td>Draft versions of BS-BME CAVP Proposal.</td>
</tr>
<tr>
<td>October 25, 2016</td>
<td>CBE Department Curriculum Committee, College of Engineering Curriculum Committee, Associate Dean of the College of Engineering.</td>
<td>Final version of BS-BME CAVP Proposal reviewed by all parties and sent to the FSU and FAMU Provosts' Offices.</td>
</tr>
<tr>
<td>November 10, 2016</td>
<td>Provosts' Offices of FSU and FAMU.</td>
<td>Final version of BS-BME CAVP Proposal approved; authorization given to begin Proposal to Explore.</td>
</tr>
<tr>
<td>March 28, 2017</td>
<td>College of Engineering Curriculum Committee, Associate Dean of the College of Engineering.</td>
<td>Final version of BS-BME Proposal to Explore submitted and approved by College of Engineering.</td>
</tr>
<tr>
<td>April 12, 2017</td>
<td>FSU Undergraduate Policy Committee (UPC) and FAMU Provost's Office.</td>
<td>BS-BME Proposal to Explore presented to and approved by these offices.</td>
</tr>
<tr>
<td>April – May 2017</td>
<td>FSU Associate Vice President for Faculty Development and Advancement Jennifer Buchanan, Dean Julia Zimmerman, Assistant Vice President and SACSCOC Liaison Ruth Feiick and Assistant Vice President for Human Resources Renisha Gibbs.</td>
<td>FSU Vice President for Faculty Development and Advancement obtains sign-off on BS-BME Proposal to Explore by the Library, the SACS Liaison, and the Office of Equal Opportunity and Compliance.</td>
</tr>
<tr>
<td>May 2017</td>
<td>FSU Vice President for Faculty Development and Advancement, and by the FSU and FAMU Provosts.</td>
<td>BS-BME Proposal to Explore presented to and approved by these offices.</td>
</tr>
<tr>
<td>May 2017</td>
<td>State University System CAVP Workgroup.</td>
<td>BS-BME Proposal to Explore presented to and approved by SUS CAVP Workgroup.</td>
</tr>
<tr>
<td>June 6 – 7, 2017</td>
<td>FSU Board of Trustees.</td>
<td>BS-BME Proposal to Explore presented to and approved by FSU Board of Trustees.</td>
</tr>
<tr>
<td>June 2017</td>
<td>SUS Board of Governors.</td>
<td>Degree placed on SUS Board of Governors work plan. Begin approval process for the full Proposal to Implement (same steps as for the Proposal to Explore).</td>
</tr>
<tr>
<td>June – October 2017</td>
<td>CBE Department BS-BME working group.</td>
<td>Drafts of BS-BME Proposal to Implement.</td>
</tr>
<tr>
<td>November 2017</td>
<td>CBE Department Curriculum Committee.</td>
<td>BS-BME Proposal to Implement reviewed and approved by this office.</td>
</tr>
<tr>
<td>November 2017</td>
<td>FSU Vice President for Faculty Development and Advancement and FAMU Provost's Office.</td>
<td>BS-BME Proposal to Implement draft reviewed by these offices.</td>
</tr>
</tbody>
</table>
January 2018 | College of Engineering Curriculum Committee, and Dean of the College of Engineering. | BS-BME Proposal to Implement reviewed and approved by these offices.
---|---|---
January 2018 | FSU Vice President for Faculty Development and Advancement, and the FSU and FAMU Provosts' Offices. | BS-BME Proposal to Implement presented to and approved by these offices.
January 2018 | Undergraduate Policy Committee (Dean Karen Laughlin). | Review BS-BME Proposal to Implement.
January 2018 | Associate Vice President for Faculty Development Jennifer Buchanan, Dean Julia Zimmerman, Assistant Vice President and SACSCOC Liaison Ruth Feiock and Assistant Vice President for Human Resources Renisha Gibbs. | BS-BME Proposal to Implement Reviewed by Dean of University Libraries, SACSCOC Liaison and Equal Opportunity and Compliance.
February, 2018 | Florida State University Board of Trustees and FAMU Board of Trustees. | BS-BME Proposal to Implement presented to, reviewed, and approved by Florida State University Board of Trustees.
February 2018 | State University System Board of Governors Academic and Student Affairs Committee. | Request 120-hour exemption from the State University System Board of Governors Academic and Student Affairs Committee.

**Events Leading to Implementation**

<table>
<thead>
<tr>
<th>Date</th>
<th>Implementation Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 2017</td>
<td>Florida State University Board of Trustees</td>
</tr>
<tr>
<td>June 2017</td>
<td>Associate Vice President for Faculty Development informs Florida Board of Governors</td>
</tr>
<tr>
<td>December 2017</td>
<td>FAMU-FSU College of Engineering and Panama City campus prepare and submit 2017-2018 Budget Request</td>
</tr>
<tr>
<td>February 2018</td>
<td>Proposal to Implement approved by FSU and FAMU</td>
</tr>
<tr>
<td>Spring 2018</td>
<td>Curriculum Development</td>
</tr>
<tr>
<td>August 2018</td>
<td>BS-BME Courses Begin</td>
</tr>
</tbody>
</table>

The timetable for implementation of the BS-BME degree is as follows:
<table>
<thead>
<tr>
<th>Year</th>
<th>Start Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 0</td>
<td>Fall 2017</td>
<td>Advertisement of tenure-track and specialized faculty positions; specialized faculty hired (Spring 2018); staff hiring.</td>
</tr>
<tr>
<td>Year 1</td>
<td>Fall 2018</td>
<td>Program implementation; inaugural class enters program (sophomore year); first tenure-track faculty begin; first grad assistants.</td>
</tr>
<tr>
<td>Year 2</td>
<td>Fall 2019</td>
<td>Inaugural class begins junior year, additional faculty and grad assistant hiring.</td>
</tr>
<tr>
<td>Year 3</td>
<td>Fall 2020</td>
<td>Inaugural class begins senior year; additional faculty and grad assistant hiring.</td>
</tr>
<tr>
<td></td>
<td>Spring 2021</td>
<td>Inaugural class graduates; additional faculty and grad assistant hiring.</td>
</tr>
<tr>
<td>Years 4 &amp; 5</td>
<td>Fall 2021/22</td>
<td>Full complement of faculty, graduate assistants, and staff on-board.</td>
</tr>
</tbody>
</table>
VII. Program Quality Indicators - Reviews and Accreditation

A. 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.

1. Internal Reviews – SMALCS - ALCS

The Department of Chemical and Biomedical Engineering is committed to a process of continuous quality improvement, maintaining a process that began with the initial needs assessment for the proposed program. The initial planning included a review of the literature and comparisons of existing BS-BME programs in the State of Florida. The proposed program evaluation goals are to evaluate performance yearly in May as part of its overall outcomes assessment process. The Department of Chemical & Biomedical Engineering assessment of student outcomes will focus on performance indicators and implementation strategies. Program evaluation and student outcomes data will be reported annually (fall) during both universities' institutional effectiveness process SMALCS – FSU, and ALCS – FAMU). The data, analysis, and review will be used to gauge progress toward program goals.

The program must meet internal review requirements by the two universities every seven years per the Florida Board of Governors. The program will also be subject to two external reviews every seven years to meet the requirements of the regional accrediting body of both FAMU and FSU, the Southern Association of Colleges & Schools Commission on Colleges (SACS).

2. FSU Quality Enhancement Review (QER) and Graduate Policy Review (GPC) and FAMU Program Review in Chemical Engineering

Every seven years, the academic programs are jointly reviewed by both FAMU and FSU as part FSU’s Quality Enhancement Review (QER) and a Graduate Policy Review (GPC) and FAMU’s program review process. The Department of Chemical and Biomedical Engineering underwent its last QER-GPC review in 2011. The external reviewer was Dr. Timothy M. Wick, Professor and Chairman, Department of Biomedical Engineering, University of Alabama-Birmingham. The results of his exit report that pertain to Biomedical Engineering are as follows.

"The Department is excited about developing an ABET accredited BSBME Degree. This is clearly a growth area for FAMU/FSU and could strengthen collaborations with the School of Medicine. The Department is doing a good job evaluating the benefits of the program. It is important that other key departments and schools (Biology, Medicine, Chemistry, etc.) are involved in planning and implementation of the BSBME degree. The Dean and each of the Provosts need to ensure resources are available for the faculty hires (start-up funds, lab space), staffing, and instructional lab facilities necessary to implement a high-quality BSBME degree program within the department. As resources are invested to support growth of BME in the department, it will be important to maintain the strong scholarship and
expertise in chemical engineering. With increasing investment and enrollment in BME programs in the department, it will be important to maintain department cohesion, ensure that both chemical engineering and biomedical engineering remain strong, and develop a pedagogy that supports both degree programs within a single department."

"SWOT Analysis:

"Strengths: Active, engaged faculty and enthusiastic students. The student body is adequate for degree programs. Excellent racial and gender diversity among student body. Many strong research programs. Academic advising (both pre-engineering and within the Department) are excellent. Good offering of degrees and options (ChE, BME, MSE) supports department strengths and meets student demand. Planned expansion of degree programs (5 year BS-MS for domestic students, 3+2 BS-MS for foreign students, BSBME degree) are exciting options provided resources are available (e.g., new faculty, additional staff, appropriate research and teaching space, adequate student demand). The department is emerging as a 'force' in biomedical engineering.

"Weaknesses: .....Curricula for BS degree options (ChE, MSE, BME) are very similar (and rigid); the department should ensure that BME or MSE option graduates have competitive skills sets (for industry and graduate school) compared to BSBME or BSMSE graduates from competing programs.

"Opportunities: .....An ABET accredited BSBME degree can help the department grow significantly.

"The Department recognizes the limitation of a BME option within a Chemical Engineering BS program and proposes to develop an ABET accredited BSBME degree. As noted, biomedical engineering is a growth industry with high student demand. The number of BME programs (in the US and world-wide) and BME graduates has grown remarkably over the past two decades and it is expected to be an area of high job growth for at least the next decade. Clearly, this is an opportunity that the Department, College, and both university administrations should consider carefully. Addition of a BSBME degree program, while attractive, will require significant allocation of resources as noted in section 8—for new faculty (a minimum of 4-5 start ups and recurring faculty lines), additional staff, allocation of dedicated BME teaching labs and acquisition of necessary equipment, etc. Before moving forward, it is prudent to assess State-level support (and threats from potential new programs at other institutions) and the willingness of both the FAMU and FSU administrations to devote necessary new resources to the BSBME degree program. Additional key stakeholders need to be engaged early in the planning—including the FSU School of Medicine (as well as Biology, Physics, Chemistry, and other relevant departments and their Deans).

"The most successful BME programs (even at the undergraduate level) have strong
commitment and partnership (often including joint funding of faculty, shared space, etc.) from the Medical School. This will be critical to the success of BSBME programs at FAMU/FSU. Finally, alums and key industry leaders should be included in planning. Even with strong support from FAMU, FSU, the State of Florida, industry, and alums, success of the BME degree program will depend upon recruiting enough high-quality students with skills and abilities comparable to top BME programs. If students plan the BSBME as their terminal degree, placement becomes an issue without a well-defined local industry. As the prominence of BME degree and research programs grows within the Department (and especially if a separate BSBME degree is offered), it is imperative that the strength and viability of both BME and ChE academic and research programs are maintained. Recent heavy (but not exclusive) investment in BME (faculty hires, equipment, space) and greater student demand for the BME option puts the ChE research and academic programs at risk (lower student demand, greater ‘age’ of the ‘ChE’ faculty). It will be unfortunate if the chemical engineering academic and research programs atrophy because of a greater emphasis on the BME programs."

3. Accreditation Board for Engineering and Technology, Inc. (ABET) review of Chemical Engineering Program

The proposed program will be subject to external review by the Accreditation Board for Engineering and Technology (ABET). ABET is the national accrediting body for all engineering and technology academic programs. The Department plans to undergo an initial ABET review of the BS-BME program in 2021.

Shown below is the final statement of accreditation by the Accreditation Board for Engineering and Technology to the FAMU-FSU Department of Chemical and Biomedical Engineering Bachelor of Science Degree program in Chemical Engineering for the 2015-2016 accreditation cycle.

"The Accreditation Board for Engineering and Technology, Inc. (ABET)

"Final Statement of Accreditation to
Florida A&M Univ. - Florida State Univ. (FAMU-FSU), Tallahassee, FL
2015-2016 Accreditation Cycle

"August 15, 2016

"The Engineering Accreditation Commission (EAC) of ABET recently held its 2016 Summer Meeting to act on the program evaluations conducted during 2015-2016. Each evaluation was summarized in a report to the Commission and was considered by the full Commission before a vote was taken on the accreditation action. The results of the evaluation for Florida A&M University - Florida State University are included in the enclosed Summary of Accreditation Actions. The
Final Statement to your institution that discusses the findings on which each action was based is also enclosed.

"The policy of ABET is to grant accreditation for a limited number of years, not to exceed six, in all cases. The period of accreditation is not an indication of program quality. Any restriction of the period of accreditation is based upon conditions indicating that compliance with the applicable accreditation criteria must be strengthened. Continuation of accreditation beyond the time specified requires a reevaluation of the program at the request of the institution as noted in the accreditation action. ABET policy prohibits public disclosure of the period for which a program is accredited. For further guidance concerning the public release of accreditation information, please refer to Section II.A. of the 2015-2016 Accreditation Policy and Procedure Manual (available at www.abet.org).

"It is the obligation of the officer responsible for ABET accredited programs at your institution to notify ABET of any significant changes in program title, personnel, curriculum, or other factors which could affect the accreditation status of a program during the period of accreditation stated in Section 11.H. of the 2015-2016 Accreditation Policy and Procedure Manual (available at www.abet.org).

"ABET requires that each accredited program publicly state the program's educational objectives and student outcomes as well as publicly post annual student enrollment and graduation data as stated in Section 11.A.6. of the Accreditation Policy and Procedure Manual (available at www.abet.org).

"This statement is the final summary of the EAC evaluation. This statement consists of two parts: the first part of the statement addresses the institution and its overall engineering educational unit; the second part addresses the individual engineering programs. Its format allows the reader to discern both the original report findings and any subsequent progress made during due process.

"A program's accreditation action is based upon the findings summarized in this statement. Actions depend on the program's range of compliance or non-compliance with the criteria. This range can be construed in order of increasing severity:

- Observation
- Concern
- Weakness
- Deficiency

"Programs Reviewed: Chemical Engineering, BS Program

"(Program Criteria for Chemical, Biochemical, Biomolecular, and Similarly Named Engineering Programs)

"Introduction
"The chemical engineering BS program is administered by the Department of Chemical and Biomedical Engineering. The program has 17 full-time faculty members and 469 students enrolled. There were 63 graduates during the 2014-15 academic year.

"Program Strengths"

"1. In the last six years, the program has hired six new and replacement faculty. During this time, the number of graduates in an academic year has risen from 27 to 64. Institutional support for the program, enrollment in the program, and the program's ability to attract faculty are noteworthy.

"2. Through new faculty hires and course offerings, the program has established a biomedical option for students. One-third of chemical engineering students presently choose this option. This option provides students with new educational and career opportunities."

There were no Observations, Concerns, Weaknesses, or Deficiencies noted.

"Action:"
Accredit to September 30, 2022. A request to ABET by January 31, 2021 will be required to initiate a reaccreditation evaluation visit. In preparation for the visit, a Self-Study Report must be submitted to ABET by July 1, 2021. The reaccreditation evaluation will be a comprehensive general review."
VIII. Curriculum

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

The Department has identified the following three departmental educational objectives:
1. Successfully pursue careers in a wide range of industrial, professional and academic settings through application of their rigorous foundation in biomedical engineering and strong communication skills.
2. Successfully adapt and innovate to meet future technological challenges and evolving regulatory issues, while addressing the ethical and societal implications of their work at both the local and global level.
3. Successfully function on interdisciplinary teams and assume participatory and leadership roles in professional societies, and interact with educational, community, state, and federal institutions.

Program Student Quality

Program Outcome
At least 80% of the BS-BME program graduates will, within six months of graduation, be employed in industry, government, or public service, or enrolled in post-graduate or professional schools.

Assessment and Evaluation Process
The assessment and evaluation process will be used to ascertain that at least 80% of the full-time students completing the undergraduate degree program in Biomedical Engineering be employed or in post-graduate or professional schools within six months of graduation. This will be determined by several methods.

1. A Senior Exit Survey will be administered to all graduating BS-BME students. This survey requires a response to the question "plans after graduation". Statistics will be compiled from the Senior Exit Survey regarding post-graduation student outcomes.
2. Follow-up contact by the Department with BS-BME graduates using telephone, e-mail, and social media to ascertain employment or graduate/professional school status.
3. Initiate contact with alumni at conferences, trade shows, and employment fairs to update the Department's records regarding students' new business or university addresses.

Student Outcomes and Performance Indicators for the Program

1. Student Outcome #1 – Scientific Knowledge and Problem Solving.
   Outcome Definition
   Students graduating from the program will have an ability to identify, formulate, and solve complex engineering problems at the interface of engineering, biology, and medicine by applying principles of engineering, science, and mathematics.
   Assessment and Evaluation Process
   This will result in 80% of students receiving 70% or better on course examinations and
assignments in BME 4211 and BME 4323.

Performance Indicators

Students will have the following:

1. Knowledge of and the ability to apply the fundamentals of mathematics, including topics in differential and integral calculus, differential equations, multivariable calculus, and linear algebra;
2. Knowledge of and the ability to apply basic sciences, including calculus-based physics and general chemistry (including the laboratory);
3. Knowledge of and the ability to apply advanced chemistry including organic, physical, and analytical chemistry or biochemistry (including the laboratory);
4. The ability to apply the knowledge of chemistry, physics and mathematics to develop biomedical engineering process models that take into account constraints on the design (e.g., cost and safety).
5. The ability to analyze engineering problems, including open-ended biomedical processes, clearly identifying the problem and applying analytical, numerical and/or experimental techniques to obtain a solution.
6. The ability to evaluate proposed solutions based on specified criteria, and validation of results.

Implementation Strategies

1. Biomedical engineering graduates must successfully complete a core mathematics sequence of nineteen semester hours of courses, which stress fundamental principles and problem solving in differential, integral, and multivariable calculus, as well as differential equations of mathematics, all with a grade of C or better.
2. Biomedical engineering graduates must successfully complete a core sequence of courses which stress fundamental principles and problem solving in physical and organic chemistry and physics, including ten semester hours of physics, twelve semester hours of general chemistry and six semester hours of advanced chemistry, all with a grade of C or better.
3. Biomedical engineering graduates must complete a core biomedical engineering sequence of courses which stress fundamental principles and problem solving in the chemical and biomedical engineering disciplines of material and energy balances (ECH 3023 and ECH 3024), introduction to biomedical engineering (BME 3009), quantitative anatomy and systems physiology I & II (BME 4403C, BME 4404C), biomedical engineering computations (BME 3854), biomaterials (BME 3100), biomechanics (BME 4211), biodynamics and control with lab (BME 4323 & BME 4323L), cellular and tissue engineering with lab (BME 4332 & BME 4332L), and bioinstrumentation with lab (BME 4503 & BME 4503L).
4. Students will be required to practice problem-solving skills in classroom, laboratory, and examination situations.
5. Students will receive formal training in problem-solving methods and evaluation strategies.
6. Students will be assigned open-ended problems throughout the curriculum, including comprehensive projects in the capstone design course.

2. Student Outcome #2 – Design Skills

Outcome Definition

Students graduating from the program will have the ability to apply engineering design to produce a system, component, or process that meets specified needs within multiple realistic
constraints such as economic, environmental, public health and safety, welfare, manufacturability and sustainability while incorporating appropriate engineering standards.

**Assessment and Evaluation Process**

This will result in 80% of students receiving 70% or better on course examinations and assignments in BME 4604 and BME 4615.

**Performance Indicators**

Students will have the ability to:

1. Use mass and energy balances, quantitative anatomy and systems physiology, biomedical engineering computations, biomaterials, biomechanics, biodynamics and control, cellular and tissue engineering, and bioinstrumentation for the analysis, design, and control of biomedical engineering systems.
2. Analyze and synthesize biomedical engineering processes involving multiple operations.
3. Choose and implement an appropriate design approach, possibly requiring novel and innovative approaches.
4. Include constraints arising from economic, health and safety, ethical, environmental, and social considerations in designing systems, processes, and devices.
5. Evaluate the solution and iterate the design process, if necessary, to achieve required performance or optimize the solution.

**Implementation Strategies**

1. Students complete a set of core biomedical engineering courses in which they solve open ended, design-oriented problems in biomedical systems engineering.
2. Students take a capstone design course sequence in which they design biomedical engineering processes and devices, taking into consideration a variety of constraints (economic, health and safety, ethical, the environmental, social, etc.).

**3. Student Outcome #3 – Effective Communications**

**Outcome Definition**

Students graduating from the program will have the ability to communicate effectively with a range of audiences.

**Assessment and Evaluation Process**

This will result in 80% of students receiving 70% or better on laboratory reports in BME 4323L, BME 4332L, and BME4503L.

**Performance Indicators**

Students will have the ability to:

1. Prepare clear, concise, and accurate written documents (project reports, term papers, memos) which present, analyze, and interpret engineering information in a logical and well-organized manner, with the effective incorporation of diagrams, tables, and graphs.
2. Prepare and deliver clear, concise, and accurate oral presentations which present, analyze, and interpret engineering information in a logical and well-organized manner.

**Implementation Strategies**

1. Student write technical laboratory reports in biomedical engineering laboratory courses (BME 4403L, BME 4404L, BME 4323L, BME 4503L, and BME 4332L), which are evaluated for technical content as well as errors in spelling, punctuation, grammar, and usage.
2. Students prepare written reports in ECH 4504, BME 4604, BME 4615, and the elective courses, which are also evaluated for technical content as well as errors in spelling,
3. Students give technical oral presentations in at least three courses, including the biomedical engineering laboratory courses, which are graded for their technical accuracy and their use of effective presentation aids.

4. Student Outcome #4 – Professional and Ethical Responsibility

**Outcome Definition**

Students graduating from the program will be able to recognize ethical and professional responsibilities in formulating engineering solutions, and will be able to make informed judgements which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

**Assessment and Evaluation Process**

This will result in 80% of students receiving 70% or better on the writing and presentation assignments in BME 4604 and BME 4615.

**Performance Indicators**

Students will:

1. Demonstrate knowledge of the Biomedical Engineering Society (BMES) code of ethics.
2. Demonstrate an understanding of the ethical aspects of professional practices, and formulate strategies to deal with unethical situations.
3. Demonstrate professional excellence in all aspects of their work.

**Implementation Strategies**

1. Students are made aware of the Department, College of Engineering, and Universities' statements on the Academic Honor Code, and the Biomedical Engineering Society (BMES) code of ethics.
2. Faculty and practicing engineers address the students on the impact of biomedical engineering on society in a seminar course.
3. Student work is graded for neatness, completeness, and punctuality throughout the curriculum.
4. Students include a section in every laboratory or process design report that discusses relevant health, safety, and environmental issues.
5. Students are encouraged to participate in service projects.
6. Students with meritorious service accomplishments are recognized by departmental and college-wide awards.
7. Students are encouraged to develop professional responsibility through participation and leadership in various profession-related activities in professional organizations.

5. Student Outcome #5 – Teamwork

**Outcome Definition**

Students graduating from the program will have the ability to function effectively as a member or leader of a team that establishes goals, plans tasks, meets deadlines, and creates a collaborative and inclusive environment.

**Assessment and Evaluation Process**

This will result in 80% of students receiving 70% or better on course examinations and assignments in BME 4403C.

**Performance Indicators**

Students will:
1. Demonstrate effective teamwork and leadership skills, including the setting of objectives, development of strategy, division of responsibilities in consultation with other team members, preparation of a schedule, and implementation of a process to monitor and review progress.

2. Have a broad-based education that allows them to function on multi-disciplinary teams.

**Implementation Strategies**

1. Biomedical engineering graduates complete a core sequence of chemistry (CHM 1045 + L, CHM 1046 + L, CHM 3217, BCH 3023), and physics (PHY 2048C, PHY 2049C).

2. Biomedical engineering graduates work in formal groups in biomedical engineering laboratory courses (BME 4403L, BME 4404L, BME 4323L, BME 4503L, and BME 4332L). Each student assumes all of the roles in a team.

3. Biomedical engineering students have involvement in teams consisting of students from different areas within biomedical engineering (e.g., cellular, instrumentation, biomaterials, imaging) in the biomedical engineering laboratory and design courses, as well as students from different engineering fields.

6. **Student Outcome #6 — Biomedical Engineering Process Experimentation**

**Outcome Definition**

Students graduating from the program will be able to design and conduct biomedical engineering experiments, and analyze and interpret data of importance to the design and operation of biomedical processes.

**Assessment and Evaluation Process**

This will result in 80% of students receiving 70% or better on course examinations and assignments in BME 4404C.

**Performance Indicators**

Students will be able to:

1. Outline an experimental protocol to perform an experiment, given a general statement of the objectives;

2. Implement an experimental protocol to achieve stated objectives using a specific experimental apparatus;

3. Operate instrumentation and biomedical engineering process equipment and instrumentation.

4. Analyze and interpret experimental data to obtain relevant process or design information, including estimation of uncertainties in experimental measurements and calculated parameters.

**Implementation Strategies**

1. Students learn to follow experimental procedures in required laboratory courses in general chemistry (CHM 1045L, CHM 1046L), and general physics (PHY 2048L, PHY 2049L).

2. Students are introduced to statistical analysis of experimental data, including regression, error, and sensitivity analysis in process analysis (ECH 3301) and in biomedical engineering computations (BME 3854).

3. All students graduating from the biomedical engineering program are required to complete four laboratory courses (BME 4403L, BME 4404L, BME 4323L, and BME 4503L) with a grade of "C" or higher in each course. Learning activities in both courses include "hands on" lab experiments. Students must demonstrate, at a minimum, competence in each of three areas: (i) designing experiments, (ii) conducting experiments, and (iii) analyzing and
interpreting data.

4. Coursework provides, in most of the core courses in the curriculum, experience in working with analysis and interpretation of experimental data.

5. Students complete problems in biomaterials, biomechanics, cellular and tissue engineering, and bioinstrumentation requiring analysis of experimental data to select optimal system parameters and/or suggest further experiments to refine their choice.

6. In biodynamics and control (BME 4323 and BME 4323L), students learn techniques to estimate model parameters from experimental data, and also learn the design and operation of controllers for process equipment.

7. **Student Outcome #7 – Lifelong Learning**

   **Outcome Definition**
   
   Students graduating from the program will have an ability to recognize the ongoing need to acquire new knowledge, to choose appropriate learning strategies, and to apply this knowledge to engineering problems.

   **Assessment and Evaluation Process**
   
   This will result in 80% of students receiving 70% or better on teamwork component of BME 4604 and BME 4615.

   **Performance Indicators**
   
   Students will:
   
   1. Demonstrate an awareness of the dynamic, evolving nature of science and engineering and recognition of the need to keep abreast of knowledge and skills, as well as expand those skills to new areas.
   2. Demonstrate familiarity with a large range of information sources, and an ability to effectively retrieve data.
   3. Demonstrate an awareness of the professional and technical resources that are available, including professional and technical societies and continuing education courses.

   **Implementation Strategies**
   
   1. Students are assigned problems and projects that require the use of a variety of informational resources including text and reference books, scientific and technical journals, the World Wide Web, and online databases.
   2. Students are made aware of the professional and technical resources available to them through professional and technical societies, and continuing education courses.
   3. Students are provided with examples and perspective of historical progression of theoretical and experimental approaches.
   4. Students attend seminars that contrast industrial approaches to classroom approaches.
   5. Students complete open-ended design problems that require independent learning.

The Academic Learning Compact for the BS Degree in Biomedical Engineering is shown in Appendix D.
B. Describe the admission standards and graduation requirements for the program.

General Admissions Procedure

This section describes the admissions procedures for a student applying either as a first-time-in-college (FTIC) student or transferring from another college or university to the Department of Chemical and Biomedical Engineering, FAMU-FSU College of Engineering, Florida State University and Florida A&M University. In the State of Florida, prospective students are admitted to post-secondary studies at the university level. Admissions decisions are made at the university level based on many academic and other factors. Entering students indicate their intended academic discipline on their application, but since engineering is not a limited access program at either university, this has no bearing on student admissions.

University Admissions

The FAMU-FSU College of Engineering is jointly shared between two universities — Florida A&M University (FAMU) and Florida State University (FSU). Prospective students should first choose which university through which to apply, because their degree will be granted by one of the two universities. Information about the two universities is available at their web sites: www.fsu.edu (FSU) and www.famu.edu (FAMU); students should make their decision based on the proffered information. Once a decision on the university has been made, prospective students should access admissions information from a link on the main university web pages entitled "Admissions". Students can apply for admission to the universities in the Fall, Spring, or Summer Terms, but special attention should be paid to the admissions deadlines, which should be posted on the web sites.

If a prospective student is applying as an entering freshman (FTIC), the Admissions Office at the applicable university will evaluate their admissions application, high school transcript, standardized test scores, and other documentation to make a decision on admissibility. If the student has transfer credit from another college or university, their official transcript will be evaluated by the Office of Transfer Credit Evaluation at FSU or the Admissions Office at FAMU to determine any applicable transfer credits from other schools. AP and CLEP credit will also be noted in the admissions file. College-level courses that may have been previously taken in subjects such as math, chemistry, physics, computer programming, English, history, humanities, etc., are normally accepted by both FAMU and FSU in accordance with the Statewide Common Course Numbering System.

College of Engineering Admissions

General information about the FAMU-FSU College of Engineering can be found at www.eng.famu.fsu.edu. Neither the FAMU-FSU College of Engineering nor the Department of Chemical and Biomedical Engineering have specific undergraduate admission requirements over and above that required by the two universities.

Upon being accepted to either university, if a student expresses an interest in biomedical engineering their records will be sent to the College of Engineering. First-time-in-college (FTIC)
students have the ability to declare their intended course of study as "Pre-Biomedical Engineering". Until these students meet the pre-engineering requirements of the College of Engineering, they will remain in this major. In contrast, the universities forward all transfer students' transcripts to the College for evaluation. The Office of the Associate Dean for Student Affairs and Curriculum will evaluate transfer student transcripts and make a decision on whether to accept or deny these students. Again, all accepted transfer students will be initially coded as "Pre-Biomedical Engineering" majors until they meet the College pre-engineering retention requirements. Students will remain pre-engineering until they have met the pre-engineering requirements shown below.

College of Engineering Pre-Engineering Requirements

Biomedical engineering students admitted into the program will be subject to a uniform set of academic requirements established by the college and approved by both Florida A&M University and Florida State University. All first-year engineering students (first year in college or first-year transfer students) admitted into the CBE program are initially classified as Pre-engineering program majors until they satisfy the following pre-engineering requirements. The requirements to change majors from Pre-Engineering to Biomedical Engineering are:

- Students must have an overall GPA of 2.0 or better and achieve a grade of "C" or better, from any institution attended, in First Year Engineering Laboratory, Calculus I, Calculus II, and General Chemistry I to be admitted to an engineering major.
- A single repeated attempt in only one of the four (4) courses listed above with no more than one grade of "C-" is allowed.
- Pre-engineering students are strongly encouraged to contact an academic advisor prior to enrolling in any of the four pre-engineering courses to ensure they have completed the proper course prerequisites.

CBE Department – Declaration of Major

After a pre-engineering student satisfies all of the pre-engineering requirements listed above, they may initiate a change from "Pre-Biomedical Engineering" status to a major within the BS degree program in Biomedical Engineering. To help them decide whether the field of biomedical engineering is right for them, students can access a wealth of information at the Biomedical Engineering Society's web site at www.bmes.org. The US Department of Labor Statistics Occupational Outlook Handbook (http://www.bls.gov/ooh/) also has information pertaining to the field of biomedical engineering.

The Department of Chemical and Biomedical Engineering web site is www.eng.fsu.famu.edu/cbe. The current BS program curriculum and course checklist are available on the Department's web site as downloadable files. Prospective and current students can peruse these documents to get an idea of what courses may transfer here and count towards their BS degree. For freshmen, a BS degree in Biomedical Engineering will take about four to five years (plus summers) to complete, depending upon AP, CLEP, and transfer credits.
Curriculum Guide and Course Checklist

A chronological curriculum guide (semester-by-semester course listing) and course checklist (organized along functional course groupings) are utilized by faculty advisors to ensure that each student follows university, College of Engineering, and Department of Chemical and Biomedical Engineering requirements. Separate tables contain the procedure in selecting elective areas and specified courses as well as the course prerequisites and co-requisites. These tables are accessible to faculty and students on the Department's web site, and blank paper copies of the checklists are kept in the reception area of the CBE Main Office. The curriculum for the Bachelor of Science degree in Biomedical Engineering is shown graphically in Section D of this section.

Graduation Checklist

Shown below are graduation checklists for 1) the Department of Chemical & Biomedical Engineering and the FAMU-FSU College of Engineering, and 2) Florida State University and Florida A&M University.

Table VIII.B.1. Graduation Checklist for the BS Degree in Biomedical Engineering

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Official College/Department date upon declaring major in the Dept. of Chemical and Biomedical Engineering.</td>
<td></td>
</tr>
<tr>
<td>2. Biomedical Engineering GPA – 2.0 for 65 credit hours of ChE-BME courses.</td>
<td></td>
</tr>
<tr>
<td>3. Biomedical Engineering &quot;C&quot; Rule – No &quot;Ds&quot; will count in any Biomedical Engineering course.</td>
<td></td>
</tr>
<tr>
<td>4. Mathematics – 13 credit hours.</td>
<td></td>
</tr>
<tr>
<td>5. Basic Science – 27 credit hours.</td>
<td></td>
</tr>
<tr>
<td>6. General Education – 33 credit hours in English, mathematics, science, history, social science, and humanities (or AA).</td>
<td></td>
</tr>
<tr>
<td>7. Core Biomedical Engineering courses – 50 credit hours.</td>
<td></td>
</tr>
<tr>
<td>8. Elective Biomedical Engineering courses – 19 credit hours.</td>
<td></td>
</tr>
<tr>
<td>9. College of Engineering Graduation Check – Student–academic advisor meeting.</td>
<td></td>
</tr>
</tbody>
</table>

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Table VIII.B.1.  Graduation Checklist for the BS Degree in Biomedical Engineering
Florida State University and Florida A&M University Requirements

<table>
<thead>
<tr>
<th>#</th>
<th>Requirement</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>University Matriculation Date – Date of first term at FSU or FAMU.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Total Number of Credit Hours – 131 credit hours.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Overall GPA – 2.0 for 131 degree credit hours.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Upper Division Status – Yes / No.</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>CLAST Passed – Yes / No.</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Summer Residency Requirement – Must take 9 credit hours during one or more summer terms at one of the twelve (12) state universities in Florida.</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>University Graduation Check (FSU) – Student must request online a university Registrar graduation requirement check at 100 credit hours.</td>
<td></td>
</tr>
</tbody>
</table>
C. Describe the curricular framework for the proposed program, including number of credit hours and composition of required core courses, restricted electives, unrestricted electives, thesis requirements, and dissertation requirements. Identify the total numbers of semester credit hours for the degree.

The total number of semester credit hours needed to obtain the BS degree in Biomedical Engineering degree will be 131. Core courses in subjects such as Biothermodynamics, Biotransport Phenomena, BME Computations, Biomaterials, Biomechanics, Bioinstrumentation, and Cellular and Tissue Engineering will provide a strong educational foundation in biomedical engineering. In addition to the core courses common to the BS-BME degree, students may choose from a number of elective courses to focus on areas of interest to their eventual career goals. Students currently majoring in Biomedical Engineering within the BS degree in Chemical Engineering should be able to avoid losing any credit if their transition to the BS-BME program is done before their junior year.

Students working toward the BS-BME degree will elect to follow one of three possible majors – Cell & Bioprocess Engineering, Biomaterials & Biopolymers Engineering, or Image & Signal Process Engineering. The motivation for separating the BS-BME degree into majors is to allow students to build depth in one of three major areas within the field of biomedical engineering. Most other universities offering a BS degree in Biomedical Engineering delineate their program into several tracks corresponding to the three majors proposed here.

Thirteen (13) new core BME courses will be developed as needed for the rising classes of the Biomedical Engineering degree. Additional elective and/or special topics courses will be developed; four (4) are shown. Three (3) core and two (2) elective courses are currently taught as part of the major in Biomedical Engineering. In Year 1, one tenure-earning faculty and one multi-year contract faculty will join the Department. These new faculty will focus on developing the new courses needed for the rising junior class. In Year 2 and beyond, additional tenure-earning and multi-year contract faculty will be hired to develop the senior-level core and elective courses.

The new and existing courses planned for the proposed BS Degree in Biomedical Engineering are:

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<td>Quantitative Anatomy and Systems Physiology I</td>
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<td>Mass and Energy Balances I</td>
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<td>Mass and Energy Balances II</td>
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<tr>
<td>ECH 3301</td>
<td>Process Analysis and Design</td>
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</table>

Subtotal, existing core for all majors: 20

*4. For the major in Cell & Bioprocess Engineering:
ECH 4504 – Kinetics and Reactor Design

*5. For the major in Biomaterials and Polymers Engineering:
ECH 4823 – Polymer Science and Engineering
## Elective Courses (existing)

<table>
<thead>
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<th>Credit Hours</th>
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<td>2</td>
<td>BME 4082</td>
<td>Biomedical Engineering Ethics</td>
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<tr>
<td>3</td>
<td>BME 4904r</td>
<td>Undergraduate Research Project</td>
<td>(1-3 per term)</td>
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<td>4</td>
<td>BME 4906r</td>
<td>Honors in Biomedical Engineering</td>
<td>(1-3 per term)</td>
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<tr>
<td>5</td>
<td>BME 4937r</td>
<td>Special Topics in Biomedical Engineering</td>
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<tr>
<td>6</td>
<td>ECH 4743</td>
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(Total of 3 courses, 9 credit hours required)

## Core Courses (new)

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<td>BME Computations</td>
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<td>BME 4332</td>
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Subtotal, core                                      34

## Elective Courses (new)

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<td>Elective – NMR-MRI</td>
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<td>Elective – Cell Engineering</td>
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(Total of 3 courses, 9 credit hours required)

Total New Courses (17)                                46
D. Provide a sequenced course of study for all majors, concentrations, or areas of emphasis within the proposed program.

The 2017-2018 curriculum guides for the three majors 1) Cell & Bioprocess Engineering, 2) Biomaterials and Polymers Engineering, and 3) Imaging and Signal Processing Engineering within the proposed BS Degree in Biomedical Engineering are shown below. The first set of curriculum guides are for FTIC students or those transferring to FSU or FAMU within the first year of college. The second set of curriculum guides are for students transferring to FSU or FAMU with an AA degree and having taken all prerequisite basic science and math courses prior to matriculating.

Curriculum Guides Listing, in order:

1. FTIC – Cell & Bioprocess Engineering Majors
2. FTIC – Biomaterials and Biopolymers Engineering Majors
3. FTIC – Imaging and Signal Processing Majors
4. AA Transfers – Cell & Bioprocess Engineering Majors
5. AA Transfers – Biomaterials and Biopolymers Engineering Majors
6. AA Transfers – Imaging and Signal Processing Majors
## 2017-2018 Curriculum Guide
### BS Degree in Biomedical Engineering
131 Credit Hours
Florida State University and Florida A & M University
**FTIC - Cell & Bionprocess Majors**

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<td>CHM 1046 - Gen Chemistry II</td>
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### SOPHOMORE YEAR (2ND)

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### SENIOR YEAR (4TH)

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</table>

### Key:
- New courses that need to be created
- Courses for which there are some existing options

1. Students taking MAC 1105, MAC 1114, and/or MAC 1140 as prerequisites to MAC 2311 should take a math course every term (including summers) until completing the math sequence.
2. History, Social Science, and Humanities electives are to be selected to satisfy the Liberal Studies or General Education requirements. See the Checklist (reverse side) for details. Two (2) courses must include a writing "W" designation. The Liberal Studies courses taken must include one course with an "a" designation and one course with a "y" designation.
3. Most courses shown in the Freshman and Sophomore years of this Guide are also taught during the Summer terms, during which students are encouraged to make up missed classes. Nine (9) hours of summer credit must be taken at one of the twelve state universities in Florida sometime during the college career.
4. See approved Biomedical Engineering electives on reverse side.
<table>
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<tr>
<th></th>
<th>FRESHMAN YEAR (1ST)</th>
<th>SOPHOMORE YEAR (2ND)</th>
<th>JUNIOR YEAR (3RD)</th>
<th>SENIOR YEAR (4TH)</th>
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</table>

**Key:** New courses that need to be created  
Courses for which there are some existing options

1 Students taking MAC 1105, MAC 1114, and/or MAC 1140 as prerequisites to MAC 2311 should take a math course every term (including summers) until completing the math sequence.

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4 See approved Biomedical Engineering electives on reverse side.

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## BS Degree in Biomedical Engineering

### 2017-2018 Curriculum Guide

**Florida State University and Florida A & M University**

**FTIC - Imaging & Signal Processing Majors**

**131 Credit Hours**

### FRESHMAN YEAR (1ST)

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>15</th>
<th>Fall Semester</th>
<th>16</th>
<th>Fall Semester</th>
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<td>BME 4XXX - BiosignalsSysProc</td>
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### Key: New courses that need to be created

| Courses for which there are none existing options |

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## 2017-2018 Curriculum Guide
### BS Degree in Biomedical Engineering
#### Florida State University and Florida A & M University
##### AA Transfers - Imaging & Signal Processing Majors

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

The courses in the proposed BS-BME degree program will provide instruction consistent with the standards of ABET and BMES. The proposed BS-BME curriculum is comprised of the following courses:

**Existing Core Courses**

**BME 3009. Introduction to Biomedical Engineering (3).**
Prerequisites: BSC 2010, MAC 2312, and PHY 2048C, all with a grade of "C" or higher. Corequisites: ECH 3024, ECH 3301, MAC 2313, and PHY 2049C. This course presents an introduction to the field of biomedical engineering, building on previous basic coursework in biological science, physics, and calculus. Topics in cell physiology and modeling, bioinstrumentation, biomaterials, tissue engineering, and bioimaging are covered. The course provides sophomore-level biomedical engineering students with both fundamentals and applications in contemporary biomedical science and engineering.

**BME 4403C. Quantitative Anatomy and Systems Physiology I (3).**
Prerequisites: CHM 3217, [BME 3009, ECH 3024, and ECH 3301, all with a "C" grade or higher], PHY 2049C. Co-requisites: BME 3266; BME 3854; BME 4503; and BME 4503L. This course introduces engineering students to engineering principles of the anatomy and physiology of the human body. The lecture portion of the course focuses on relating fundamental biomedical engineering concepts to the human physiological system. The laboratory portion of the course involves a practical, in-depth study of the physical and chemical interrelationships in the form and function of all human anatomical and physiological subsystems.

**BME 4404C. Quantitative Anatomy and Systems Physiology II (3).**
Prerequisites: BME 3266, BME 3854, BME 4403, BME 4503, BME 4503L. Corequisites: BME 3100, BME 3101, and BME 4211. This course focuses on introducing fundamental concepts of anatomy and physiology of the human nervous, digestive, and urinary systems, quantitative aspects of systems, and scientific principles underlying the systems, diseases and disorders of systems, and biomedical engineering techniques related to the systems.

**ECH 3023. Mass and Energy Balances I (3).**
Prerequisites: CHM 1046, MAC 2312. Corequisites: CHM 2210, MAC 2313, PHY 2048C. This course is the first in a two-part sequence introducing the general concepts of chemical engineering. This course covers mass and energy balances related to chemical process systems and measurements, as well as to the development of problem-solving methodologies in mass and energy balances.

**ECH 3024. Mass and Energy Balances II (4).**
Prerequisites: CHM 2210, ECH 3023, MAC 2313, PHY 2048C. A "C" grade is required in the prerequisite course ECH 3023. Corequisites: BSC 2010, ECH 3301, PHY 2049C. This course is the second in a two-part sequence introducing the general concepts of chemical engineering. In this course, the applications of mass and energy balances are extended to include reactive systems, and systems undergoing phase changes as well as transient processes.
Computational tools such as Excel and MATLAB will be used to demonstrate the use of a structured programming language for material and energy balances.

**ECH 3301. Process Analysis and Design (4).**
Prerequisites: MAC 2312. Corequisites: ECH 3023, MAC 2313.
Development of process models for equilibrium and dynamic systems including stagewise processes that arise in chemical engineering applications, and their analysis using exact and approximate techniques.

**Existing Elective Courses**

**BME 4007. Biomedical Engineering (3).**
Prerequisites: BME 3100, BME 3101, BME 4211, and BME 4403L. Corequisite: BME 4604.
This course introduces the major principles of the life sciences (microbiology, cell biology, and genetics) that are important for biomedical engineering applications. The application of the chemical engineering principles of kinetics, mass transport, bioreactor design, and separation processes to solve the important problems in the biomedical engineering are emphasized.

**BME 4082. Biomedical Engineering Ethics (3).**
Prerequisites: BME 3100, BME 3101, BME 4211, and BME 4403L. Corequisite: BME 4604.
This course is an introduction to the key theories, concepts, principles, and methodology relevant to the development of biomedical engineering professional ethics. The student is facilitated in his/her development of a code of professional ethics through written work, class discussion and case analysis.

**BME 4904r. Undergraduate Research Project (1–3).**
Prerequisites: BME 3266, BME 3854, BME 4403, BME 4503, BME 4503L, a 3.0 GPA, and instructor permission. Corequisites: BME 3100, BME 4211, and BME 4403L.
This course involves the completion of the Undergraduate Research Program (URP) for six hours with a minimum grade of "C". This program requires independent student research on a topic relevant to biomedical engineering and may be used to satisfy the Biomedical Engineering Elective requirement. May be repeated to a maximum of six semester hours.

**BME 4906r. Honors in Biomedical Engineering (1–3).**
Prerequisites: BME 3266, BME 3854, BME 4403, BME 4503, BME 4503L, a 3.2 GPA, and instructor permission. Corequisites: BME 3100, BME 4211, and BME 4403L.
This course involves the completion of an Honors Research Program (Honors-URP) for six hours with a minimum grade of "C". This program requires independent student research on a topic relevant to biomedical engineering and may be used to satisfy the Biomedical Engineering Elective requirement. May be repeated to a maximum of six semester hours. May be repeated within the same semester.

**BME 4937r. Special Topics in Biomedical Engineering (3).**
Prerequisites: BME 3100, BME 3101, BME 4211, and BME 4403L. Corequisite: BME 4604.
This course emphasizes recent developments in the field of biomedical engineering. Selected readings are assigned by the instructor. Structure of the course varies by instructor and topic, but
generally involve lectures and a final project on a topic in biomedical engineering. May be repeated to a maximum of twelve semester hours.

**BME 4937r. Special Topics in Biomedical Engineering – Interdisciplinary Design Project (3).**
Prerequisites: BME 3100, BME 3101, BME 4211, and BME 4403L. Corequisite: BME 4604.
The course allows students to demonstrate and apply engineering principles learned throughout their undergraduate coursework. Working as a multidisciplinary team, students will use their cumulative knowledge to design, implement, and test a feasible engineering solution for a relevant medical application. The course includes human-centered design processes and incorporates all necessary aspects of design, such as problem solving, ethics, safety, control and management, technical writing, and oral communication. Culmination of the 2-course sequence is participation in the Engineering Design Day competition in the spring semester. May be repeated to a maximum of twelve semester hours.

**ECH 4743. Bioengineering (3).**
Prerequisites: BME 3100, BME 3101, BME 4211, and BME 4403L. Corequisite: BME 4604.
This course introduces chemical engineering students to the major principles of life sciences that are important for biotechnological applications, and extends and applies the students' knowledge of the chemical engineering principles of kinetics, mass transfer, separation, purification, and characterization to important problems in bioprocess engineering.

**New Common Core Courses (proposed)**

**BME 3100. Biomaterials (3).**
Prerequisites: BME 3266, BME 3854, BME 4403, BME 4503, BME 4503L. Corequisites: BME 3100, BME 4211, and BME 4403L.
This course introduces fundamental concepts and properties of different types of biomaterials to undergraduate engineering students. It will also give the overview of biomaterials characterization methods and the use for drug delivery and transplantation. This course will covers biomedical applications of the major classes of biomaterials including polymeric, ceramic, metallic, composite, hydrogels and biological materials.

**BME 3101. Biothermodynamics (3).**
Prerequisites: BME 3266, BME 3854, BME 4403, BME 4503, BME 4503L. Corequisites: BME 3100, BME 4211, and BME 4403L.
This course covers the fundamental principles of thermodynamics, energy balances and conversion, and their applications to biochemical, cellular, and physiological function. In addition, the principles of chemical kinetics of biochemical reactions and metabolic reaction networks will be addressed.

**BME 3266. Biotransport Phenomena (3).**
Prerequisites: CHM 3217, [BME 3009, ECH 3024, and ECH 3301, all with a "C" grade or higher], PHY 2049C. Co-requisites: BME 3854, BME 4403, BME 4503, and BME 4503L.
This course presents the fundamental concepts of convective and diffusive transport phenomena in biological systems, and to apply these concepts to the solution of problems relevant to
biomedical engineering. The focus will be on developing and applying balance equations for conservation of momentum, energy and mass in biological systems. Biofluid mechanics, mass transport, and biochemical reactions will be covered contextually within functional biological and/or biomedical systems. Biotransport processes will be examined across a wide range of spatial scales, from molecular to organismal.

**BME 3854. BME Computations (4).**
Prerequisites: CHM 3217, [BME 3009, ECH 3024, and ECH 3301, all with a "C" grade or higher], PHY 2049C. Co-requisites: BME 3266; BME 4403; BME 4503; and BME 4503L.
This course presents the structured programming techniques and numerical techniques useful in the solution of biomedical engineering problems, such as root finding techniques, direct and iterative approaches to solve linear systems, linear and nonlinear regression, interpolation, numerical differentiation and integration, statistical analysis of data; numerical solutions of ordinary differential equations. Applications from physiological, cell, and molecular systems are used.

**BME 4211. Biomechanics (3).**
Prerequisites: BME 3266, BME 3854, BME 4403, BME 4503, BME 4503L. Corequisites: BME 3100, BME 4211, and BME 4403L.
The course will provide an overview of the mechanical behavior of biological tissues and living systems. The mechanical properties of biological materials and its influence on the structure and function of living systems will be introduced. Methods for the analysis of both rigid body and deformational mechanicals will be presented as they apply to biological tissues including bone, muscle, and connective tissues. The course will also introduce the methods of continuum mechanics to biomechanical phenomena at the cellular to tissue or organ level.

**BME 4323. Biodynamics and Control (3).**
Prerequisite: BME 4604. Corequisites: BME 4615.
This course discusses the mathematical analysis evaluating dynamic and linear feedback control systems. Emphasis will be on application to physiological systems, physiological transport, pharmacokinetics, glucose/insulin control, and respiratory control. Performance criteria. Root locus, Nyquist, and other stability criteria. State space analysis with state variable feedback control. Design and compensation. Computational methods for anatomical modeling and boundary value problems in the biomechanics of tissues and biomedical devices. Nonlinear biodynamics, heat flow, cardiac impulse propagation, anatomic modeling, and biomechanics are discussed in addition to signal processing and systems analysis.

**BME 4323L. Biodynamics and Control Lab (1).**
Prerequisite: BME 4604. Corequisites: BME 4615.
The Biodynamics and Control laboratory will reinforce the lectures of BME 4323 by evaluating and developing tools to rationally design and implement multiscale, closed-loop control of biological systems through the development of biological controllers, testbeds to evaluate control of system-level behavior, and theory and models to predict and design effective control strategies. The resulting capabilities will be generalizable to a variety of biological systems.
BME 4503. Bioinstrumentation (3).
Prerequisites: CHM 3217, [BME 3009, ECH 3024, and ECH 3301, all with a "C" grade or higher], PHY 2049C. Co-requisites: BME 3266, BME 3854, BME 4403, and BME 4503L.
This course covers the principles, applications, and design of the medical instrumentation most commonly used in research and clinical settings, with a focus on the fundamental principles of operation and general types of equipment. Biomedical transducers for measurements of movement, biopotentials, pressure, flow, concentrations, and temperature are discussed, as well as treatment devices covering a variety of healthcare industry applications.

BME 4503L. Bioinstrumentation Lab (1).
Prerequisites: CHM 3217, [BME 3009, ECH 3024, and ECH 3301, all with a "C" grade or higher], PHY 2049C. Co-requisites: BME 3266, BME 3854, BME 4403, and BME 4503.
This laboratory course accompanies the Bioinstrumentation lecture course (BME 4503) and provides hands on interaction, design, and measurement with biomedical transducers. Students perform experiments with existing medical instrumentation while designing and implementing new designs relevant to the material discussed in lecture.

BME 4801. Biomedical Engineering Process Design I (3).
Prerequisites: BME 3100, BME 3101, BME 4211, and BME 4403L. Corequisite: BME 4604.
This course is the first of a two-semester sequence on the design of biomedical engineering processes and products. The first semester consists of introducing students to the principles of engineering economics and cost estimation techniques relating to principles of biomedical engineering design. Included is an introduction to computer-aided design calculations.

BME 4802. Biomedical Engineering Process Design II (3).
Prerequisite: BME 4604. Corequisites: BME 4323, BME 4323L.
This course is the second of a two-semester sequence on the design of biomedical engineering processes and products. The second term focuses on the actual design of a biomedical engineering process or product using computer-aided design calculations. This is the capstone senior design course in biomedical engineering. An individual design project is completed by each student.

New Major-Specific Core Courses (proposed)

BME 4332. Cellular & Tissue Engineering (3).
Prerequisites: BME 3100, BME 3101, BME 4211, and BME 4403L. Corequisite: BME 4332L, BME 4604.
The overall objective of this course is to gain understanding of the basic principles of cellular and tissue engineering in different biomedical systems. The course will then apply cellular and tissue engineering principles to solve problems in human health, biomedicine, and related engineering processes. The focus will be on cellular growth and differentiation, tissue morphogenesis at molecular, cellular and tissue and organ levels, characterization tools, oxygen transfer, and tissue engineering biomaterials and bioreactors.

BME 4332L. Cellular & Tissue Engineering Lab (1).
Prerequisites: BME 3100, BME 3101, BME 4211, and BME 4403L. Corequisite: BME 4332, BME 4604.
The overall objective of this course is to gain understanding of the basic principles of cellular and tissue engineering in different biomedical systems. The lab portion will provide the students with hands-on experience in cellular culture, cell-biomaterials interactions, and bioreactor systems.

BME 4XXX. Medical Imaging (3).
Prerequisites: BME 3100, BME 3101, BME 4211, and BME 4403L. Corequisite: BME 4604.
This course provides an in depth and quantitative analysis of the engineering and physics behind modern biomedical imaging modalities applied in current clinical practice. The course covers x ray, computed tomography, ultrasound, positron emission tomography and magnetic resonance imaging. Beyond discussion of the principles of resolution, contrast and signal to noise applied to each of these modalities, the course will cover the physics, instrumentation and mathematics unique to these frontline medical imaging approaches while discussing respective advantages and disadvantages for use in medicine.

BME 4XXXL. Medical Imaging Lab (1).
Prerequisites: BME 3100, BME 3101, BME 4211, and BME 4403L. Corequisite: BME 4604.
The following is the companion laboratory course for Medical Imaging lecture. Provides students with hands-on activities relevant to biomedical imaging in a clinical setting.

New Elective Courses (proposed)

BME 4937. Neural Engineering (3).
Prerequisites: BME 3100, BME 3101, BME 4211, and BME 4403L. Corequisite: BME 4604.
Neural engineering is the application of engineering principles and techniques to the understanding and repairing of the injured, diseased or degenerated human nervous system. This course teaches students to understand pathology of the major injuries/diseases/disorders of the human nervous system, and the underlying mechanisms of the engineering techniques for diagnosing and treating the injuries/diseases/disorders.

BME 4937. Clinical MR Imaging and Spectroscopy (3).
Prerequisites: BME 3100, BME 3101, BME 4211, and BME 4403L. Corequisite: BME 4604.
This course investigates MR imaging and spectroscopy methods that are utilized in biomedical applications. The course will employ spin physics, the Bloch equations, operator notation, and k-space sampling to develop an understanding of these techniques. Emphasis will be placed on utilizing engineering principles and mathematics to modify basic MR methods to address pertinent biomedical issues of bioimaging, medical diagnostics, and physiological quantification.

BME 4937. Prosthetics (3).
Prerequisites: BME 3100, BME 3101, BME 4211, and BME 4403L. Corequisite: BME 4604.
This course emphasizes the applications of mechanics to describe the material properties of living tissues in interaction with prosthetics. It is concerned with the description and measurements of properties as related to physiological functions with an emphasis on the interrelationship between biomechanics and physiology in medicine, surgery, body injury, and prostheses. Topics covered include: mechanics, stress, strain, constitutive equations and the field equations, viscoelastic behavior, and models of material behavior. The focus of the course is on the measurement and characterization of properties of tendons, skin, muscles, and bone as related to body injury and the

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design of prosthetic devices.

BME 4937. Genetic Engineering (3).
Prerequisites: BME 3100, BME 3101, BME 4211, and BME 4403L. Corequisite: BME 4604.
This course will introduce modern techniques for genetic engineering with a focus on cutting edge molecular engineering. The course will cover the basics of genetic engineering, the methodology of gene manipulation, and the implications of genetic engineering with specific additional topics covered by guest lecturers. Students will learn to gather genetic information and design DNA constructs.

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

Every spring, the Chemical and Biomedical Engineering External Advisory Board meets at the College of Engineering to discuss the progress of the Department towards its goals. The Departmental Advisory Board has been very helpful in providing advice on a) strategic planning, b) exploring avenues to providing sponsorship for a seminar series or lectureship, c) the Department Research Day, which highlights department graduate student research, d) outreach activities, and e) faculty awards for both junior and senior faculty. Increased board involvement in the student educational experience is planned through industrial internships, sponsored student awards to top undergraduates (best seniors, best senior design project, best senior honors research thesis, etc.), sponsored senior design projects, and sponsored student field/plan trips or conferences. The board also gives input into proposed curriculum and course changes, and they are very supportive of the initiative to institute a BS degree in Biomedical Engineering.

G. For all programs, list the specialized accreditation agencies and learned societies that would be concerned with the proposed program. Will the university seek accreditation for the program if it is available? If not, why? Provide a brief timeline for seeking accreditation, if appropriate.

The Department of Chemical and Biomedical Engineering is nationally accredited by the Accreditation Board for Engineering and Technology, Inc. (ABET). ABET Engineering criteria encourages each engineering program to pursue its own unique objectives in accordance with its own environment and stakeholder demands. ABET also stipulates that the outcomes of program implementation must be assessed and evaluated regularly, and the results of such assessments and evaluations must be utilized as needed in future program objectives and implementation.

As part of the accreditation process, the Department has developed program educational objectives and program outcomes to reflect the educational goals of the Department. These objectives and outcomes are continually assessed and modified to meet the changing demands of the departmental stakeholders. Accreditation by ABET for the BS-BME will be sought as soon as allowed. The BS in Chemical Engineering will be reviewed by ABET in 2021; it is expected that

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we will apply for an accreditation visit for the proposed BS-BME degree at the same time.

Both universities' accreditation is reaffirmed every ten years by the Southern Association of Colleges and Schools, Commission on Colleges (SACSCOC). The Southern Association of Colleges and Schools (SACS) is a private, non-profit, voluntary organization founded in 1895 in Atlanta, Georgia. SACSCOC accredits colleges and universities in Florida and other southern states.

The proposed BS-BME curriculum is informed by both the American Society for Engineering Education and the Biomedical Engineering Society. A student chapter of the Biomedical Engineering Society was established in 2004 to provide pre-professional support and activities for students at the Tallahassee campus.

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

Not applicable (this is a BS degree 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 2 in Appendix A. Provide a narrative describing the feasibility of delivering the proposed program through collaboration with other universities, both public and private. Cite specific queries made of other institutions with respect to shared courses, distance/distributed learning technologies, and joint-use facilities for research or internships.

The anticipated delivery system for the proposed BS-BME program will be a combination of traditional delivery on the main campus (the FAMU-FSU College of Engineering), traditional delivery at the FSU Panama City branch campus, and nontraditional delivery such as distance or distributed learning. The majority of the delivery system will be the traditional in-person mode. Some elective courses will be taught in person at the Engineering School in Tallahassee and accessed by Panama City campus students via distance learning.

Despite the general growth of online degree programs, there are relatively few fully-online engineering programs. According to ABET, the principal accrediting body for degree programs in engineering and technology, there are only seven institutions in the United States with fully-online, ABET-accredited bachelor's degree programs in one or more engineering fields. One of those programs is currently offered by Florida State University and administered by the Panama City campus. A total of 32 online undergraduate degree programs in engineering have been reported by 23 institutions to the NCES, indicating that—even putting accreditation standards aside
few institutions have found it feasible to offer fully-online engineering bachelor’s degrees. One reason for the relative scarcity of online engineering programs is that many engineering courses include lab components, which typically require expensive equipment and close supervision from skilled educators.
IX. Faculty Participation

A. Use Table 4 in Appendix A to identify existing and anticipated full-time (not visiting or adjunct) faculty who will participate in the proposed program through Year 5. Include (a) faculty code associated with the source of funding for the position; (b) name; (c) highest degree held; (d) academic discipline or specialization; (e) contract status (tenure, tenure-earning, or multi-year annual [MYA]); (f) contract length in months; and (g) percent of annual effort that will be directed toward the proposed program (instruction, advising, supervising internships and practica, and supervising thesis or dissertation hours).

Current Faculty Members
Current faculty members who will participate in the new program include:
• Teng Ma, Department Chair and Professor, CBE Department.
• Samuel C. Grant, Associate Professor, CBE Department.
• Jingjiao Guan, Associate Professor, CBE Department.
• Yan Li, Assistant Professor, CBE Department.
• Wright C. Finney, Senior Research Associate, CBE Department.
(Note that these faculty members' duties (AOR) will not be assigned 100% to the BS-BME program.)

New Faculty Members
Estimates of additional faculty members to teach core-BME courses (~10 courses):
• 2 full time tenure track faculty members: area of expertise – Biomechanics.
• 2 full time tenure track faculty members: area of expertise - Biosignals and Imaging.
• 1 full time tenure track faculty member: area of expertise - Cell and Tissue Engineering.
• 1 full time specialized teaching faculty member: BME core courses.
• 1 full time specialized teaching faculty member: Design I & II and Biomedical Laboratories.
Total new faculty members: 5 tenure track, 2 specialized teaching.

Support Staff
Estimates of additional staff to provide support for the program:
• 1 full-time A&P academic advisor/ABET coordinator.
• 1 full-time USPS office manager/fiscal assistant.
• 1 full-time USPS laboratory engineer.
Total new support staff: 3.

Graduate Students
Estimates of graduate students for the program:
• 10 graduate teaching assistants (TAs) per semester (recurring).
B. Use Table 2 in Appendix A to display the costs and associated funding resources for existing and anticipated full-time faculty (as identified in Table 4 in Appendix A). Costs for visiting and adjunct faculty should be included in the category of Other Personnel Services (OPS). Provide a narrative summarizing projected costs and funding sources.

Table 2 in Appendix A shows the projected costs and funding sources for the BS-BME degree. Faculty salaries and benefits ramp up from approximately $275,000 in Year 1 to $503,000 in Year 5. Costs for assistantships will rise in concert with new faculty hires. Because the proposed BS-BME program is designed to complement rather than supplant the existing BS in Chemical Engineering degree, no existing Education & General funds will be shifted to support the new program in Year 1 (Table 3).

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

Appendix E contains the abbreviated FEAS curriculum vitae (CVs) for each existing faculty member.

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

Faculty citations summarized in the tables below are based on the selection of tenure-track faculty that have CV information in the FSU FEAS database. Citations with the following status are excluded from the analysis: Accepted, Submitted, Contracted. Averages are calculated by dividing the number of citations by the number of faculty. Four faculty having affiliations with biomedical engineering were included in this analysis. Summaries of student research supervision and student collaborations are based on counts of student references from selected faculty CVs; students may be double counted if they appear in multiple faculty CVs; students graduated after reporting period are those with a graduation date on or after 2017.

### Summary of Non-Thesis Student Research Supervision, 2014-2016

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The Profession

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The faculty currently on-staff that will be associated with the proposed new degree have been productive in teaching, research, and service. All of the faculty have numerous published articles in prestigious refereed and non-refereed journals. They have also contributed significantly in research grants between 2014 and 2017. Two of the current faculty expected to contribute significantly to the BS-BME degree have just received a very competitive $1.7M NIH R01 grant. Two other faculty also have significant active NIH grants. In addition, the current faculty have excelled in providing service to their institution and their profession. National searches for additional faculty are expected to produce exceptional individuals who will contribute significantly to the development of the BS-BME degree.

Average teaching loads for research-active faculty in the Department is three courses per year. Faculty also supervise an average of three graduate students each; these students work in their research laboratories. Many of the faculty are active in the existing MS and PhD degree programs in Biomedical Engineering, and they teach core and graduate elective courses each term.
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 at both FAMU and FSU are well-equipped with primary literature in the areas of engineering, basic science, mathematics, and liberal studies, and provide excellent support for our undergraduates. Annual purchases of books, based on recommendations of the faculty and the college library committee, ensure that the collections are maintained up-to-date.

The Samuel H. Coleman Memorial Library at FAMU holds over 500,000 catalogued volumes, almost 6,000 serial subscriptions, 131,500 microfilms, and 73,000 non-print items. Furthermore the library serves as a depository for extensive United States government publications. All topics related to engineering are housed at this library. Students also have access to many online journals.

Florida State University is served by thirteen libraries, which include the FAMU-FSU College of Engineering Library and the Panama City Library and Learning Center that work together to provide information resources and library services to meet the needs of faculty, students, and staff regardless of location or discipline. FSU's library collections compare favorably with those of other academic research institutions. All FSU owned or subscribed information resources are available to faculty, students and staff of the proposed BS-BME program. FSU Panama City Library and Learning Center patrons may request express delivery of physical books or journal articles housed remotely in the FSU Libraries. Same-day delivery is available Monday-Thursday.

The FSU Dirac Science Library has extensive facilities for online bibliographic subject searches in the sciences and engineering, including Chemical Abstracts, ISI Web of Science, and many others. In addition, excellent interlibrary services are available for access to materials not available locally from national and international sources. At FSU, public access terminals and microcomputers connected to the university's Computing Center are also available for researcher and student use.

The FSU Panama City Library and Learning Center facility has 6,300 square feet, including seating for 119 within a study space and a classroom. Sixty-one computer workstations and 5,200 volumes are available for student use. A full-time librarian, a qualified assistant librarian and several support staff offer a wide range of standard library services including reference services, instruction, research consultations, course reserves, interlibrary loan, and the like. The University Libraries maintain an online subject guide for biomedical engineering that students and faculty can access at: http://guides.lib.fsu.edu/engineering. In addition, a full-time librarian specializing in finding resources for research in biomedical engineering is available via email for consultation.

The relevance of library resources to all university degree programs, including the proposed program, is assured through well-defined collection development policies, a web-based book request acquisitions form, regular consultation with the Faculty Senate Library Committee, and
the Library Liaison Program through which librarians interact frequently with faculty in their assigned academic departments. Faculty participates in collection management decisions through a process developed by the libraries in conjunction with the Faculty Senate Library Committee. The University Libraries subscribe to a substantial number of online services for student and faculty access to journals, indexes, and databases related to the field of biomedical engineering.

B. Describe additional library resources that are needed to implement and/or sustain the program through Year 5. Include projected costs of additional library resources in Table 2 in Appendix A. Please include the signature of the Library Director in Appendix B.

No additional library resources are needed to implement or sustain the proposed BS-BME program because the FAMU-FSU College of Engineering Library already meets the research needs of the already established graduate degree programs in biomedical engineering.

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.

Space and Infrastructure – General

The total space in the original FAMU-FSU College of Engineering building (Phase I) and the second building (Phase II) is about 200,000 square feet. Both buildings are shared by all five departments and supporting units within the College of Engineering.

Department of Chemical and Biomedical Engineering space in the Phase I ("A") building includes an administrative office suite, ten faculty offices, a graduate student office, a laboratory instructor office suite, a dedicated seminar room, a storage and support lab, two undergraduate teaching laboratories, and six graduate laboratories.

Space in the Phase II ("B") facility occupied by the Department includes one office suite consisting of eight faculty offices and a common area (approximately 1500 ft²). Four graduate laboratories, each approximately 750 ft² in floor area, are dedicated to the Biomedical Engineering program. Each of the research labs is occupied by a faculty member. Phase II also contains the Nuclear Magnetic Resonance Imaging laboratory suite consisting of four large laboratories and a single office. A single biomedical engineering teaching lab of approximately 1000 ft² is also in Phase II.

Department Offices and Seminar Room

Within the Phase I and II buildings, the Department has nineteen faculty offices, a main office suite including the Chair's office and five interior offices and support areas, and an office suite used by the chemical engineering laboratory instructor. Graduate student offices are either carrels contained within a large room, or are attached to the graduate laboratories where they work. Table X.C.1 shown below is a summary of all departmental offices and laboratories. In addition, the
Department has the full-time use of a dedicated Seminar Room (1070 ft²) with full multimedia projection capabilities, seating up to 50 students for classes.

Classroom Space and Facilities

Most freshman and most sophomore courses are taught on the FSU and FAMU main campuses. Scheduling and maintenance of these classrooms are the responsibility of the respective university. The classroom space and availability in the College of Engineering is for the most part adequate to deal with our current enrollments. Future increases in enrollment will lead to scheduling problems unless some additional classroom spaces are made available.

Undergraduate Laboratory Space and Facilities

A dedicated biomedical engineering teaching lab of approximately 1000 ft² is currently being used to teach the Quantitative Anatomy and Systems Physiology labs. This is currently the only wet lab dedicated to biomedical engineering, but with some scheduling changes this lab should be able to also accommodate the proposed cell and tissue engineering lab course. A second dry lab will be needed to accommodate the bioinstrumentation and biodynamics and control labs. Elective courses having an experimental component should be able to be accommodated within these two labs.

Research Facilities other than at the College of Engineering

Several faculty members also have research space at other buildings on either the FSU main campus or at Innovation Park adjacent to the College of Engineering. At FSU, the Departments of Biomedical Science, Biological Sciences, Chemistry and Biochemistry, Scientific Computing, and several interdisciplinary programs regularly host departmental faculty for research purposes. At Innovation Park, current faculty have labs at the National High Magnetic Field Laboratory (NHMFL), the Aeropropulsion, Mechatronics, and Energy Center (AME), and the High Performance Materials Institute (HPMI). Utilization of these laboratories on the main FSU campus and at Innovation Park facilitates collaboration with other faculty and allows greater access to research equipment and infrastructure. At FAMU, the College of Pharmacy and Pharmaceutical Sciences provides laboratories for research collaboration in areas of common interest. Several current faculty have ongoing joint federally-funded research programs with FAMU faculty.

D. Describe additional classroom, teaching laboratory, research laboratory, office, and other space needed to implement and/or maintain the proposed program through Year 5. Include any projected Instruction and Research (I&R) costs of additional space in Table 2 in Appendix A. Do not include costs for new construction because that information should be provided in response to X (E) below.

Additional Classroom Space

The classroom space and availability in the College of Engineering in Tallahassee is currently sufficient to teach courses for students in the major in Biomedical Engineering within the existing
BS degree in Chemical Engineering. Student enrollment in the proposed BS in Biomedical Engineering is expected to increase, because 1) all current BME majors are expected to shift to the BS-BME degree, and 2) many new students are expected to be attracted to the program. Future increases in enrollment may lead to scheduling issues unless some additional classroom spaces are made available. At the FSU Panama City campus, classroom space to accommodate expected enrollments in biomedical engineering is currently sufficient.

Additional Laboratory Space

1. Tallahassee Campus

The proposed BS-BME program will require at least two new laboratory spaces at Innovation Park, each of at least 1500 ft². One of these labs should be a "wet lab" with sinks and fume hoods/biosafety cabinets. This lab will accommodate the core and elective courses in cell and tissue engineering, and it can be used for other labs as well. The second lab space should be a "dry lab", which will be used for lab courses such as Biodynamics, Biomechanics, and Bioinstrumentation. Two laboratories, one in College of Engineering Building "B" and the other in the Shaw Building have been identified as being suitable for these courses, but this space will have to be reassigned from other campus units.

New laboratory and design courses will require substantial investment in space renovation, specialized experimental apparatus, and technical support. These laboratories are central to the student learning experience and are required by the accreditation agency ABET. The FAMU-FSU College of Engineering will also see increased undergraduate research opportunities upon implementation of the proposed program.

2. Panama City Campus

At the FSU Panama City campus, the proposed BS-BME program will require two new laboratory spaces. Again, one of these lab spaces should be a "wet lab" with sinks and fume hoods/biosafety cabinets for the cell and tissue engineering lab courses. A second "dry lab" space for the lab courses in Biodynamics, Biomechanics, and Bioinstrumentation is needed. Because the enrollment at the Panama City campus is not expected to be a great as at the Tallahassee campus, these lab spaces may be shared with other engineering disciplines. during a visit to the Panama City campus in November, 2017, two existing laboratories were identified as being suitable for this purpose.

Additional Office Space

At the FAMU-FSU College of Engineering, offices for five (5) tenure-earning and two (2) multi-year appointment faculty will be needed. At present, these offices have not been identified. An office suite of approximately 500 ft² will be required to accommodate the office manager and fiscal assistant for the new program. At the FSU Panama City campus three (3) faculty offices will be needed; these should be able to be accommodated using existing space resources.

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E. If a new capital expenditure for instructional or research space is required, indicate where this item appears on the university’s fixed capital outlay priority list. Table 2 in Appendix A includes only Instruction and Research (I&R) costs. If non-I&R costs, such as indirect costs affecting libraries and student services, are expected to increase as a result of the program, describe and estimate those expenses in narrative form below. It is expected that high enrollment programs in particular would necessitate increased costs in non-I&R activities.

There will be a minimal impact on existing campus services at the Tallahassee campus. A potential positive impact that the proposed program will be the increased utilization of the infrastructure at the FSU Panama City, FL Campus. Some space modification at both the Tallahassee and Panama City campuses will be needed. We have consulted with the administration and faculty at the Panama City Campus, as well as the directors of the departments of Police, Enrollment & Student Affairs, Finance & Administration, Advancement, and Development. These individuals have expressed and provided support for the development of the proposed BS-BME program.

In the short run, the implementation of the BS-BME provides an opportunity to recruit as well as retain current faculty interested biomedical engineering education, research, and service as the focus of their professional development activities. In the long run, the proposed BS-BME program will promote interdisciplinary teaching and research as well as provide a unique administrative collaboration opportunity between two universities and across two regions. The development and implementation of program of such and interdisciplinary program will promote an atmosphere of innovation in which faculty and administrators who value biomedical scholarship will be supported and valued.

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

The specialized equipment currently exists for teaching the Quantitative Anatomy and Systems Physiology (QASP) labs – BME 4403C and BME 4404C – is shown in the table and text below.

1. QASP Laboratory (existing - Tallahassee) – Equipment & Expenses

1.1. Laboratory Instruments, Capital (OCO) – $191,400; Expense – $11,100.

<table>
<thead>
<tr>
<th>Instrument Name (Number)</th>
<th>Estimated Cost</th>
<th>Application</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bruker 4.7T 33-cm MRI magnet and AMX scanner</td>
<td>$50,000 (FSU); Original purchase price of $1.7M</td>
<td>Preclinical MRI</td>
<td>Dept &amp; COE funds</td>
</tr>
<tr>
<td>Biopac Physiology Units (9)</td>
<td>$5,000-7,500 ea/$52,500 total</td>
<td>Physiological measurements</td>
<td>OCO, Donation, Dept funds</td>
</tr>
<tr>
<td>Instrument Description</td>
<td>Cost</td>
<td>Category</td>
<td>Source</td>
</tr>
<tr>
<td>----------------------------------------------------------</td>
<td>-------------</td>
<td>---------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Stereo dissecting microscopes (4)</td>
<td>$7,500 ea/$22,500 total</td>
<td>Microscopy</td>
<td>OCO &amp; Dept Funds</td>
</tr>
<tr>
<td>High resolution tissue microscope and digital camera</td>
<td>$15,000</td>
<td>Microscopy</td>
<td>OCO</td>
</tr>
<tr>
<td>Vet ECG system</td>
<td>$12,400</td>
<td>Cardiac measurements</td>
<td>Dept funds</td>
</tr>
<tr>
<td>Casework, tables and chairs</td>
<td>$30,000</td>
<td>Casework and movable tables/chairs</td>
<td>Surplus, OCO</td>
</tr>
<tr>
<td>Biopac Gas analysis system</td>
<td>$3,000</td>
<td>Gas chemistry analysis</td>
<td>OCO</td>
</tr>
<tr>
<td>Pico Network/Spectrum Analyzer with S-parameter (1)</td>
<td>$6,000</td>
<td>Circuit analysis</td>
<td>OCO</td>
</tr>
<tr>
<td>Dissection instruments and trays</td>
<td>$5,000</td>
<td>Wet dissection kits and reusable trays</td>
<td>Expense</td>
</tr>
<tr>
<td>Personal Protective Equipment</td>
<td>$1,000</td>
<td>Glasses, smocks</td>
<td>Expense</td>
</tr>
<tr>
<td>Human physiology models</td>
<td>$5,000</td>
<td>Skeletal, blood and brain models</td>
<td>Expense</td>
</tr>
<tr>
<td>Digital Multimeters (2)</td>
<td>$50 ea/$100 total</td>
<td>Circuit analysis</td>
<td>Expense</td>
</tr>
<tr>
<td>Computers (8)</td>
<td>$N/A</td>
<td>Data acquisition and analysis</td>
<td>Surplus</td>
</tr>
<tr>
<td><strong>Total Existing Instruments</strong></td>
<td><strong>$202,500</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1.2. Annual Expense for Supplies and Maintenance – $40,000.

The existing Quantitative Anatomy and Systems Physiology (QASP) laboratory serves 35 students in Tallahassee per term, or 70 per year. The annual recurring cost for the laboratory supplies is estimated at $10,000 year for (1) circuit components, (2) general lab supplies, (3) dissection models, and (4) specialty chemicals. No funds are regularly budgeted for maintenance and upgrade of laboratory instruments at present.

G. Describe additional specialized equipment that will be needed to implement and/or sustain the proposed program through Year 5. Include projected costs of additional equipment in Table 2 in Appendix A.
The facilities, instrumentation and resources detailed below will provide hands-on laboratory experiences for future BS-BME students in all three majors. The Cell & Tissue Engineering Laboratory will share space with the Quantitative Anatomy & Systems Physiology Laboratory to minimize costs. The requested specialized equipment builds upon existing instrumentation to provide an adequate facility for students to culture, optimize, and characterize living cellular constructs. The Bioinstrumentation laboratory and Biodynamics and Control Laboratory will share instrumentation and space to minimize costs as well. The specialized equipment details below will provide the ability to design, analyze, and construct electrical devices while also providing a means of analyzing existing clinical implementations and adaptive feedback systems digitally. As part of the ABET required physiological measurements provided by the core Quantitative Anatomy & Systems Physiology Laboratory, additional instrumentation will be purchased and/or renovated to provide clinical and preclinical imaging capabilities (ultrasound, MRI, etc). These capabilities will be shared with the Medical Imaging Laboratory, which is an elective affiliated with the Image & Signal Process Engineering major.

The additional specialized equipment that will be needed to implement the proposed program is shown in the tables and text below. Estimates for the 1) Cell and Tissue Engineering, 2) Bioinstrumentation, 3) Biodynamics and Control, and 4) QASP laboratories are made for both Tallahassee and Panama City campuses, except where noted.

1. **Cell and Tissue Engineering Laboratory – Equipment & Expenses**
   (both Tallahassee and Panama City)

1.1. Laboratory Instruments, Capital (OCO) – $328,000.

<table>
<thead>
<tr>
<th>Instrument Name (Number)</th>
<th>Estimated Cost</th>
<th>Application</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biosafety Hoods (5)</td>
<td>$10,000 ea/$50,000 total</td>
<td>For cell handling and tissue culture</td>
<td>OCO</td>
</tr>
<tr>
<td>Biological CO2 incubators (4)</td>
<td>$6,000 ea/$30,000 total</td>
<td>For incubation of mammalian cells</td>
<td>OCO</td>
</tr>
<tr>
<td>Table top cell counter (2)</td>
<td>$50,000</td>
<td>Fully automated cell analyzer for fast measurement of cell number and size distribution</td>
<td>OCO</td>
</tr>
<tr>
<td>Centrifuges (multiple)</td>
<td>$18,000</td>
<td>For isolation of cells and preparation of biological media</td>
<td>OCO</td>
</tr>
<tr>
<td>Electrophoresis equipment (2)</td>
<td>$10,000</td>
<td>For separation and analysis of biological samples, including protein, DNA, and RNA</td>
<td>OCO</td>
</tr>
<tr>
<td>Fluorescent/UV microplate reader (2)</td>
<td>$20,000</td>
<td>For measurement of DNA, RNA, ELISA, immunoassays, and cell proliferation and cytotoxicity.</td>
<td>OCO</td>
</tr>
<tr>
<td>Biological microscope I (2)</td>
<td>$20,000</td>
<td>For routine imaging of cell samples</td>
<td>OCO</td>
</tr>
<tr>
<td>Instrument Name (Number)</td>
<td>Estimate Cost</td>
<td>Application</td>
<td>Category</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>---------------------</td>
<td>-----------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>Vector Network/Spectrum Analyzer with S-parameter (5)</td>
<td>$40,000 ea/$200,000 total</td>
<td>Circuit analysis</td>
<td>OCO</td>
</tr>
<tr>
<td>Multi-channel Oscilloscopes (5)</td>
<td>$30,000 ea/$150,000 total</td>
<td>Circuit Analysis</td>
<td>OCO</td>
</tr>
<tr>
<td>Precision LCR meter (5)</td>
<td>$18,000 ea/$90,000 total</td>
<td>Circuit Analysis</td>
<td>OCO</td>
</tr>
<tr>
<td>Arbitrary waveform Function Generators (5)</td>
<td>$5,000 ea/$25,000 total</td>
<td>Circuit Analysis</td>
<td>OCO</td>
</tr>
<tr>
<td>Stereomicroscope (3)</td>
<td>$8,000 ea/$24,000 total</td>
<td>Microscopy</td>
<td>OCO</td>
</tr>
<tr>
<td>Digital Multimeters (10)</td>
<td>$50 ea/$500 total</td>
<td>Circuit analysis</td>
<td>Expense</td>
</tr>
</tbody>
</table>

1.2. Annual Expense for Supplies and Maintenance – $55,000.

The Cell and Tissue Engineering laboratory will serve about 40 students/yr in Tallahassee and 10 students/yr in Panama City. The annual recurring cost for the laboratory supplies is estimated at $40,000 year for (1) biological reagents, (2) plastic culture wares, (3) glassware and general supplies, and (4) specialty chemicals. Additionally, $15,000 is required for maintenance and upgrade of laboratory instruments.

1.3. Building/Lab Renovation – $75,000 (one time cost).

The Cell and Tissue Laboratory in Tallahassee needs to be assigned a wet lab of 1,500 ft² with two chemical and four biological hoods. The estimated cost for renovation and installation of the instruments is estimated at $50,000. In Panama City, renovation costs for a wet lab for the Cell and Tissue Engineering lab is estimated to be $25,000.

2. Bioinstrumentation Laboratory – Equipment & Expenses (both Tallahassee and Panama City)

2.1. Laboratory Instruments, Capital (OCO) – $489,000; Expense – $16,000.
<table>
<thead>
<tr>
<th>Computers (5)</th>
<th>$2,000 ea/$10,000 total</th>
<th>Data acquisition and analysis</th>
<th>Expense</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soldering station (4)</td>
<td>$500 ea/$1,500</td>
<td>Circuit fabrication</td>
<td>Expense</td>
</tr>
<tr>
<td><strong>Total of OCO Instruments</strong></td>
<td><strong>$489,000</strong></td>
<td><strong>Total of Expense Instrumentation</strong></td>
<td><strong>$16,000</strong></td>
</tr>
</tbody>
</table>

2.2. **Annual Expense for supplies and maintenance – $35,000.**

The Bioinstrumentation laboratories will serve 40 students in Tallahassee and 10 students in Panama City per year. The annual recurring cost for the laboratory supplies is estimated at $25,000 year for (1) circuit components, (2) prototyping boards, (3) solder and PCB supplies, and (4) specialty chemicals. Additionally, $10,000 annually is required for maintenance and upgrade of laboratory instruments.

2.3. **Building/Lab Renovation – $60,000 (one time cost).**

At both campuses, Bioinstrumentation Laboratories would require renovation, casework, and fabrication stations. Renovation and casework is estimated at $30,000 with an additional $30,000 budgeted for 5 fabrication and test stations. The space needed in Panama City would be smaller because of lower enrollment.

3. **Biodynamics and Control Laboratory – Equipment & Expenses (both Tallahassee and Panama City)**

3.1. **Laboratory Instruments, Capital (OCO) – $150,000; Expense – $16,000.**

<table>
<thead>
<tr>
<th>Instrument Name (Number)</th>
<th>Estimate Cost</th>
<th>Application</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portable Ultrasound machine (2)</td>
<td>$12,000 ea/$25,000 total</td>
<td>Medical and preclinical imaging</td>
<td>OCO</td>
</tr>
<tr>
<td>4.7 T MRI Systems Re-Energization</td>
<td>$50,000 total</td>
<td>Pre-clinical imaging</td>
<td>OCO</td>
</tr>
<tr>
<td>Pacemaker system (2)</td>
<td>$10,000 ea/$20,000 total</td>
<td>Feedback analysis</td>
<td>OCO</td>
</tr>
<tr>
<td>Stimulator (3)</td>
<td>$5,000 ea/$15,000 total</td>
<td>Circuit Analysis</td>
<td>OCO</td>
</tr>
<tr>
<td>Impedance Analyzer (2)</td>
<td>$20,000 ea/$40,000 total</td>
<td>Signal analysis</td>
<td>OCO</td>
</tr>
<tr>
<td>Instrument Name (Number)</td>
<td>Estimate Cost</td>
<td>Application</td>
<td>Category</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>------------------------</td>
<td>----------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Insulin pump and model (2)</td>
<td>$5,000 ea/$10,000 total</td>
<td>Fluid dynamics model system</td>
<td>OCO</td>
</tr>
<tr>
<td>Biopac respiratory model (2)</td>
<td>$5,000 ea/$10,000 total</td>
<td>Gas exchange system</td>
<td>OCO</td>
</tr>
<tr>
<td>Pharmacokinetic/fluid</td>
<td>$5,000 ea/$10,000 total</td>
<td>Delivery system</td>
<td>OCO</td>
</tr>
<tr>
<td>dynamic model (4)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Syringe pumps (4)</td>
<td>$5,000 ea/$20,000 total</td>
<td>Fluid pumps</td>
<td>OCO</td>
</tr>
<tr>
<td>Total of OCO Instruments</td>
<td>$150,000</td>
<td>Total of Expense Instrumentation</td>
<td>$16,000</td>
</tr>
</tbody>
</table>

3.2. Annual Expense for supplies and maintenance – $25,000.

The laboratories will serve 40 students in Tallahassee and 10 students in Panama City per year. The annual recurring cost for the laboratory supplies is estimated at $15,000 year for (1) electrical components, (2) piping and tubing, (3) electrodes, and (4) specialty chemicals. Additionally, $10,000 annually is required for maintenance and upgrade of laboratory instruments.

3.3. Building/Lab Renovation – $0 (one time cost).

Renovation will be included as part of the renovation of the Bioinstrumentation Laboratory.

4. Quantitative Anatomy and Systems Physiology Laboratory – Equipment & Expenses (Panama City only)

4.1. Laboratory Instruments, Capital (OCO) – $15,000; Expense – $16,000.

<table>
<thead>
<tr>
<th>Instrument Name (Number)</th>
<th>Estimate Cost</th>
<th>Application</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biopac Units (2)*</td>
<td>$7,500 ea/$15,000 total</td>
<td>Human physiological measurements</td>
<td>OCO</td>
</tr>
<tr>
<td>Dissection Equipment</td>
<td>$2,000 total</td>
<td>Wet dissection</td>
<td>Expense</td>
</tr>
<tr>
<td>Total of OCO Instruments</td>
<td>$15,000</td>
<td>Total of Expense Instrumentation</td>
<td>$2,000</td>
</tr>
</tbody>
</table>

*Biopac units required only for Panama City campus.

4.2. Annual Expense for supplies and maintenance – $10,000.
The laboratories will serve 40 students in Tallahassee and 10 students in Panama City per year. The annual recurring cost for the laboratory supplies is estimated at $5,000 year for (1) electrical components, (2) dissection specimen, (3) general laboratory supplies, (4) electrodes and (5) specialty chemicals. Additionally, $5,000 annually is required for maintenance and upgrade of laboratory instruments.

Renovation – $25,000.

4.3. Renovation of Panama City laboratories for QASP instructional lab, including case work and plumbing.

Summary Table – New BS-BME Laboratories – OCO and Expenses

The costs in dollars ($) for additional specialized equipment that will be needed to implement the proposed program is shown in a summary table below. Estimates for the 1) Cell and Tissue Engineering, 2) Bioinstrumentation, 3) Biodynamics and Control, and 4) QASP laboratories are made for both Tallahassee and Panama City campuses, except where noted.

<table>
<thead>
<tr>
<th>Teaching Laboratory</th>
<th>Non-Recurring Costs ($)</th>
<th>Recurring Costs ($)</th>
<th>Total ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Instruments - OCO</td>
<td>Instruments - Expense</td>
<td>Renovation Costs</td>
</tr>
<tr>
<td>QASP (Tallahassee – existing)</td>
<td>191,400</td>
<td>11,100</td>
<td>0</td>
</tr>
<tr>
<td>1. Cell and Tissue Engineering Lab (new)</td>
<td>328,000</td>
<td>0</td>
<td>75,000</td>
</tr>
<tr>
<td>2. Bioinstrumentation Lab (new)</td>
<td>489,000</td>
<td>16,000</td>
<td>60,000</td>
</tr>
<tr>
<td>3. Biodynamics and Control Lab (new)</td>
<td>150,000</td>
<td>16,000</td>
<td>0</td>
</tr>
<tr>
<td>4. QASP Lab (Panama City – new)</td>
<td>15,000</td>
<td>2,000</td>
<td>25,000</td>
</tr>
<tr>
<td>Totals – New Labs</td>
<td>982,000</td>
<td>34,000</td>
<td>160,000</td>
</tr>
<tr>
<td>Totals – Non-Recurring Costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals – Recurring Costs</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
H. Describe any additional special categories of resources needed to implement the program through Year 5 (access to proprietary research facilities, specialized services, extended travel, etc.). Include projected costs of special resources in Table 2 in Appendix A.

None noted.

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

Not applicable (this is a BS degree program).

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.

Although an internship is not required to complete the program of study, the Department of Chemical & Biomedical Engineering will facilitate a variety of internships in the field of biomedical product development and research. The two universities have career centers that assist students with their internship searches. Internships are normally done during the summer term following the junior year in the curriculum. Students accepted into an approved internship can have this noted on their transcripts by enrolling for BME 3949 (0 credit hours).
APPENDIX A

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

<table>
<thead>
<tr>
<th>Source of Students</th>
<th>Year 1 (Fall 2018)</th>
<th>Year 2 (Fall 2019)</th>
<th>Year 3 (Fall 2020)</th>
<th>Year 4 (Fall 2021)</th>
<th>Year 5 (Fall 2022)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HC</td>
<td>FTE</td>
<td>HC</td>
<td>FTE</td>
<td>HC</td>
</tr>
<tr>
<td>Upper-level students who are transferring from other majors within the university**</td>
<td>30</td>
<td>27</td>
<td>33</td>
<td>29.7</td>
<td>36</td>
</tr>
<tr>
<td>Students who initially entered the university as FTIC students and who are progressing from the lower to the upper level***</td>
<td>0</td>
<td>0</td>
<td>41</td>
<td>36.9</td>
<td>99</td>
</tr>
<tr>
<td>Florida College System transfers to the upper level***</td>
<td>4</td>
<td>3.6</td>
<td>10</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>Transfers to the upper level from other Florida colleges and universities***</td>
<td>2</td>
<td>1.8</td>
<td>4</td>
<td>3.6</td>
<td>6</td>
</tr>
<tr>
<td>Transfers from out of state colleges and universities***</td>
<td>2</td>
<td>1.8</td>
<td>4</td>
<td>3.6</td>
<td>6</td>
</tr>
<tr>
<td>Other (Explain)***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>38</td>
<td>34.2</td>
<td>92</td>
<td>82.8</td>
<td>135</td>
</tr>
</tbody>
</table>

* 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.

Worksheet Table 1-A UG Enrollment
## APPENDIX A

### TABLE 2  
PROJECTED COSTS AND FUNDING SOURCES

<table>
<thead>
<tr>
<th>Instruction &amp; Research Costs (non-recurring)</th>
<th>Funding Source</th>
<th>Subtotal columns W...+7</th>
<th>Funding Source</th>
<th>Subtotal columns 9...+11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reallocation Base* (E&amp;G)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enrollment (E&amp;G)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Recurring (E&amp;G)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Non-Recurring (E&amp;G)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contracts &amp; Grants (E&amp;G)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Philanthropy Endowments</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enterprise Auxiliary Funds</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>$275,915</strong></td>
<td><strong>$323,361</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Faculty Salaries and Benefits            |                | **$275,915**            |                | **$323,361**   |

**A & P Salaries and Benefits             |                | **$0**                  |                | **$0**        |

**USPS Salaries and Benefits               |                | **$7,000**              |                | **$158,130**  |

**Other Personnel Services**              |                | **$0**                  |                | **$5,000**    |

**Assistants & Fellowships**              |                | **$0**                  |                | **$0**        |

**Library**                                |                | **$0**                  |                | **$0**        |

**Expenses**                               |                | **$0**                  |                | **$34,000**   |

**Operating Capital Outlay**              |                | **$0**                  |                | **$982,000**  |

**Special Categories**                    |                | **$0**                  |                | **$0**        |

**Total Costs**                            |                | **$282,915**            |                | **$338,361**  |

---

*Identify reallocation sources in Table 3.

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

***Identify if non-recurring.

### Faculty and Staff Summary

<table>
<thead>
<tr>
<th>Total Positions</th>
<th>Year 1</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty (person-years)</td>
<td>2.48</td>
<td>4.23</td>
</tr>
<tr>
<td>A &amp; P (PTE)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>USPS (PTE)</td>
<td>1.5</td>
<td>2</td>
</tr>
</tbody>
</table>

### Calculated Cost per Student FTE

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total E&amp;G Funding</td>
<td>$323,953</td>
<td>$3,062,491</td>
</tr>
<tr>
<td>Annual Student FTE</td>
<td>34.2</td>
<td>201.6</td>
</tr>
<tr>
<td>E&amp;G Cost per FTE</td>
<td>$10,613</td>
<td>$10,231</td>
</tr>
</tbody>
</table>

Worksheet Table 2 Budget
### Table 2 Column Explanations

<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>E&amp;G funds that are already available in the university’s budget and will be reallocated to support the new program. Please include these funds in the Table 3 - Anticipated reallocation of E&amp;G funds and indicate their source.</td>
</tr>
<tr>
<td>2</td>
<td>Additional E&amp;G funds allocated from the tuition and fees trust fund contingent on enrollment increases.</td>
</tr>
<tr>
<td>3</td>
<td>Recurring funds appropriated by the Legislature to support implementation of the program.</td>
</tr>
<tr>
<td>4</td>
<td>Non-recurring funds appropriated by the Legislature to support implementation of the program. Please provide an explanation of the source of these funds in the budget section (section III.A.) of the proposal. These funds can include initial investments, such as infrastructure.</td>
</tr>
<tr>
<td>5</td>
<td>Contracts and grants funding available for the program.</td>
</tr>
<tr>
<td>6</td>
<td>Funds provided through the foundation or other Direct Support Organizations (DSO) to support of the program.</td>
</tr>
<tr>
<td>7</td>
<td>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.</td>
</tr>
<tr>
<td>8</td>
<td>Subtotal of values included in columns 1 through 7.</td>
</tr>
<tr>
<td>9</td>
<td>Includes the sum of columns 1, 2, and 3 over time.</td>
</tr>
<tr>
<td>10</td>
<td>See explanation provided for column 2.</td>
</tr>
<tr>
<td>11</td>
<td>These are specific funds provided by the Legislature to support implementation of the program.</td>
</tr>
<tr>
<td>12</td>
<td>See explanation provided for column 5.</td>
</tr>
<tr>
<td>13</td>
<td>See explanation provided for column 6.</td>
</tr>
<tr>
<td>14</td>
<td>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.</td>
</tr>
<tr>
<td>15</td>
<td>Subtotal of values included in columns 9 through 14.</td>
</tr>
</tbody>
</table>
## Key - Calculation of Numbers in Cells

<table>
<thead>
<tr>
<th>Cell #</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>07</td>
<td>Reallocated Base Year 1: Prorated Salary and Benefits for - T. Ma, S. Grant, Y. Li, J. Guan, K. Hunter, Tenure-Earning Faculty #1, MYA Faculty #1.</td>
</tr>
<tr>
<td>09</td>
<td>Reallocated Base Year 1: Prorated Salary and Benefits for - 1.0 FTE USPS Lab Engineer, 0.5 FTE USPS Office Manager/Fiscal Assistant.</td>
</tr>
<tr>
<td>17</td>
<td>Continuing Base Year 5: Prorated Salary and Benefits for - T. Ma, S. Grant, Y. Li, J. Guan, K. Hunter, Tenure-Earning Faculty #1, MYA Faculty #1, T-E Faculty #2, MYA Faculty #2, T-E Faculty #3, T-E Faculty #4, T-E Faculty #5.</td>
</tr>
<tr>
<td>19</td>
<td>Continuing Base Year 5: Prorated Salary and Benefits for - 1.0 FTE USPS Lab Engineer, 1.0 FTE USPS Office Manager/Fiscal Assn., 1.0 FTE A&amp;P Academic Advisor/ABET Coordinator.</td>
</tr>
<tr>
<td>110</td>
<td>Continuing Base Year 5: Prorated Salary and Benefits for - CPS personnel.</td>
</tr>
<tr>
<td>113</td>
<td>Continuing Base Expenses Year 5: Non-Recurring Lab Equipment ($34,000), Lab Supplies &amp; Maintenance ($25,000), Renovations ($166,000), Office Operations ($5,800).</td>
</tr>
<tr>
<td>114</td>
<td>Continuing Base OCO Year 5: Lab Equipment ($982,000).</td>
</tr>
</tbody>
</table>

*Worksheet Table 2 Budget*
APPENDIX A

TABLE 3
ANTICIPATED REALLOCATION OF EDUCATION & GENERAL FUNDS*

<table>
<thead>
<tr>
<th>Program and/or E&amp;G account from which current funds will be reallocated during Year 1</th>
<th>Base before reallocation</th>
<th>Amount to be reallocated</th>
<th>Base after reallocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>058800-110 (Provost)</td>
<td>4,655,187</td>
<td>125,183</td>
<td>$4,570,004</td>
</tr>
<tr>
<td>214000-110 (CBE Department)</td>
<td>1,419,238</td>
<td>126,270</td>
<td>$1,295,658</td>
</tr>
<tr>
<td>212000-110 (Engineering Dean)</td>
<td>1,613,815</td>
<td>24,461</td>
<td>$1,589,354</td>
</tr>
<tr>
<td>212000-110 (Engineering Dean)</td>
<td>574,573</td>
<td>57,040</td>
<td>$487,533</td>
</tr>
<tr>
<td>Totals</td>
<td>$8,243,514</td>
<td>$362,555</td>
<td>$7,880,959</td>
</tr>
</tbody>
</table>

* If not reallocating funds, please submit a zeroed Table 3.
## APPENDIX A

### TABLE 4

ANTICIPATED FACULTY PARTICIPATION

<table>
<thead>
<tr>
<th>Faculty Code</th>
<th>Faculty Name or &quot;New Hire&quot; Highest Degree Held Academic Discipline or Speciality</th>
<th>Rank</th>
<th>Contract Status</th>
<th>Initial Date for Participation in Program</th>
<th>Mon. Contract Year 1</th>
<th>FTE Year 1</th>
<th>% Effort for Prg. Year 1</th>
<th>PY Year 1</th>
<th>Mon. Contract Year 5</th>
<th>FTE Year 5</th>
<th>% Effort for Prg. Year 5</th>
<th>PY Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Teng Ma, PhD, Chemical Engineering</td>
<td>Full Professor</td>
<td>Tenured</td>
<td>Fall 2018</td>
<td>9</td>
<td>0.75</td>
<td>0.03</td>
<td>0.04</td>
<td>9</td>
<td>0.75</td>
<td>0.05</td>
<td>0.04</td>
</tr>
<tr>
<td>A</td>
<td>Samuel C. Grant, PhD, Biomedical Engineering</td>
<td>Associate Professor</td>
<td>Tenured</td>
<td>Fall 2018</td>
<td>9</td>
<td>0.75</td>
<td>0.23</td>
<td>0.19</td>
<td>9</td>
<td>0.75</td>
<td>0.25</td>
<td>0.19</td>
</tr>
<tr>
<td>A</td>
<td>Jingxiao Guan, PhD, Biomedical Engineering</td>
<td>Associate Professor</td>
<td>Tenured</td>
<td>Fall 2018</td>
<td>9</td>
<td>0.75</td>
<td>0.38</td>
<td>0.28</td>
<td>9</td>
<td>0.75</td>
<td>0.38</td>
<td>0.29</td>
</tr>
<tr>
<td>A</td>
<td>Yan Li, PhD, Biomedical Engineering</td>
<td>Assistant Professor</td>
<td>Tenure-earning</td>
<td>Fall 2018</td>
<td>9</td>
<td>0.75</td>
<td>0.38</td>
<td>0.28</td>
<td>9</td>
<td>0.75</td>
<td>0.38</td>
<td>0.29</td>
</tr>
<tr>
<td>A</td>
<td>Kimberly T. Hunter, PhD, Biomedical Engineering</td>
<td>Teaching Faculty I</td>
<td>year annual</td>
<td>Fall 2018</td>
<td>12</td>
<td>1.00</td>
<td>0.50</td>
<td>0.50</td>
<td>12</td>
<td>1.00</td>
<td>0.50</td>
<td>0.50</td>
</tr>
<tr>
<td>C</td>
<td>New Hire, PhD, Biomedical Engineering</td>
<td>Assistant Professor</td>
<td>Tenure-earning</td>
<td>Fall 2018</td>
<td>9</td>
<td>0.75</td>
<td>0.23</td>
<td>0.19</td>
<td>9</td>
<td>0.75</td>
<td>0.25</td>
<td>0.19</td>
</tr>
<tr>
<td>C</td>
<td>New Hire, PhD, Biomedical Engineering</td>
<td>Teaching Faculty I</td>
<td>year annual</td>
<td>Fall 2018</td>
<td>12</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>12</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>C</td>
<td>New Hire, PhD, Biomedical Engineering</td>
<td>Assistant Professor</td>
<td>Tenure-earning</td>
<td>Fall 2019</td>
<td>0.00</td>
<td>0.00</td>
<td>0.75</td>
<td>0.00</td>
<td>9</td>
<td>0.75</td>
<td>0.25</td>
<td>0.19</td>
</tr>
<tr>
<td>C</td>
<td>New Hire, PhD, Biomedical Engineering</td>
<td>Teaching Faculty I</td>
<td>year annual</td>
<td>Fall 2019</td>
<td>0.00</td>
<td>0.00</td>
<td>12</td>
<td>1.00</td>
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<td>1.00</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>New Hire, PhD, Biomedical Engineering</td>
<td>Assistant Professor</td>
<td>Tenure-earning</td>
<td>Fall 2020</td>
<td>0.00</td>
<td>0.00</td>
<td>9</td>
<td>0.75</td>
<td>0.25</td>
<td>0.19</td>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>New Hire, PhD, Biomedical Engineering</td>
<td>Assistant Professor</td>
<td>Tenure-earning</td>
<td>Fall 2020</td>
<td>0.00</td>
<td>0.00</td>
<td>9</td>
<td>0.75</td>
<td>0.25</td>
<td>0.19</td>
<td>0.25</td>
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</tbody>
</table>

Worksheet Table 4 Faculty
<table>
<thead>
<tr>
<th>Faculty Code</th>
<th>Source of Funding</th>
<th>PY Workload by Budget Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Existing faculty on a regular line</td>
<td>Current Education &amp; General Revenue</td>
</tr>
<tr>
<td>B</td>
<td>New faculty to be hired on a vacant line</td>
<td>Current Education &amp; General Revenue</td>
</tr>
<tr>
<td>C</td>
<td>New faculty to be hired on a new line</td>
<td>New Education &amp; General Revenue</td>
</tr>
<tr>
<td>D</td>
<td>Existing faculty hired on contracts/grants</td>
<td>Contracts/Grants</td>
</tr>
<tr>
<td>E</td>
<td>New faculty to be hired on contracts/grants</td>
<td>Contracts/Grants</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.29</td>
<td>2.48</td>
</tr>
<tr>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>1.19</td>
<td>1.78</td>
</tr>
<tr>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Overall Totals for

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.48</td>
<td>4.26</td>
</tr>
</tbody>
</table>
Appendix B.

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

<table>
<thead>
<tr>
<th>Signature of Equal Opportunity Officer</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carol Lam</td>
<td>2/26/2018</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Signature of Library Director</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faye Watkins</td>
<td>2/23/2018</td>
</tr>
</tbody>
</table>

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

Provide data that support the need for an additional program.

Universities and SUS

The Florida Board of Governors Strategic Plan 2005-2013 specifically identifies Science, Technology, Engineering, and Math (STEM) professionals as an area of programmatic strategic emphasis. Despite nearly a decade of efforts, shortages in STEM professions persist (US News & World Report, "The STEM Worker Shortage is Real", issue of September 15, 2014). The most recent Board of Governors Strategic Plan 2012-2025 notes that "Florida must become more competitive in the national and global economy. To accomplish this, the state must increase the educational attainment levels of its citizens and the state universities must respond by awarding more degrees in specific high demand programs." The proposed BS-BME degree will produce graduates in a field that is both critical and high-wage.

Occupational Outlook

Occupational projections demonstrate how biomedical engineering is growing on a broad scale. Biomedical engineering has a particularly high projected growth rate of 26.6% from the years 2012-2022 at the national level.

To provide a more geographically-specific picture of projected employment for graduates from the proposed biomedical engineering program from the FAMU-FSU College of Engineering, Florida State University reported employment projections from the State of Florida from 2016-2024. Although less than the projected percentage change in growth at the national level, the expected change in employment growth in the State of Florida is 21.5% (Reference: http://www.floridajobs.org/labor-market-information/data-center/statistical-programs/employment-projections).


National and Regional Enrollment Trends

The field of biomedical engineering exhibits high student enrollment demand nationally and regionally. According to data collected by the American Society of Engineering Education (ASEE), between 2005 and 2014 the annual growth rate of students majoring in biomedical engineering was 11.12% (Yoder, 2016). At some of the nation’s top engineering schools, the majority of the engineering students wish to enroll in biomedical engineering. In 2014, 4,500 students applied to the BME program at Johns Hopkins University, and only 120 or 2.7% of
students were accepted. IPEDS data from the National Center for Education Statistics (NCES) also shows heavy student demand for the Bachelor’s degree in Biomedical Engineering (https://nces.ed.gov/ipeds/). Degree completion for the BS-BME nationally has increased by 32% from 2012 – 2016, and even greater for African American students at 40% during this same time frame.

Regionally, Georgia Institute of Technology has the largest BME program in the country with more than 1300 undergrads and 200 graduate students supported by more than 50 faculty members (Georgia Institute of Technology, 2016). All of Georgia Tech’s College of Engineering programs are ranked in the top 10 nationally by U.S. News and World Report. The Biomedical Engineering Department at Georgia Tech ranked as the top undergraduate program in the country, and the BME program is one of the highest NIH funded academic departments in the country (Georgia Institute of Technology, 2016). In addition, in 2015, there were more females enrolled in biomedical engineering than males in the program (Georgia Institute of Technology, 2016).

Rationale for initiating a BS-BME undergraduate program at the FAMU-FSU College of Engineering through the Department of Chemical & Biomedical Engineering (CBE)

Department and College

- Enrollment in the BME major constitutes at least 1/3 of the undergraduate CBE degrees awarded (2007-17).
- Of the current tenured or tenure-track faculty, 4 of the 18 faculty are aligned toward BME with 3 (17%) of the BME faculty currently having undergraduate teaching duties. The influx of faculty members required to support the establishment of the BS-BME degree would significantly distribute BME-related undergraduate teaching, advising, and research loads while providing critical mass for graduate level research and course development.
- The viability and growth of the BME graduate program will depend on the implementation of the BS-BME degree. Students from our own undergraduate population are known quantities with respect to preparation and performance, constituting the least amount of risk at the graduate level – particularly critical in light of limited resources.
- CBE is the only department in the FAMU-FSU College of Engineering capable of and invested in establishing an undergraduate degree in biomedical Engineering (e.g., CBE is the only COE department that requires Biology for all of its undergraduates).
- Although the addition of BS-BME courses in the departmental curriculum will increase the number of total classes, it will decrease the number of students per class and alleviate some of our current issues with respect large class sizes in the core curriculum.

State of Florida

- There are currently five Florida higher educational institutions offering a BS degree in Biomedical Engineering or Bioengineering, with three additional Florida programs (including CBE) offering undergraduate tracks or minors in BME.
- The University of Central Florida has notified the State University System Council of Academic Vice Presidents Academic Program Coordinator Work Group that the University is considering adding a BS-BME program.
• There are significant enrollment figures for each of the three public universities in Florida offering a BS-BME degree.
• To remain competitive within the State of Florida in the field of BME, creating a BS-BME program at the FAMU-FSU COE is vital. Student demand for a BS degree in biomedical engineering is increasing. FSU and FAMU may lose students to other state or national universities if no BS degree is instituted.
• The northern and panhandle portions of Florida are not served by either a public or private university offering a BS-BME degree.
• Employment projections in the field of biomedical engineering within the State of Florida show an increase of 21.5% from 2015-2023.

National
• Of the top 20 universities listed among the US News & World Report 2017 Ranking of Best Undergraduate Engineering Programs (Doctorate), only one university (Princeton University) does not offer a separate BS degree in either biomedical, biological or bioengineering. Nationally, most other engineering colleges offer a program in Biomedical Engineering.
• No HBCU offers a BS degree in Biomedical Engineering – such a program at the FAMU-FSU College of Engineering would be the first. Only one HBCU offers a BS degree in Bioengineering or Biological Engineering, namely North Carolina A&T University. Interestingly, NC A&T’s Bioengineering program is run out of the Department of Chemical, Biological, & Bio-Engineering.
• National Bureau of Labor Statistics Occupational Outlook Handbook 2015, Job Outlook for 2014-24: Average growth among all professions = 4%; Chemical Engineering = 2%; Biomedical Engineering = 23%. Biomedical Engineering is the engineering discipline with the largest job growth nationally and regionally.
• ASEE Growth by BS degree, 2006-2015: Chemical Engineering = 2.04; Biomedical Engineering = 1.95. The only engineering disciplines that show larger increases are Petroleum = 4.32; Environmental = 3 and Mining = 2.79; however, these disciplines have much smaller total degree numbers. Enrollment nationally for both biomedical engineering and chemical engineering have increased by a factor of 2 over this period.
• In 2015, 40.9% of BS-BME degrees nationwide were awarded to women compared to 32.4% of degrees in chemical engineering. Women earned 19.9% of all BS degrees in all engineering disciplines in 2015.
Appendix D.
Academic Learning Compact – BS in Biomedical Engineering

The compact is a list of core learning expectations. The expectations are in the table below. The types of items are listed to the right. The last three items in the table are associated with expectations in Liberal Studies. The assessment used to measure the expectations are listed separately in another table below.

<table>
<thead>
<tr>
<th>Biomedical Engineering</th>
</tr>
</thead>
</table>

Purpose of the Program:

The Bachelor of Science degree in Biomedical Engineering shall prepare its students for academic and professional work through the creation and dissemination of knowledge related to the field, as well as through the advancement of those practices, methods, and technologies that form the basis of the biomedical engineering profession.

Program Objectives:

1. Successfully pursue careers in a wide range of industrial, professional and academic settings through application of their rigorous foundation in biomedical engineering and strong communication skills.
2. Successfully adapt and innovate to meet future technological challenges and evolving regulatory issues, while addressing the ethical and societal implications of their work at both the local and global level.
3. Successfully function on interdisciplinary teams and assume participatory and leadership roles in professional societies, and interact with educational, community, state, and federal institutions.

Program Outcome:

At least 80% of the BS-BME program graduates will, within six months of graduation, be employed in industry, government, or public service, or enrolled in post-graduate or professional schools.

Student Outcomes for the BS degree in Biomedical Engineering are:

1. Student Outcome #1 – Scientific Knowledge and Problem Solving.
   Outcome Definition: Students graduating from the program will have an ability to identify, formulate, and solve complex engineering problems at the interface of engineering, biology, and medicine by applying principles of engineering, science, and mathematics.
2. Student Outcome #2 – Design Skills
Outcome Definition: Students graduating from the program will have the ability to apply engineering design to produce a system, component, or process that meets specified needs within multiple realistic constraints such as economic, environmental, public health and safety, welfare, manufacturability and sustainability while incorporating appropriate engineering standards.

3. Student Outcome #3 – Effective Communications
Outcome Definition: Students graduating from the program will have the ability to communicate effectively with a range of audiences.

4. Student Outcome #4 – Professional and Ethical Responsibility
Outcome Definition: Students graduating from the program will be able to recognize ethical and professional responsibilities in formulating engineering solutions, and will be able to make informed judgements which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

5. Student Outcome #5 – Teamwork
Outcome Definition: Students graduating from the program will have the ability to function effectively as a member or leader of a team that establishes goals, plans tasks, meets deadlines, and creates a collaborative and inclusive environment.

6. Student Outcome #6 – Chemical Engineering Process Experimentation
Outcome Definition: Students graduating from the program will be able to design and conduct biomedical engineering experiments, and analyze and interpret data of importance to the design and operation of biomedical processes.

7. Student Outcome 7 — Lifelong Learning
Outcome Definition: Students graduating from the program will have an ability to recognize the ongoing need to acquire new knowledge, to choose appropriate learning strategies, and to apply this knowledge to engineering problems.

Program Outcomes Assessment Process:

A review of the course binders (in accordance with the program articulation matrix) forms the primary basis for the annual assessment of program outcomes by the outcomes assessment committees. The course materials are reviewed on the basis of outcomes, rather than on a course-by-course basis, in accordance with our understanding of the guidelines set out in the ABET Self-Study Questionnaire. The committees doing the assessment address the following questions:

1. Are the specific skills that correspond to a particular program outcome appropriate? If not, how should they be changed?
2. Are the implementation strategies for a particular outcome appropriate? If not, how should they be changed?
3. Are the student learning tasks (course learning objectives) in the courses appropriate? If not, how should they be changed?
4. Has evidence been presented to demonstrate that the course objectives are being accomplished at the level corresponding to that outcome in the program articulation matrix?
Each outcomes assessment committee submits its findings in a brief written report and in a presentation at the annual departmental assessment workshop. The reports and presentations also offer specific recommendations for course improvements based on their evaluation of the course binders. Recommendations for changes in program outcomes, performance indicators, and implementation strategies are considered for adoption by the faculty at the annual assessment workshop. Recommendations made for changes in a course are considered for implementation by the faculty member teaching the course in the following academic year. The assessment committee also offers specific recommendations for course improvement based on their evaluation of the course binders.

For each program outcome, an overall score is assigned based on all the courses evaluated. The score is given as an assessment of how well that program outcome was accomplished. The score is awarded on a scale of 1-3, with 1 corresponding to unsatisfactory performance, 2 to acceptable performance, and 3 to good performance.

An overall score of 2 out of 3 is desired for each program outcome. A score below 1.5 indicates a need for reevaluation of the course syllabi, and a score of 1 or below indicates the need for a close assessment of issues for a specific term offering of those courses. A grade significantly higher than 2 indicates that the specific outcome's overall level of learning (LOL) should be adjusted to a higher level.

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>The Outcome Involves These Skills:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upon completion of the Bachelors in Chemical Engineering:</td>
<td>Content</td>
</tr>
<tr>
<td>Student Outcome #1 – Scientific Knowledge and Problem Solving.</td>
<td></td>
</tr>
<tr>
<td>Outcome Definition: Students graduating from the program will have an ability to identify, formulate, and solve complex engineering problems at the interface of engineering, biology, and medicine by applying principles of engineering, science, and mathematics.</td>
<td></td>
</tr>
<tr>
<td>Student Outcome #2 – Design Skills</td>
<td></td>
</tr>
<tr>
<td>Outcome Definition: Students graduating from the program will have the ability to apply engineering design to produce a system, component, or process that meets specified needs within multiple realistic constraints such as economic, environmental, public health and safety, welfare,</td>
<td></td>
</tr>
<tr>
<td>Student Outcome #3 – Effective Communications</td>
<td></td>
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<td>-----------------------------------------------</td>
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</tr>
<tr>
<td>Outcome Definition: Students graduating from the program will have the ability to communicate effectively with a range of audiences.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Student Outcome #4 – Professional and Ethical Responsibility</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome Definition: Students graduating from the program will be able to recognize ethical and professional responsibilities in formulating engineering solutions, and will be able to make informed judgements which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Student Outcome #5 – Teamwork</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome Definition: Students graduating from the program will have the ability to function effectively as a member or leader of a team that establishes goals, plans tasks, meets deadlines, and creates a collaborative and inclusive environment.</td>
<td></td>
<td>X</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Student Outcome #6 – Chemical Engineering Process Experimentation</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome Definition: Students graduating from the program will be able to design and conduct biomedical engineering experiments, and analyze and interpret data of importance to the design and operation of biomedical processes.</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Student Outcome 7 — Lifelong Learning</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome Definition: Students graduating from the program will have an ability to recognize the ongoing need to acquire new knowledge, to choose appropriate learning strategies, and to apply this knowledge to engineering problems.</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Present Ideas and/or Information — The student will be able to demonstrate the ability to formulate a</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
clear original message that presents ideas or shares information.

**Effective Use of Both Vocal and Physical Delivery** — The student will be able to demonstrate the ability to formulate a clear original message that makes effective use of both vocal and physical delivery.

**Adaptation to Audience** — The student will be able to demonstrate the ability to formulate a clear original message that has been adapted to the particular audience.

<table>
<thead>
<tr>
<th>Student Performance on the Outcomes will be Assessed Directly Using:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral Observation</td>
<td>X</td>
</tr>
<tr>
<td>Capstone Course Evaluation</td>
<td>X</td>
</tr>
<tr>
<td>Class Performance or Presentation</td>
<td>X</td>
</tr>
<tr>
<td>Clinical Evaluation</td>
<td></td>
</tr>
<tr>
<td>Course Embedded Assignment (Often in tandem with exam question bank)</td>
<td>X</td>
</tr>
<tr>
<td>Course Report</td>
<td>X</td>
</tr>
<tr>
<td>Department Assessment</td>
<td>X</td>
</tr>
<tr>
<td>Departmental Exam/Comprehensive Exam/Preliminary Exam</td>
<td></td>
</tr>
<tr>
<td>Faculty Committee Evaluation of Dissertation, Thesis or Treatise</td>
<td></td>
</tr>
<tr>
<td>Faculty Designed Comprehensive or Capstone Examination and Assignment</td>
<td>X</td>
</tr>
<tr>
<td>Instructor Constructed Exam</td>
<td>X</td>
</tr>
<tr>
<td>Internship Evaluation of Specific Activity</td>
<td></td>
</tr>
<tr>
<td>Judged Exhibition</td>
<td></td>
</tr>
<tr>
<td>Judged Performance</td>
<td>X</td>
</tr>
<tr>
<td>National or State Standardized Exam</td>
<td></td>
</tr>
<tr>
<td>Performance on Licensing or other External Examination</td>
<td></td>
</tr>
<tr>
<td>Portfolio of Student Work</td>
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</tr>
<tr>
<td>Evaluation Type</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------</td>
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</tr>
<tr>
<td>Pre-Test/Post-Test Evaluation</td>
<td></td>
</tr>
<tr>
<td>Problem-Solving Exercise</td>
<td>X</td>
</tr>
<tr>
<td>Professional Judged Performance or Demonstration</td>
<td></td>
</tr>
<tr>
<td>Project Evaluation</td>
<td>X</td>
</tr>
<tr>
<td>Public Performance or Presentation (Juried)</td>
<td>X</td>
</tr>
<tr>
<td>Simulation</td>
<td></td>
</tr>
<tr>
<td>Videotaped or Audio-taped Performance</td>
<td></td>
</tr>
<tr>
<td>Written Report or Essay</td>
<td>X</td>
</tr>
</tbody>
</table>
Appendix E.

Curriculum Vitae for the Existing Faculty – BS-BME

1. Dr. Teng Ma
2. Dr. Samuel Grant
3. Dr. Jingjiao Guan
4. Dr. Yan Li
5. Dr. Kimberly Hunter
Curriculum Vitae
Teng Ma
April 02, 2013

General Information

University address: Chemical & Biomedical Engineering
FAMU-FSU College of Engineering
2525 Pottsdamer Street B-335
Florida State University
Tallahassee, Florida 32310
Phone: (850) 410-6558; Fax: (850) 410-6150

E-mail address: teng@eng.fsu.edu

Web site: http://eng.fsu.edu/cbc/people/ma.html

Professional Preparation

1999 Ph.D., The Ohio State University, Columbus, OH. Major: Chemical Engineering.

1989 B.S., Tianjin University, Tianjin, China. Major: Chemical Engineering.

Postdegree Education and Training

1999–2000 Obstetrics and Gynecology (OB/GYN), The Ohio State University Medical Center.

Professional Experience

2011–present Professor with tenure, Chemical and Biomedical Engineering, FAMU-FSU College of Engineering, Florida State University, Tallahassee, FL.

2001–present Molecular Biophysics Graduate Faculty, Florida State University, Tallahassee, FL.

2006–2011 Associate Professor with tenure, Chemical and Biomedical Engineering, FAMU-FSU College of Engineering, Florida State University, Tallahassee, FL.
2000–2006  Assistant Professor, Chemical and Biomedical Engineering, FAMU-FSU College of Engineering, Florida State University, Tallahassee, FL.

1999–2000  Postdoctoral Research Associate, The Perinatal Research Laboratory, Department of OB/GYN, The Ohio State University, Columbus, OH.

Honors, Awards, and Prizes

Innovator Award, Florida State University (2010).
Developing Scholar Award, Florida State University (2008).
Inventor Award, Florida State University (2007).
Inventor Award, Florida State University (2006).
Progress Energy Faculty Development Award, Florida State University (2005).
First Year Assistant Professor Award, Florida State University (2001).
Outstanding Postdoctoral Award for Research Excellence, The Ohio State University (2000).

Current Membership in Professional Organizations

American Association for the Advancement of Science (AAAS)
American Institute of Chemical Engineers (AIChE)
Biomedical Engineering Society
Tissue Engineering International and Regenerative Medicine Society

Teaching

Courses Taught

Special Topics in Biomedical Engineering (BME5937)
Research Methods in Chemical Engineering (ECH5052)
Mass and Energy Balances (ECH3023)
Biomedical Engineering (BME4007)
Kinetics and Reactor Design (ECH4504)
Biomedical Engineering (ECH4741)
Honors URP in Biomedical Engineering (BME4906)
Chemical Engineering Seminar (ECH5935)
Bioengineering (ECH4743)
Special Topics in Chemical Engineering (ECH5934)
Doctoral Committee Chair


Grayson, W., graduate. (2005). *Reconstructing the In Vivo Environment for the Development of Tissue-engineered Constructs from Human Mesenchymal Stem Cells.*


Doctoral Committee Member

Pathi, B., graduate. (2012).


Masad, I., graduate. (2011).


Martinez, J. S., doctoral candidate.

Zhang, P., doctoral candidate.

Elam, M. L., doctoral student.

Doctoral Committee University Representative


Wu, X., doctoral candidate.

Andrade, P. F., doctoral student.

Shu, Z., doctoral student.

Yu, Y., doctoral student.

Master's Committee Chair

Liao, T., graduate. (2008). *Thermoresponsive polyelectrolyte multilayer films as culture substrates for human mesenchymal stem cells.*


Tsai, Ang-chen, student. (2014).

Master's Committee Member


Research and Original Creative Work

Publications

Refereed Journal Articles


Invited Book Chapters


Presentations

Invited Papers at Conferences


Refereed Papers at Conferences

Kim, J., & Ma, T. (presented 2010). Effects of macroscopic flow on hMSC growth and osteogenic differentiation in Perfusion Bioreactor. Paper presented at American Institute of Chemical Engineers Annual Meeting, American Institute of Chemical Engineers. (National)
Kim, J., & Ma, T. (presented 2010). *Oxygen tension regulates hMSC expansion and formation of microenvironment*. Paper presented at American Institute of Chemical Engineers Annual Meeting, American Institute of Chemical Engineers. (National)

Ma, T. (presented 2010). *Chitosan scaffolds for bone regeneration using human mesenchymal stem cells*. Paper presented at Department of Biomedical Engineering, Ohio State University. (National)


Ma, T. (presented 2010). *Oxygen tension regulates the formation of human mesenchymal stem cell microenvironment*. Paper presented at Stem Cell Group, Ohio State University. (National)


Crowe, J., Grant, S., Logan, T., & Ma, T. (presented 2008). *1H Spectroscopic Analysis of hMSC Microenvironment In a 3D Perfusion Bioreactor*. Paper presented at American Institute of Chemical Engineers Annual Meeting, American Institute of Chemical Engineers. (National)

Conference on Stem Cell Engineering, American Institute of Chemical Engineers. (National)


Zhao, F., Chella, R., & Ma, T. (presented 2008). *Effects of Bone Morphogenetic Protein Distribution and Shear Stress on 3-D Human Mesenchymal Stem Cell Construct Development In a 3-D Perfusion Bioreactor System*. Paper presented at American Institute of Chemical Engineers Annual Meeting, American Institute of Chemical Engineers. (National)


Zhao, F., Sellgren, K., & Ma, T. (presented 2007). Interstitial flow modulates 3-D human mesenchymal stem cell construct development. Paper presented at American Institute of Chemical Engineers Annual Meeting, American Institute of Chemical Engineers. (National)


Zhao, F., & Ma, T. (presented 2006). Shear Stress Regulates hMSC Expansion in 3-D Scaffolds. Paper presented at American Institute of Chemical Engineers Annual Meeting, American Institute of Chemical Engineers. (National)

Zhao, F., Stroud, J., & Ma, T. (presented 2006). Oxygen Tension Influences HUVEC Endothelialization on PET Membrane. Paper presented at American Institute of Chemical Engineers Annual Meeting, American Institute of Chemical Engineers. (National)


Zhao, F., Grayson, W., Lu, W., Ma, T., & Ma, T. (presented 2005). Effects of hydroxyapatite on 3-D human mesenchymal stem cell tissue development. Paper presented at Engineering Tissues, Engineering Tissues. (National)


Patented Inventions


Ma, T. (2005). Modular cell culture bioreactor and associated methods. 6,875,605 B1, FSU.

Contracts and Grants

Contracts and Grants Funded


Contracts and Grants Pending


Ma, T. (Jan 2013). Development of Spinner Flask Bioreactor for Scalable Expansion of Human Mesenchymal Stem Cell Aggregates for Heart Diseases. Submitted to Florida Biomedical Research Program.

Service

Florida State University

FSU University Service

Member, FSU President's Health Science Committee (2012).

Member, FSU Graduate Policy Committee (GPC), Chemical and biomedical engineering sub-committee (2011–2012).

Committee member, FSU Animal Care and Use Committee (2010–2012).

Senator, FSU Faculty Senate (2010–2012).

FSU College Service

Chair, Graduate Committee (2010–2013).

Member, Dean Search Committee (2011).

FSU Department Service

Chair, Graduate Committee (2005–2013).
The Profession

Guest Reviewer for Refereed Journals


Reviewer for *Biotechnology and Bioengineering* (2000–present).


Reviewer or Panelist for Grant Applications

National Science Foundation (2007–present).

Curriculum Vitae
Samuel C. Grant
September 16, 2016

General Information
University address: Chemical & Biomedical Engineering
FAMU-FSU College of Engineering
2525 Pottsdamer Street
Florida State University
Tallahassee, Florida 32310-2740
Phone: 850-645-7197; Fax: 850-644-1366

E-mail address: scgrant@fsu.edu

Web site: www.eng.fsu.edu/~grantsa

Professional Preparation


Nondegree Education and Training

Professional Experience
2013–present Associate Professor, Chemical & Biomedical Engineering, Florida State University.

2013–present Associate Professor, National High Magnetic Field Laboratory, Florida State University.

2006–2013 Assistant Professor, Chemical & Biomedical Engineering, Florida State University.
2006–2013 Assistant Professor, National High Magnetic Field Laboratory, Florida State University.

1994 Intern, Center for Compound Semiconductor Microelectronics, University of Illinois, Urbana-Champaign. Undergraduate Summer Internship.

Honors, Awards, and Prizes

Certificate of Service for Excellence in Mentorship, National High Magnetic Field Laboratory (2010). ($0).
Senior Member, Institute for Electrical and Electronics Engineers (2010). ($0).
Certificate of Appreciation for Excellence in Mentorship, National High Magnetic Field Laboratory (2009). ($0).
Certificate of Service, National High Magnetic Field Laboratory (2009).

Current Membership in Professional Organizations

Biomedical Engineering Society
Engineering in Medicine and Biology Society
Institute of Electrical and Electronics Engineers, Senior Member
International Society for Magnetic Resonance in Medicine

Teaching

Courses Taught

Honors-DTIAnalyS-AplysiaNetwork (BME4906)
Introduction to Biomedical Engineering (BME3009)
Quantitative Anatomy and Systems Physiology II (BME4404C)
Honors - MREIT in Aplysia (BME4906)
Directed Individual Study (ECH5905)
DirIndividStudy-BasicsofMRI (BME5905)
Honors - High Field MRI (BME4906)
Quantitative Anatomy and Systems Physiology I (BME4403C)
Honors - Carbon Nanotube MRI (BME4906)
Honors-NMR-MRI (BME4906)
Directed Individual Study (EEL5905)
Dissertation (BME6980)
Honors URP in Biomedical Engineering (BME4906)
Thesis (BME5971)
Thesis Defense (BME8976)
Directed Individual Study (BME5905)
Dissertation Defense (BME8985)
Biomedical Engineering (BME4007)
Supervised Research NMR/MRI (BME5910)
NMR and MRI Methods in Biology and Medicine (BME6530)
Graduate Special Topics: Bioimaging (BME5937b)
Responsible Conduct of Research and Creative Activity (ECO5936)
Special Topics in Biomedical Engineering (BME4937)
Special Topics in Biomedical Engineering (BME5937)
Undergraduate Special Topics: Bioimaging (BME4937)
Graduate Quantitative Anatomy and System Physiology I (BME5937c)
RF Transceiver (BME5905a)
Undergraduate Research Project (BME4904)
Special Topics: Bioinstrumentation (BME5937)
NMR/MRI Instrumentation (BME5905)
Biomedical Engineering Seminar (BME5935)
Chemical Engineering Seminar (ECH5935)
Quantitative Anatomy and Systems Physiology I (ECH4937)
Quantitative Anatomy and Systems Physiology I (BME4003C)

New Course Development

Introduction to Biomedical Engineering (2012)
Graduate Special Topics: Bioimaging (2009)
Undergraduate Special Topics: Bioimaging (2009)
Special Topics: Bioinstrumentation (2008)
NMR and MRI Methods in Biology and Medicine (2007)
Quantitative Anatomy and Systems Physiology I (2006)

Curriculum Development

BME 3008 - Introduction to Biomedical Engineering: A sophomore level introductory survey to the field of Biomedical Engineering to be held for the first time in Spring 2012 (2011)
BME/ECH 8965r - Doctoral Qualifying Exam (0) Redefinition and codification of the qualifying examination for doctoral candidacy for either the chemical or biomedical engineering programs
(2007)

**Doctoral Committee Chair**

Masad, I. S., graduate. (2011). *ASSESSMENTS OF SKELETAL MUSCLE ARCHITECTURE AND ENERGETICS BY MAGNETIC RESONANCE DIFFUSION TENSOR IMAGING AND 31P SPECTROSCOPY.*
Rosenberg, J., graduate. (2011). *INTRACELLULAR MRI CONTRAST AGENTS FOR HIGH MAGNETIC FIELDS.*
Ould Ismail, A. A., doctoral student.

**Doctoral Committee Cochair**

Amouzandeh, G., doctoral student.

**Doctoral Committee Member**

Pathi, B., graduate. (2012).
Darkazalli, A., doctoral candidate.
Jo, E., doctoral candidate.
Liu, Y., doctoral candidate.
Thompson, K. L., doctoral candidate.
Xia, J., doctoral candidate.
Yan, Y., doctoral candidate.

**Doctoral Committee University Representative**

Henning, P. C., graduate. (2010).
Wilson, J. M., graduate. (2010).
Kanel, P., doctoral candidate.
Ridel, C. D., doctoral candidate.
Kim, D. H., doctoral student.
Rose, A. M., doctoral student.

Master's Committee Chair

Ould Ismail, A. A., graduate. (2016).
Sagaram, S., graduate. (2013). Waveguide Analysis for High Field MRI.
Flagas, C. A., student. Magnetic Resonance Electrical Impedance Tomography of Neural Activity at 11.75 T.

Master's Committee Member

Yan, Y., graduate. (2014).
Lio, T., graduate. (2008).
Badal, K. E., student. The Use of Liquid State 1H NMR to Study the Precipitation Kinetics of Cellulose from an NMMO/Cellulose/Water Solution.

Bachelor's Committee Chair

Chrzanski, G., student.
Hampe, A., student.
Chin, A. R., student Quantitative Susceptibility Mapping of Pathological Metal Distributions.
Bachelor's Committee Member

McLaughlin, C. M., graduate. (2010).
Morales, D., graduate. (2010).

Additional Teaching Not Reported Elsewhere


Research and Original Creative Work

Publications

Referred Journal Articles


doi:10.1016/j.ces.2011.05.046


**Invited Book Chapters**


**Refereed Proceedings**


In *20th Annual Meeting of the Society for Magnetic Resonance in Medicine*. Melbourne, Australia.


Rosenberg, J. T., Kogot, J. M., Ridel, C., Strouse, G. F., & Grant, S. C. (2009). Evaluation of Nanoparticle Contrast Agent Uptake in Murine Microglia (Bv-2) and Human Teracarcinoma (NT2) for Cell Tracking in Neurodegenerative Disease at 21.1 T. In 17th Joint Annual


**Presentations**

**Invited Presentations at Conferences**

Grant, S. C., Falgas, C. A., Sadlier, R., & Woo, E. J. (accepted). *Magnetic Resonance Electrical Impedance Tomography of Neural Activity at 11.75 T*. Presentation to be given at 2012 Annual Meeting of the Biomedical Engineering Society, Biomedical Engineering Society, Atlanta, GA. (International)


**Invited Lectures and Readings of Original Work**


Contracts and Grants

Contracts and Grants Funded


Cross, Timothy A (Co-PI), Bird, Mark D (Co-PI), Gan, Zehong (Co-PI), Brey, William W (PI), & Grant, Samuel (Co-PI). (Oct 2010–Sep 2016). *MRI: Development of an NMR Console for the 36 T Series.* Funded by National Science Foundation. (1039938). Total award $1,300,000.

Ma, Teng (PI), & Grant, Samuel (Co-PI). (Jul 2010–Jun 2013). *Transplantation Of Culture Expanded HmSc In Stroke Treatment.* Funded by American Heart Association. (10GRNT3860040). Total award $165,000.

Levenson, Cathy W (Co-PI), Grant, Samuel (Co-PI), Arjmandi, Bahram H (PI), Schepkin, Victor D (Co-PI), & Kim, Jeong-Su (Co-PI). (Feb 2008–Mar 2009). *MDS, Studies on Age-Related Disorders Utilizing Nutrition, Exercise and Magnetic Resonance.* Funded by FSU CRC. Total award $25,000.


Contracts and Grants Pending


Grant, S. C., & Frydman, L. (Feb 2013). *Ultrafast In Vivo Diffusion Imaging Of Stroke At High Field By Spatiotemporal Encoding*. Submitted to NIH.

Grant, S. C., & Ma, T. (Feb 2013). *MRI Analysis Of Culture Expanded Human Mesenchymal Stem Cell Therapy For Stroke*. Submitted to NIH.

Grant, S. C., & Ma, T. (Jan 2013). *Timed Human Mesenchymal Stem Cell Therapy In Stroke Evaluated By High Field MRI*. Submitted to AHA.

Ma, T., & Grant, S. C. (Jan 2013). *Scalable Expansion and Functional Enhancement of Human Mesenchymal Stem Cell (hMSC) in Three-dimensional Aggregates for Stroke Treatment*. Submitted to AHA.

Rosenberg, J. T., & Grant, S. C. (Jan 2013). *Transplantation of human MSCs for optimal combined therapeutic effects of exogenous and endogenous stem cells after ischemic injury*. Submitted to AHA.

**Postdoctoral Supervision**


**Service**

**Florida State University**

**FSU Department Service**

Member, Bylaws Committee (2013–present).

Member, PhD Qualifying Examination Committee (2011–present).

Faculty Advisor, BMES Student Chapter (2007–present).

Member, Graduate Committee (2006–present).


Member & External Candidate Host, 2013 Department Chair Search Committee (2013).
Chair, Graduate School Open House (2009–2010).

Chair, PhD Qualifying Examination Committee (2007–2008).


FSU Institute or Center Service

Member, NHMFL Promotion Committee (2012–present).


Associate Director, FSU Center for Advancing Exercise & Nutrition Research on Aging (2009–present).


Member, NHMFL 900 UWB Scientific Committee (2006–2009).

Chair, NHMFL Animal Facility Build-out Committee (2006–2009).

The Profession

Guest Reviewer for Refereed Journals


*Transactions on Biomedical Engineering* (2011–present).


Judge for an Exhibition


*Annual Meeting of the Biomedical Engineering Society.* Atlanta, GA: Biomedical Engineering Society (2012).


Chair of a Symposium

Grant, S. C. (Chair). (2011, May). ISMRM MR Engineering Study Group. Symposium conducted at the meeting of International Society for Magnetic Resonance in Medicine, Montreal, Quebec, Canada.
Reviewer or Panelist for Grant Applications


University of Minnesota Center for Magnetic Resonance Research (2012).

National Science Foundation (2008).

Service to Professional Associations

Primary Section Delegate for Tallahassee Area, IEEE 2011 Sections Congress, Institute for Electrical and Electronics Engineers (2011–present).

Chair, Professional Organization of the Institute for Electrical and Electronics Engineers, IEEE Tallahassee Area Section (2012).


Vice Chair, Tallahassee Area Section, Institute for Electrical and Electronics Engineers (2010–2011).


The Community


Consultation


Additional Service Not Reported Elsewhere


3 Year Curriculum Vitae
Jingjiao Guan
December 16, 2014

General Information

University address: Chemical & Biomedical Engineering
FAMU-FSU College of Engineering
2525 Potsdamer Street B-337
Florida State University
Tallahassee, Florida 32310
Phone: (850)410-6643; Fax: (850)410-6150

E-mail address: guan@eng.fsu.edu

Web site: http://eng.fsu.edu/cbe/people/guan.html

Professional Preparation (Highest Degree Only)

2005 Ph.D., The Ohio State University, Columbus, OH. Major: Biomedical Engineering.

Professional Experience

2008–present Assistant Professor, Chemical and Biomedical Engineering, Florida State University.

Current Membership in Professional Organizations

American Institute of Chemical Engineers
Institute for Biological Engineering

Teaching

Courses Taught

Quantitative Anatomy and Systems Physiology II (BME4404-C)
Special Topics in Biomedical Engineering - Microfabrication (BME5937)
Quantitative Anatomy and Systems Physiology II (BME4404-C)
New Course Development

Special Topics in Biomedical Engineering - Microfabrication (2012)

Doctoral Committee Chair

Xia, J., doctoral candidate. Orthogonal Microarrays for Biomedical Applications.  
Zhang, P., doctoral candidate. Top-Down Fabrication of Particulate Microdevices for Biomedical Applications. [This student was awarded with PhD in June 2013]

Doctoral Committee Member

Xiao, Z., doctoral candidate. [Advisor: Tao Liu, Industrial and Manufacturing Engineering]  
Hotmar, P., doctoral candidate. [Advisor: Ravi Chella]  
Barreda, J. L., doctoral student. Superconducting Nanowires on One-Dimensional Molecular Templates. [Advisor: Peng Xiong in Department of Physics]  
Lowry, T., doctoral student. [Advisers: Steven Lennert (Biological Science) and David Van Winkle (Physics)]  
Hunter, K., doctoral student. [Adviser: Teng Ma]

Doctoral Committee University Representative

Kusi-Appiah, A. E., doctoral candidate. [Advisor: Steven Lennert, Biological Science]

Master's Committee Member


Bachelor's Committee Member

Chin, A., student. [Advisor: Samuel C. Grant]  
Rodriguez, M., student. The role of alpha-7 nicotinic acetylcholine receptors in angiogenesis after in vivo nicotine administration. [Advisor: Susanne Cappendijk]
Supervision of Student Research Not Related to Thesis or Dissertation


Khan, B. (Sep–Dec 2012).


Research and Original Creative Work

Publications

Refereed Journal Articles


Invited Book Chapters


Presentations

Invited Presentations at Conferences


Science, OAHOST, Open-Access Publication and Conference Management by Scientists and for Scientists, Orlando, FL. (International)

Refereed Presentations at Conferences


Zhang, P., Xia, J., Liu, Y., & Guan, J. (presented 2012, October). Top-down Fabrication of Theranostic Microparticles. Poster presentation at Annual Meeting, Biomedical Engineering Society, Atlanta, GA. (International)

Contracts and Grants

Contracts and Grants Funded


Contracts and Grants Pending


Postdoctoral Supervision


Service

Florida State University

FSU College Service

Judge, Annual College of Engineering Graduate Student Symposium (2013).

FSU Department Service

Member, Biomedical Engineering qualifying examination committee (2013).

Member, Graduate Committee (2008–2013).

FSU Institute or Center Service


The Profession

Editor for Refereed Journals


Guest Reviewer for Refereed Journals

Nanoscale (May 2013).


Lab on a Chip (Feb 2013).


Lab on a Chip (Dec 2012).

Analytical Chemistry (Aug 2012).


Lab on a Chip (Jul 2012).

Nano Life (May 2012).

Lab on a Chip (Mar 2012).

Journal of Physical Chemistry (Feb 2012).

Lab on a Chip (Jan 2012).

Sensors & Actuators (Jan 2012).


Lab on a Chip (Dec 2011).

Reviewer or Panelist for Grant Applications

National Science Foundation (2013).
National Science Foundation (2012).


The Community

Curriculum Vitae
Yan Li
August 21, 2017

General Information

University address: Chemical and Biomedical Engineering
FAMU-FSU College of Engineering
2525 Potsdam Street, B343
Florida State University
Tallahassee, Florida 32310-6046
Phone: (850) 410-6320; Fax: (850) 410-6150

E-mail address: yli@eng.famu.fsu.edu; yli4@fsu.edu; yan.li@famu.edu

Web site: http://www.eng.fsu.edu/faculty/cbe/li.html

Professional Preparation

2002 Ph.D., The Ohio State University, Columbus, OH. Major: Chemical Engineering.

Yan Li. (2002). Human tissue development in three-dimensional nonwoven fibrous matrix with defined microstructure. Unpublished doctoral dissertation, The Ohio State University, Columbus, OH.

1995 B.S., Tsinghua University, Beijing, P.R. China. Major: Chemical Engineering. Graduated with honors.

Professional Experience

2013–present Affiliates, Institute for Successful Longevity, Florida State University.

2013–present Institute of Molecular Biophysics Graduate Faculty, Florida State University.

2011–present Assistant Professor, Chemical and Biomedical Engineering Department, FAMU-FSU College of Engineering, Florida State University.

2009–2011 Principal Scientist, Group/Project leader, Department of Process Sciences, Geron Corporation, Menlo Park, California. Supervised the activity of Process Sciences and led the joint process development efforts for human pluripotent embryonic stem cell (hPSC)-derived products among Process Sciences, Manufacturing Operations, and Manufacturing Sciences.
2007–2009 Senior Scientist, Department of Process Sciences, Geron Corporation, Menlo Park, California. Responsible for process development and technology transfer of human pluripotent stem cell-derived cell products, including oligodendrocyte progenitor cells, cardiomyocytes, and dendritic cells.

2003–2006 Scientist II, Department of Process Sciences, Geron Corporation, Menlo Park, California. Responsible for optimization and scale-up of undifferentiated human embryonic stem cell culture process, oligodendrocyte progenitor cell differentiation process, cardiomyocyte differentiation process, peripheral blood mononuclear cell-derived dendritic cells.


**Honors, Awards, and Prizes**

Cell Culture Engineering XV Organizer, ECI (2016).
Exceptional speaker award, Society for Biological Engineering (2012).
First Year Assistant Professor Award, Florida State University (2012).
Geronosity Award (for GRNCM1 process lock down), Geron Corporation (2010).
Award for GE HealthCare Technology Transfer, Geron Corporation (2009).
Award of Achievement for GRNOPC1 program, Geron Corporation (2008).
Geronosity Award (for cardiomyocyte culture and recombinant laminin-1), Geron Corporation (2006).
Outstanding Graduate Award for Academic Achievement, The Ohio State University (2001).
CIC Women in Science and Engineering Travel Award, The Ohio State University (2000).
Graduate Student Alumni Research Award, The Ohio State University (2000).

**Fellowship(s)**

Presidential Fellowship, The Ohio State University (2001).
Department Fellowship, The Ohio State University (1999–2000).

**Current Membership in Professional Organizations**

American Chemical Society (ACS)
American Institute of Chemical Engineers (AIChE)
Biomedical Engineering Society (BMES)
International Society for Experimental Hematology (ISEH) (2001)
Phi Kappa Phi, National Honor Society
Society for Biological Engineering (SBE)
Teaching

Courses Taught

Biomedical Engineering (BME4007)
Biomedical Engineering Seminar (BME5935)
Chemical Engineering Seminar (ECH5935)
Special Topics: Cellular and Tissue Engineering (BME 5937)
Honors URP in Chemical Engineering (ECH4906)
Bioengineering (ECH4743)
Doctoral Preliminary Examination (ECH8965)
Mass and Energy Balances II (ECH3024)
Honors URP in Biomedical Engineering (BME4906)
Mass and Energy Balances I (ECH3023)
Special Topics in Chemical Engineering (ECH5934)

Curriculum Development

In Bioengineering and Biomedical Engineering, incorporation of the topics of current Good Manufacturing Practices (cGMP), quality by design, and Pharmaceutical Engineering (2012)

Doctoral Committee Chair


Doctoral Committee Member

Bosco, D., graduate. (2015). *Influencing human mesenchymal stem cell behavior with small molecular compounds (Institute of Molecular Biophysics).*
Leonard, S., graduate. (2014). *Solid State NMR Structural Analysis OF Designer Self-Assembling Peptides MAX8 and SAF.*
Abad, N., doctoral candidate.
Ogden, S., doctoral candidate. Association of cell death-inducing DFFA-like effector B with lipid droplet (Department of Biological Science) 2014-2016.

Master's Committee Chair

Yan, Y., graduate. (2014). MPIO labeling of Pluripotent Stem Cell-derived Neural Progenitors.

Master's Committee Member


Bachelor's Committee Chair

Harris, D., graduate. (2013). FAMU Title III project: Neural Differentiation of Pluripotent Stem Cells.

Bachelor's Committee Member

Padgett, K., graduate. (2014). Fabrication of binder-free electrodes.
Supervision of Student Research Not Related to Thesis or Dissertation

Paez, J. (Jul 2017–present).
Harris, D. A. (2012).

Additional Teaching Not Reported Elsewhere

Li, Y. (2001). ChE766: Biotechnology and Bioprocess Engineering. Gave lecture when the instructor was absent. The Ohio State University.

Li, Y. (2001). Teaching assistant of ChE523: Chemical Engineering Operations. Gave lecture when the instructor was absent. The Ohio State University.

Li, Y. (1999). Teaching assistant of ChE762: Chemical Engineering Process Development. Led the project for one group (5 undergraduate students). The Ohio State University.

Training


Li, Y. (2010). Training, advising, and transferring technology for 3 scientists from Lonza as company's technical leader.


Research and Original Creative Work

Dr. Li's research mainly focuses on pluripotent stem cell expansion and differentiation, tissue engineering, and biomaterials. Based on her 10-year experience at Geron Corporation, the world leader in human pluripotent stem cell technology, Dr. Li is interested in developing a research program focused on stem cell-based systems for drug screening, disease modeling, and regenerative medicine. Specifically, her research is in the 3-D culture systems and the extracellular matrix and other cell-biomaterials interactions. Some research are collaborative, indicating her expertise in stem cell engineering. The PI has a total of 50+ publications, 2000+ citations. ** indicates key research papers from FSU. * indicates corresponding author.

Publications

Invited Journal Articles


Yan, Y., Song, L., Tsai, A.-C., Ma, T., & *Li, Y. (2016). Generation of Neural Progenitor Spheres from Human Pluripotent Stem Cells in a Suspension Bioreactor [Invitation to Y Li]. *Methods in Molecular Biology, 1502*, 119-128.


Sart, S., Ma, T., & *Li, Y. (2014). Preconditioning Stem Cells for In Vivo Delivery.[Invitation to Y Li]. *Bioresearch Open Access, 3*, 137-149.

**Refereed Journal Articles**


**Refereed Book Chapters**


**Referred Reviews**


**Nonrefereed Summaries**


**Presentations**

**Invited Presentations at Conferences**

Sart, S (Presenter), Agothas, S. N., & Li, Y. (presented 2014, November). *Process engineering of stem cell metabolism for large-scale expansion and differentiation in bioreactors.* Presentation at the meeting of Industrial Forum: Advances in Biotechnology. 2014 Annual Meeting of American Institute of Chemical Engineers (AIChE), Atlanta, GA. (National)

Li, Y. (presented 2014, March). *Neural differentiation and imaging of pluripotent stem cells: the applications of biomaterials.* Presentation at Advancing the Science and Technology of Materials, Interfaces, and Processing, 2014 Florida AVS/FSM joint Symposium, Orlando, FL. (Regional)

Sart, S (Presenter), Agathos, S. N., & Li, Y. (presented 2013, November). *Stem Cell Expansion and Differentiation in Microcarrier-based Bioreactors for Large Scale Production.* Presentation at Industrial Forum: Advances in Biotechnology, Annual Meeting of American Institute of Chemical Engineers (AIChE), San Francisco, CA. (National)
Li, Y. (presented 2013, August). *Neural differentiation of pluripotent stem cells and the intracellular labeling with superparamagnetic iron oxide nanoparticles.* Presentation at The Third EITA Young Investigator Conference, EITA, Massachusetts Institute of Technology (MIT), Cambridge, MA. (National)

**Refereed Presentations at Conferences**


Yan, Y., Bejoy, J., Xia, J., Guan, J., Zhou, Y., & Li, Y. (presented 2016, May). Neural patterning of human induced pluripotent stem cells for studying neurotoxicity. (supported by Graduate Student Travel Grant $2495 from the meeting). Presentation at the meeting of ECI Cell Culture Engineering Conference XV, May 8-13, 2016, La Quinta, CA. (International)


Sart, S., Yan, Y., Lochner, E., Ma, T., & Li, Y. (presented 2015, May). *Extracellular Matrix Scaffolds Derived from Pluripotent Stem Cell Aggregates Regulate Stem Cell Proliferation and Differentiation*. Presentation at the meeting of 24th European Society for Animal Cell Technology (ESACT) meeting, May 31-June 3, Barcelona, Spain 2015. (International)


Wang, Z., Xia, J., Yan, Y., Tsai, A.-C., Li, Y., Ma, T., & Guan, J. (presented 2014, November). *Facile Functionalization and Assembly of Live Cells with Microcontact Printed Polymeric Biomaterials*. Presentation at 2014 Annual Meeting of AIChE, Nov 16-21, Atlanta, GA, AIChE. (National)


Sart, S., Liu, Y., Ma, T., & Li, Y. (presented 2013, November). Tissue Development of Pluripotent Stem Cell-derived Neural Progenitor Aggregates Regulated by Human Mesenchymal Stem Cell Secretome. Presentation at 2013 Annual Meeting, American Institute of Chemical Engineers (AIChE), San Francisco, CA. (National)

Sart, S., Yan, Y., Liu, Y., Ma, T., & Li, Y. (presented 2013, November). Microenvironment Regulation of Tissue Development from Pluripotent Stem Cells Post-cryopreservation. Presentation at 2013 Annual Meeting, American Institute of Chemical Engineers (AIChE), San Francisco, CA. (National)

Sart, S., Ma, T., & Li, Y. (presented 2013, March). Extracellular matrices decellularized from embryonic stem cells regulated the reseeded cell proliferation and differentiation. Presentation at Regenerative Medicine, Technologies Enabling Novel Therapies, 17th Annual Hilton Head Workshop, Hilton Head Island, SC. (Regional)

Sart, S., Ma, T., & Li, Y. (presented 2012, November). Characterization of acellular matrix derived from ESC aggregates as bioactive scaffolds. Presentation at 2012 Annual Meeting, American Institute of Chemical Engineers (AIChE), Pittsburg, PA. (National)

Sart, S., Ma, T., & Li, Y. (presented 2012, November). Size-dependent cryopreservation of pluripotent stem cell aggregates. Presentation at 2012 Annual Meeting, American Institute of Chemical Engineers (AIChE), Pittsburg, PA. (National)
Sart, S., Ma, T., & Li, Y. (presented 2012, September). Acellular matrices derived from PSC aggregates as bioactive scaffolds. Presentation at 4th Southeast Stem Cell Consortium Workshop, SouthEast Stem Cell Consortium (SESCC), Tallahassee, FL. (Regional)

Sart, S., Ma, T., & Li, Y. (presented 2012, September). Cryopreservation of pluripotent stem cell aggregates in defined protein-free formulation. Presentation at 4th SouthEast Stem Cell Consortium Workshop, SouthEast Stem Cell Consortium (SESCC), Tallahassee, FL. (Regional)


Annual Meeting, International Society for Stem Cell Research (ISSCR), San Francisco, CA. (International)

Li, Y., Denham, J., Thies, S., Brunette, E., Majumdar, A. S., Fortin, J., Powell, S. E., Priest, C., Keirstead, H., Lebkowski, J., & Mandalam, R. (presented 2004, November). *Scalable production of glial progenitor cells from human embryonic stem cells grown in defined animal component-free culture.* Presentation at 2004 Annual Meeting, American Institute of Chemical Engineers (AIChE), Austin, TX. (National)


### Invited Lectures and Readings of Original Work

Li, Y. (2017, August). *Engineering Mini-Brain Construct from Human Induced Pluripotent Stem Cells based on Biomaterials.* Delivered at College of Chemical Engineering and Biological Engineering, Zhejiang University, China. (International)


Li, Y. (2015, March). *Stem Cell-based Tissue Engineering.* Delivered at Connecting Experimental Lab and Life Sciences (CELLS), Florida State University. (Local)

Li, Y. (2015, February). *Niche engineering of pluripotent stem cells in three dimensions.* Delivered at Dept of Chemical and Biomedical Engineering, Florida State University. (Local)

Li, Y. (2014, April). *Neural differentiation of pluripotent stem cells and the intracellular labeling with superparamagnetic iron oxide nanoparticles.* Delivered at College of Nanoscale Science and Engineering, State University of New York (SUNY) at Albany. (National)
Li, Y. (2013, April). *Scalable Systems of Human Pluripotent Stem Cell (hPSC) Derived Therapeutics*. Delivered at Department of Chemical and Biological Engineering, The University of Alabama, Tuscaloosa, AL. (National)

Li, Y. (2013, January). *Human Pluripotent Stem Cell Therapies: from Research to Manufacturing*. Delivered at Institute of Molecular Biophysics, Florida State University, Tallahassee, Fl. (Local)

Li, Y. (2012, November). *Human Embryonic Stem Cell Derived Cell Therapies*. Delivered at Society for Biological Engineering (SBE) chapter, Department of Chemical and Biomolecular Engineering, The Ohio State University, Columbus, OH. (National)

Li, Y. (2012, October). *Pluripotent Stem Cell Derived Cell Therapies*. Delivered at Department of Mechanical Engineering, FAMU-FSU College of Engineering, Florida State University, Tallahassee, FL. (Local)

Li, Y. (2012, February). *Development of Scalable Manufacturing Processes for Human Pluripotent Stem Cell (hPSC) Derived Therapeutics*. Delivered at Biomedical Engineering Society (BMES) chapter. FAMU-FSU College of Engineering, Florida State University, Tallahassee, FL. (Local)

**Patented Inventions**


**Contracts and Grants Funded**


Zhou, Huan-Xiang (PI), Li, Yan (Co-PI), & Others. (May 2016–May 2017). Acquisition of a Microscale Thermophoresis Instrument for Binding Affinity Measurements. Funded by Florida State University, EIEG. Total award $60,000.


Wang, Yanchang (PI), Li, Yan (Co-PI), & Others. (Jan 2015–Jan 2016). Enhancing Biomedical Research by Confocal Microscopy with Quantitative Capability. Funded by FSU, Equipment and Infrastructure Enhancement Grant. Total award $85,000.

Li, Yan (PI). (Dec 2014–May 2016). Constructing Cardiac Tissues Using 3-D Auxetic Scaffolds. Funded by Florida State University CRC, Planning Grant. Total award $13,000.


Li, Yan (PI). (May 2014–Dec 2014). Biomechanical Regulation of Neural Differentiation from Pluripotent Stem Cells. Funded by Florida State University, Faculty Research Support Grant. Total award $14,000.


Olcese, James (PI), Li, Yan (Co-PI), & others. (Jan 2013–Dec 2013). *Improving Time and Resource Efficiency with Capillary Nanofluidic Protein Detection*. Funded by Florida State University, Equipment and Infrastructure Enhancement Grant (EIEG). Total award $40,000.

Li, Yan (PI), Chella, R., & Ma, T. (Jun 2012–May 2014). *Introduction to current good manufacturing practices (cGMP) for future process engineers*. Funded by Florida State University, Student Technology Committee. Total award $32,009.

Li, Yan (PI). (May 2012–Aug 2012). *Scalable cryopreservation and thaw bioprocess for human pluripotent stem cell derived cell therapy*. Funded by Florida State University, FYAP. Total award $17,000.

**Postdoctoral Supervision**


**Service**

**Florida State University**

**FSU University Service**

Reviewer, the Committee on Faculty Research Support (COFRS) Grant review panel (2016–present).

**FSU Department Service**

Reviewer, ABET Outcome Assessment Team (2012–present).

Faculty Advisor, Undergraduate Academic Advising (2012–present).

Member, Undergraduate Committee (2012–present).

Member, Ph.D. Qualification Exam Committee (2016).

Interim Faculty Advisor, National Society of Black Engineers, Biomedical Engineering Society, local student chapters (2015).

Member, Ph.D. Qualification Exam Committee (2015).

Assistance in coordinating corporate contributions and involvement, Development committee for the new Institute of Cellular Engineering and Molecular Imaging (2011–2012).
The Profession

Editorial Board Membership(s)


Guest Reviewer for Refereed Journals


*Bioresource Technology* (2014–present).


Biotechnology and Bioengineering (2013–present).


Nano LIFE (2012–present).

Stem Cells and Development (2012–present).

Biomaterials (2006–present).


Reviewer for Textbooks


Chair of a Symposium


Reviewer or Panelist for Grant Applications

National Science Foundation (2015–present).


Service to Professional Associations

Abstract reviewer for annual meeting, Biomedical Engineering Society (2016–present).

Member, Facilitated Dr. David Gilbert (FSU Department of Biological Science) on the organization of 4th Southeast Stem Cell Consortium Workshop, Southeast Stem Cell Consortium (2012).

The Community

Lecturer, Science, Technology, Engineering, Art and Mathematics (STEAM) day, Leon County School (2016).

Mentor, Ladies Learning to Lead "L3" for middle school and high school girls (2014).

Panelist, SciGirls Summer Camp, National High Magnetic Field Laboratory (NHMFL) and WFSU (2013).


Member, Nominated as FSU representative, Alliance for the Advancement of Florida's Academic Women in Chemistry and Engineering (AAFAWCE) (2012–2013).

Lecturer, Family Literacy Program for the Leon County Public Library system (2012).

Lecturer, "Outreach Program" to educate Wakulla Spring high school students (2012).
Curriculum Vitae
Kimberly Hunter
August, 2016

General Information

University address: Chemical and Biomedical Engineering
FAMU-FSU College of Engineering
2525 Potsdamer Street, A3152
Florida State University
Tallahassee, Florida 32310-6046
Phone: (850) 410-6682; Fax: (850) 410-6150

E-mail addresses: khunter@eng.famu.fsu.edu; kthunter@fsu.edu;
kimberlyhunter512@yahoo.com

Web site: http://www.eng.fsu.edu/faculty/cbe/hunter.html

Professional Preparation

Lakewood Ranch High School, Bradenton, FL.
Class of 2002 Salutatorian.

Florida State University, Tallahassee, FL.
B.S. Chemical Engineering- Biomedical Engineering.
Honors in the major, magna cum laude.

Florida State University, Tallahassee, FL.
Ph.D. Chemical Engineering- Biomedical Engineering.
August 2007-August 2013.

Professional Experience

2015 – present Teaching Faculty I, Department of Chemical and Biomedical Engineering,
FAMU-FSU College of Engineering, Florida State University.

Fall 2014 – present Tallahassee Community College, Adjunct Professor of Chemistry.

Spring 2011 Teaching Assistantship, Spring 2011, Transport Phenomenon Laboratory.

Fall 2007 Teaching Assistantship, Quantitative Anatomy and Systemic Physiology Laboratory.

Research
2007 – 2013  Graduate Research.
Cell and tissue engineering, Bone regeneration, Stem cells, Biomaterials, Cell-material interactions, Nanotechnology and Gene therapy.

2004 – 2007  Undergraduate Research.
Polymeric material science and engineering research.

Heat transfer at solid-liquid interface.

Honors

2009  Department of Chemical and Biomedical Engineering Graduate Research Competition winner, 2009.

2007 – 2008  Florida State University Fellowship Recipient, Magna cum laude and honors in the major.

2005  Department of Chemical and Biomedical Engineering Scholarship Recipient, Spring 2005.


Leadership

2008  NSF Young Scholars Program individual research project mentor.

2008  Young Scientist Mentorship- Highlands County Schools Gifted Program science fair project individual advising resource.

Publications


FAMU Advisory Reviews for Academic Program Proposals

The Dean of the FAMU-FSU College of Engineering has reviewed the proposal for the Bachelor of Science in Biomedical Engineering and recommends it for consideration.

[Signature]
J. Murray Gibson
Dean or Chair/Director of the academic unit
2/9/2018

The College Curriculum Committee of the College/School in which the program resides has reviewed the proposal and affirms that it is consistent with the policies of that Committee.

[Signature]
Reginald J. Perry
Chair, College Curriculum Committee
2/8/2018

The University Program Authorization Review Committee (UPARC) has reviewed the proposal and affirms that it is consistent with the policies of that Committee.

[Signature]
Sandra O. Kinsey
Chair, UPARC
2/20/2018

The Curriculum Committee of the Faculty Senate has reviewed the proposal and affirms that it is consistent with the policies of that Committee.

[Signature]
Kyle Eidlitz
Chair, Curriculum Committee of Faculty Senate
2/22/2018

The Faculty Senate has reviewed the proposal and affirms that it is consistent with the policies of the full body and recommends approval.

[Signature]
President, Faculty Senate
2/20/2018

**Graduate Programs Only:**
The Chair of the Graduate Council has reviewed the proposal and affirms that it is consistent with the policies of that Council.

[Signature]
N/A
Chair, Graduate Council

[Signature]
Signature of Provost and Vice President for Academic Affairs
3/17/18

Date
Subject: Approval of the Memorandum of Agreement on the Management Plan of the College of Engineering between Florida Agricultural and Mechanical University (FAMU), Florida State University (FSU) and the Chancellor of the Florida State University System

Rationale: The prior-existing Memorandum of Agreement on the Management Plan of the College of Engineering was executed May 19, 2005. The new Memorandum of Agreement on the Management Plan of the College of Engineering reflects the working agreement between both universities and the Board of Governors implemented in 2015.

Attachment: MOA on the Management Plan

Recommendation: It is recommended that the proposed Memorandum of Agreement on the Management Plan of the College of Engineering be endorsed by the Board of Trustees.
Updated Memorandum of Understanding for the management of the FAMU-FSU College of Engineering

FAMU Board of Trustees

Signatories: President of FAMU, President of FSU, Chancellor of the State University System Board of Governors

Last amendment date 2005 (to deal with accreditation issues)

New version recommended at the Joint Management Council February 7th approved by all parties present, presented to Board of Trustees for review
Comparison with agreement from 2005

Reflects working agreement between both universities and the Board of Governors implemented in 2015

- Adds VP’s for Research and ex-officio student reps to Management Council
- Chancellor of SUS now serves as the presiding officer
- Quarterly meetings and semi-annual reports to the board are now required
- Dean reports to both universities as before, but is now a faculty member at FAMU, appointed by FAMU President, in consultation with FSU
- Student discipline responsibilities clarified
- Fiscal agent for joint budget shifted from FAMU to FSU
- College staff access to needed university systems is now explicitly stated
- Appendix added on technical details such as facilities, emergency services, transportation etc.
- Several other minor changes to update agreement and/or improve clarity
Memorandum of Agreement

On the

Management Plan of the College of Engineering

between

Florida A &M University, Florida State University, and the Chancellor, State University System of Florida

Tallahassee, Florida

Memorandum of Agreement on the Management Plan of the College of Engineering between The Florida Agricultural and Mechanical University and The Florida State University

Articles of Agreement
Article 1. Governance of the College

Florida Agricultural and Mechanical University (FAMU) and the Florida State University (FSU) acknowledge the establishment of the Joint College of Engineering (Joint College) with engineering curricula subdivided into programs and degrees as approved by the Board of Governors of the State University System of Florida.

The Joint College shall be known as the College of Engineering of Florida Agricultural and Mechanical University and Florida State University. The acronym FAMU-FSU COE or JCOE may be used as an abbreviated designation of the College.

Article 2. Joint College Management Council

The Joint College Management Council (Management Council) consists of the Chancellor, and the Presidents (or their designees), Provosts, Vice Presidents for Research, and Chief Financial Officers of the two universities.

The Dean of the Joint College and two student representatives, appointed by the respective Student Government Association presidents, shall be ex-officio non-voting members of the Management Council.

The Management Council shall function as a policy-making body for the Joint College in all matters except those that are governed by individual University rules, regulations, policies and procedures. The Chancellor shall serve as the presiding officer of the council. Meetings shall be held at least quarterly, and may be called at the request of either President, the Chancellor or the Dean.

The Management Council may invite participants to discuss topics and appoint subcommittees to study specific issues.
Article 3. Administration of the College

There is a single Dean who reports functionally to the two Provosts and administratively and operationally to the Provost of Florida Agricultural and Mechanical University. The Management Council has designated the academic home of the Dean to be Florida Agricultural and Mechanical University.

The Dean is responsible for the planning, administration and operation of engineering programs and supporting units in the Joint College. The Dean formulates the budget, under the direction of the Provosts, for the Joint College and secures the funding according to the procedures of each university and the advice of the Management Council. The budget designated as the joint engineering budget shall be approved by the Management Council. The Management Council has designated FSU as fiscal agent, with fiduciary responsibility for the state allocated budget.

Each university, based on need, may allocate their own funds to support the Joint College. These funds will remain with the individual university and will not be accounted for as part of the Joint College budget.

The Dean is responsible for appointing College of Engineering faculty, staff and administration within established procedures of each university.

The President of Florida Agricultural and Mechanical University shall appoint the Dean of the JCOE in consultation with the President of Florida State University. The Presidents shall consider the recommendations of a search committee, and the composition of the search committee will be determined by the Presidents and approved by the Management Council.

College staff will be given access to both universities’ processes and data as needed to perform their jobs.

Article 4. Faculty Appointment, Promotion and Tenure

Faculty members are appointed by and hold tenure, when earned, in a department of the Joint College through one of the two participating universities. Faculty appointed at either university must meet uniform Joint College promotion and tenure standards. Upon the recommendation of the elected Joint College Promotion and Tenure Committee, the Dean shall make promotion and tenure recommendations to the respective universities in accord with their applicable regulations and procedures. These regulations and procedures shall be consistent, insofar as possible, with existing university regulations and procedures, and with collective bargaining agreements.
Faculty members employed by one university are automatically designated "Joint College" faculty thereby being considered a faculty member of both universities for purposes of carrying on the teaching, research and service responsibilities of the Joint College and have, except tenure, faculty privileges at both universities.

**Article 5. Students and Degrees**

Students are admitted to and graduated from either of the two participating universities. Students will be held to uniform grading standards, regardless of admitting university. Students choosing to enter an engineering program are first admitted to the Pre-engineering Program consisting of a basic set of science, mathematics, introductory engineering and liberal studies subjects. Admission to an engineering program as an engineering major at the Joint College is made after the student completes satisfactorily a prescribed set of prerequisite courses in mathematics and science at either of the two universities. Performance requirements for these prerequisites shall be set by the Joint College and approved by both universities. These requirements shall be uniform for students at both universities, and will supersede any conflicting university policies.

Registration for courses at the Joint College shall be made through the procedures of the university at which the student matriculates. The university registrars shall be the repositories of official records of student performance. All official academic records of students shall be made available to the Joint College as permitted by law.

Within the Joint College, upon the recommendation of the engineering faculty, the Dean may recommend to the Management Council policies and procedures affecting student life with the Joint College. Students shall be subject to the Student Code of Conduct regulations of their home university. The Joint College of Engineering, where possible, will follow a common set of procedures to address alleged Code violations. Responsibilities for and procedures related to student life outside the Joint College shall be handled through the normal channels of the university in which the student is enrolled.

Upon successful completion of an engineering degree program, a student shall receive a diploma from The Florida Agricultural and Mechanical University or The Florida State University, which indicates that the degree is awarded by the FAMU-FSU Joint College of Engineering.

**Article 6. Curriculum**

There is a single engineering curriculum at the Joint College specific to each
engineering program. All undergraduate degree programs at the Joint College shall be established to meet the requirements for accreditation of the Accreditation Board for Engineering and Technology (ABET).

The establishment of new degree programs or termination of existing degree programs shall be approved by the Boards of Trustees of both universities.

Faculty of the Joint College is responsible for developing and implementing the engineering curriculum leading to academic degrees in conjunction with the curriculum committees at the respective universities.

Faculty of each university may teach courses which they are qualified to instruct. Both universities shall honor all courses taught at the Joint College for degree credit. Degree curricula, requirements and course descriptions shall be published identically in the bulletins/catalogs of both universities.

**Article 7. Responsibilities of FAMU and FSU**

The Joint College is an integral part of each university. Each university has responsibilities for and obligations to support and maintain the operation of the Joint College. The Joint College uses the business and other support services of both universities and is prohibited from developing an autonomous administrative structure that is not responsible to the two universities, unless otherwise specified in this agreement.

The Joint College should be regarded as a single entity and the Dean is responsible for initiating and ensuring other support from the universities as the need arises.

FAMU and FSU shall work jointly to ensure that the most efficient and effective services are provided to the Joint College students, faculty and staff.

**Article 8 Semi-Annual Reports**

The Management Council shall receive reports from the appropriate responsible party on the following topics, and may require additional reports at its discretion:

a. Recruiting, enrollment and graduation by gender and ethnicity;
b. Adequacy and consistency in academic preparation and achievement;
c. Budget and expenditures;
d. Facilities Planning and Construction;
e. Research funding and activities;
f. Faculty hiring, promotion, tenure, and integration; and
g. Technology transfer and commercialization activities.
Article 9. Provisions

Any voting member of the Management Council may propose amendments or modifications to this agreement. Any amendment or modification to this agreement shall be approved by a two-thirds vote of the Management Council. Any matters not specifically referenced in this agreement may be resolved by consensus of the Dean and the two presidents; or may be referred to the Management Council for resolution.
President, FAMU

President, FSU

Chancellor, Board of Governors
Appendix 1

A. Construction
The Management Council shall designate one university to have oversight responsibility for all construction projects at the Joint College that are initiated after June 30, 2016. FSU is responsible for the Joint College of Engineering construction.

B. Furniture and Equipment
Purchases of furniture and other movable equipment must be approved by the Dean or designee.

The purchasing procedures and property inventory records should follow the institution which the research dollars have been awarded to.

Once a project has been closed or the property fully depreciated, the property shall be transferred to the Joint College of Engineering under the FSU property management system.

C. Maintenance
FSU is responsible for Joint College building maintenance, janitorial services, and landscaping/grounds-keeping.

Support for special services (dedications and receptions) will be provided by FSU, but the Dean may request such services of either university when conditions warrant.

D. Security and Safety
FSU will provide security for Joint College facilities. FSU Environmental Health and Safety will provide services to the Joint College. Emergency management, including closing the facility, is handled by FSU. If either university suspends classes, the college will suspend all classes.

E. Budget and Finance
The Joint College budget has been appropriated as a single entity in the General Appropriations Act. The Management Council has designated FSU as fiscal agent, with fiduciary responsibility to maintain a separate and identifiable account for the Joint College.

The legislative budget request for the Joint College shall be developed by both Universities and approved by the Management Council.

The Dean will recommend and request approval of an annual operating
budget by the Management Council.

Budget reports will be provided to the Management Council on at least a quarterly basis.

F. **Risk Management and Insurance**
   As noted in Section D, FSU will be responsible for environmental health and safety matters.

   Student/employee injury or unemployment compensation is the responsibility of the university at which the individual is enrolled or employed.

   Dealing with building and equipment damage or destruction related to research will be managed according to the procedures of the institution which has been awarded funds and in accordance with federal acquisition requirements.

G. **Minor Renovation Projects**

   The Joint College will receive its pro-rata share of any minor maintenance appropriations made to the State University System, which will be titled in the name of the Joint College.

   FSU, as fiscal agent, will manage renovation project funds unless otherwise agreed to between the two institutions.

H. **Purchasing**

   Purchasing for general educational and general items will be handled by FSU. Research related purchases will follow the purchasing procedures for the institution which has been awarded funds.

I. **Space Inventory**

   Space will be separately identified as belonging to the Joint College and will be addressed in the FSU space inventory system.

   FSU will be responsible for the reporting of Joint College space to external entities as may be required, including, but not limited to, the Board of Governors, the Department of Financial Services, and the Department of Environmental Protection.

   In addition, both universities may separately identify some space on its main campus as being assigned to the Joint College while remaining on the space
inventory of the respective university.

J. **Property Inventory**
Furniture and equipment will be separately identified as belonging to the Joint College and will be addressed in the FSU property inventory system. Property related to research will be managed according to the procedures of the institution which has been awarded funds and in accordance with federal acquisition requirements.

K. **Postal Services**
The Joint College receives US mail directly, and interchanges mail with both campus internal mail systems.

L. **Food Services and Vending**
FSU shall be responsible for food services and will ensure that FAMU students can utilize their meal plans at the Joint College. Net revenue generated from the Joint College sales will be credited to the Joint College for its use.

FSU shall be responsible for vending services. Agreements held by FAMU will terminate at the end of their existing terms and the activities will transfer to FSU. The earned proceeds from concessions will be a part of the FSU Concessions Fund and will provide support for those Joint College activities, which are normally funded from the Concessions Account.

M. **Other Contractual Agreements**
Future revenue contracts shall be the responsibility of FSU as fiscal agent. Net revenues generated from other contractual agreements will be credited to the Joint College for its use.

N. **Messenger Services including Telephones**
FSU will be responsible for the operation and maintenance of all telecommunications including, without limitation, telephones.

O. **Utilities**
This responsibility rests with FSU as fiscal agent.

P. **Transportation**
Each university shall provide reasonable transportation for its students’ education at the joint college. The funding for these services should not be a Joint College expense and should come from other resources.
Q. Parking and Traffic

FSU will be responsible for administering the parking program including the issuance of citations for violating parking regulations.

Vehicles properly identified as belonging to Board of Governors’ members, or their staff, may park at Joint College without charge when on official business.

R. Information Technology

1. The Joint College will initiate recommendations for information and computer acquisitions through the FSU planning process and will be included in the FSU computer plans.

FSU will provide such central maintenance for the Joint College as it provides for other colleges.

2. Planning and Managing Information and Computer Systems: FSU will be responsible for planning and managing the information and computer systems in full consultation with the Dean and in coordination with FAMU.

S. Personnel

Insofar as possible, the Joint College operates with its own uniform policy, but where legitimate institutional differences exist beyond the level of the Joint College, each employee is responsible to his or her own university.

The same principle holds for each category of employee, USPS, A&P and Faculty. Faculty meet uniform Joint College criteria for promotion and tenure and upon recommendation by the Joint College, proceed through the separate university procedures.

T. Miscellaneous Functions

1. Career Services

Both institutions will work collaboratively with the Dean to coordinate career services within the college and will accommodate and provide open access to students regardless of their home institution. The universities have agreed that there will not be a separate engineering career services function, but there will be career services staff members from both institutions who will work in partnership with each other to provide career services within the College of Engineering.

2. Coordination with Other Facilities

The Dean will work with facilities offices of both universities and with
Innovation Park to ensure adequate coordination of events.

3. Scheduling Space Usage
The Dean will be responsible for securing space on each campus for engineering purposes and officials of each campus will work through the Dean in scheduling space in the Joint College.
Subject: Florida A&M University 2018 Accountability Plan

The Board of Governors Regulation 2.002 requires that the Board of Governors institute a planning and performance monitoring system “…that includes the submission of university work plans and annual reports designed to inform strategic planning, budgeting and other policy decisions for the State University System.” This year in January 2018, the Florida Board of Governors combined the annual accountability report and the work plan into one document. The Accountability Plan, which conforms to the required elements, metrics and format provided by the Board of Governors, identifies five sections to include the following:

1. STRATEGY
   a. Mission & Vision Statements
   b. Statement of Strategy
   c. Strengths and Opportunities
   d. Key Initiatives & Investments
   e. Key Achievements for Last Year

2. PERFORMANCE BASED FUNDING METRICS

3. KEY PERFORMANCE INDICATORS
   a. Teaching & Learning
   b. Scholarship, Research and Innovation
   c. Institution Specific Goals

4. ENROLLMENT PLANNING

5. ACADEMIC PROGRAM COORDINATION

Attachments: 2018 Accountability Plan

Recommendation: It is recommended that the Florida A&M University Board of Trustees approve the 2018 Accountability Plan of the University, which was submitted to the Board of Governors subject to the BOT’s consideration.
INTRODUCTION

This is a new report that combines the previous Annual Accountability Report and University Work Plans into one new document that is more closely aligned with the Board of Governors’ 2025 System Strategic Plan.

This revised document will enhance the System’s commitment to accountability and strategic planning by enabling comparisons between past goals and actual data to better assess performance. This change will help foster greater coordination between institutional administrators, University Boards of Trustees and the Board of Governors.

Once an Accountability Plan is approved by each institution’s respective Boards of Trustees, the Board of Governors will review and consider the plan’s narrative strategy, metric goals and enrollment plans for potential acceptance of 2016-17 components. Longer-term components will inform future agendas of the Board’s Strategic Planning Committee. The Board’s acceptance of this Accountability Plan does not constitute approval of any particular component, nor does it supersede any necessary approval processes that may be required for each component (e.g., new academic programs).
# TABLE OF CONTENTS

1. **STRATEGY**
   a. Mission & Vision Statements, p. 3
   b. Statement of Strategy, p. 3-4
   c. Strengths and Opportunities, p. 5
   d. Key Initiatives & Investments, p. 6-7
   e. Key Achievements for Last Year, p. 8

2. **PERFORMANCE BASED FUNDING METRICS**, p. 9-10

3. **KEY PERFORMANCE INDICATORS**
   a. Teaching & Learning, p. 11-13
   b. Scholarship, Research and Innovation, p. 13-14
   c. Institution Specific Goals, p. 15

4. **ENROLLMENT PLANNING**, p. 16-17

5. **ACADEMIC PROGRAM COORDINATION**, p. 18
MISSION STATEMENT (What is your purpose?)

Florida Agricultural and Mechanical University (FAMU) is an 1890 land-grant institution dedicated to the advancement of knowledge, resolution of complex issues and the empowerment of citizens and communities. The University provides a student-centered environment consistent with its core values. The faculty is committed to educating students at the undergraduate, graduate, doctoral and professional levels, preparing graduates to apply their knowledge, critical thinking skills and creativity in their service to society. FAMU’s distinction as a doctoral/research institution will continue to provide mechanisms to address emerging issues through local and global partnerships. Expanding upon the University’s land-grant status, it will enhance the lives of constituents through innovative research, engaging cooperative extension, and public service. While the University continues its historic mission of educating African Americans, FAMU embraces persons of all races, ethnic origins and nationalities as life-long members of the university community.

VISION STATEMENT (What do you aspire to?)

Florida Agricultural and Mechanical University (FAMU) will be recognized as a premier land-grant, doctoral-research university that produces globally competitive graduates.

STATEMENT OF STRATEGY (How will you get there?) -

Given your mission, vision, strengths and available resources, provide a brief description of your market and your strategy for addressing and leading it.

The University’s primary market continues to be African Americans and other underrepresented minorities. The University will continue to increase its efforts to attract students of all races, while strengthening its position as a leading producer of African American graduates through the use of more strategic and focused approaches for: a) attracting well-qualified students; b) increasing student success; and c) improving employment outcomes. This will necessitate a continued focus on retention, student progression and graduation, and quality of instruction.

As the University works to implement the 2017-2022 strategic plan (FAMU Rising), an increased focus will be placed on recruitment, retention, student progression and graduation, and quality of instruction. Specific strategies and initiatives include:

1. Increasing FTIC retention and graduation rates by overhauling the campus student advisement structure, expanding the use of high-impact practices, leveraging the use of technology, and increasing resources for faculty development.
2. Increasing licensure pass rates by revising curricula, expanding academic support services, enhancing admissions policies, and expanding faculty development.
3. Increasing the enrollment of AA transfers by strengthening partnerships with FCS institutions via specialized 2+2 articulation agreements.
4. Enhancing the overall student experience by upgrading student housing and instructional facilities, improving the coordination and quality of student support
services via the construction of the Center for Access and Student Success (CASS), and expanding co-curricular activities.

5. Strengthening and expanding academic program offerings in high-demand areas to address Florida’s workforce needs.

6. Enhancing student recruitment efforts by restructuring the Enrollment Management unit and implementing a strategic recruitment plan.

7. Increasing faculty productivity by increasing resources for faculty development and research, and evaluating faculty workload.

8. Improving customer service by launching a comprehensive Service Excellence Program.

9. Transitioning to a more data-driven culture and increasing the efficiency of University operations by enhancing oversight and management of academic, fiscal and critical business operations.

10. Increasing financial support for the University through enhanced alumni and community engagement.
STRENGTHS AND OPPORTUNITIES (within 3 years)
What are your core capabilities, opportunities and challenges for improvement?

Core capabilities: FAMU is a doctoral/research institution and is one of the top Historically Black Colleges and Universities (HBCUs) in the nation. Key institutional strengths include its diversity in academic program offerings and array of accredited professional programs; recognition as one of the nation’s top producers of African American graduates; status as an 1890 land-grant institution; designation by Carnegie classification as a R2 institution and recognition for total research and development (R&D) expenditures; and high degree production in STEM, agriculture and health-related disciplines, areas in which minorities are historically underrepresented.

Opportunities: FAMU’s many opportunities include: a) an amplified focus on student success (including increasing retention/graduation rates and licensure pass rates); b) increased engagement in land-grant initiatives; c) increasing productivity in research; d) improving on key performance indicators; and e) growing upper-division enrollment through increased retention of current students and strategic initiatives such as specialized 2+2 articulation agreements. FAMU will also enhance its existing signature academic programs, such as pharmacy, business, architecture, law, nursing, music and STEM, while identifying new and emerging areas for growth, such as cybersecurity and data science, in which FAMU can be a national leader, particularly among HBCUs. FAMU will build upon its existing research strengths in agriculture, engineering, environmental science and the biomedical sciences, while identifying new areas of cutting-edge research in which the University can achieve distinction.

Challenges: FAMU is continuing in its efforts to ensure student success by increasing retention and graduation rates at all degree levels; and improve performance on licensure exams. There also continues to be a critical need to upgrade and expand campus facilities, particularly with respect to student housing, student services and faculty research spaces. Additionally, due to the financial circumstances of many of our students, access to need-based aid continues to be a challenge.
KEY INITIATIVES & INVESTMENTS (within 3 years)

Describe your top three key initiatives for the next three years that will drive improvement in Academic Quality, Operational Efficiency, and Return on Investment.

1. Increase student success.
The University will continue and enhance ongoing efforts to increase student success, with an emphasis on: 1) increasing student retention, persistence and graduation rates; 2) increasing passage rates on licensure exams; 3) increasing enrollment of AA transfers; 4) increasing the availability of student internship opportunities and professional development activities that enhance student preparation for employment in high-demand fields; 5) increasing the number of graduates in programs of strategic emphasis; and 6) increasing the availability of courses for current students by offering additional sections via the online modality.

As the University implements its new 2017-2022 strategic plan (FAMU Rising), specific efforts to increase retention and four-year graduation rates for FTIC students will include implementation of the following initiatives:

Restructuring Academic Advisement
The University will make significant investments to improve academic advisement by hiring up to 25 new full-time professional advisors in the coming year. These new hires will allow the University to increase the use of proven best practices, such as intrusive advising and academic coaching. The University also plans to completely overhaul its current advisement structure, which includes placing the unit under the Office of Enrollment Management. These enhancements will enable the University to more effectively monitor student progression and take appropriate action to facilitate and promote increased student success.

Expanding the Use of High-Impact Practices
The University will place more emphasis on improving student progression during the freshman and sophomore years by expanding the use of proven high-impact practices. The University will build on its successful freshman Living-Learning Communities by establishing “Student Success Communities” for all freshmen and sophomores, as well as increasing the use of intrusive advisement/academic coaching, and enhancing tutorial and peer-mentoring services. The University will also enhance its student support services by establishing a one-stop-shop in the Center for Access and Student Success (CASS) facility that is currently under construction.

Strengthening Policies and Procedures that Promote Student Progression
The University will adopt policies and procedures that encourage and promote student progression and degree completion within four years. These changes will include policies that encourage students to enroll in a minimum of 15 credit hours per semester, restrict the number of course retakes in a given major, accelerate remediation in the areas of English and mathematics, and require at-risk students to enroll in mandatory courses to remain on track for graduation.
Enhancing Student Recruitment
The University will continue its ongoing efforts to increase the enrollment of high-achieving students. These efforts include implementing a strategic recruitment plan, restructuring the University’s Office of Enrollment Management, and increasing engagement with feeder schools across Florida to increase student awareness of the requirements for entry into the University. Recruitment of AA transfers will also be expanded via the development of specialized 2+2 articulation agreements with FCS institutions.

Expanding Faculty Development
The University recognizes the important role that faculty play in facilitating student success. Over the past year the University has significantly increased the resources that are devoted to faculty development, with an emphasis on providing training on pedagogical best practices. The University will continue to invest in this area by expanding the services offered by the Teaching and Learning Center and providing more opportunities for faculty to engage in activities to improve their teaching and assessment of student learning.

2. Enrichment of Academic Programs
The University will place an increased focus on strengthening academic programs, with a particular emphasis on programs with licensure pass rate requirements and programs in areas of strategic emphasis. Specific strategies for improving student performance on licensure exams include: modifying admissions policies to ensure incoming students are adequately prepared for the program rigor; increasing the use of predictive analytics and more aggressive monitoring of key performance indicators; revising the curricula to ensure proper alignment with the most recent standards and competencies of the discipline; and expanding academic support services, which includes conducting focused workshops on test-taking preparations. Efforts to increase enrollment and degree production in high-demand areas will be enhanced. The University will provide additional support for faculty research and professional development and enhance student academic support services. Specific disciplines that have been targeted for enhancement include agriculture, cybersecurity, data science, health sciences (e.g. pharmacy, nursing, physical therapy), law, and core science and mathematics disciplines.

3. Increase the efficiency and effectiveness of University operations.
The University is dedicated to improving the efficiency and effectiveness of the core academic and administrative processes, and improving customer service. Specific areas of focus for the University will be: a) increased monitoring and evaluation of academic programs; b) enhancing engagement, communication and reporting with the BOT, BOG, and other oversight organizations and stakeholder groups; c) improving progress on strategic plan goals and key performance indicators, including the Performance Based Funding Metrics; d) establishing and maintaining a campus-wide data-driven culture; e) creating better alignment of resource allocations with institutional strategic priorities; f) enhancing campus-wide customer service, with a focus on student-service areas; and g) fostering a sustained a culture of accountability.
Key Achievements for 2016-17

STUDENT ACHIEVEMENTS
1. Maiya Stevenson, Akeisha Mandela, and Kyrik Gaines showcased their talents as members of the honors choir during the 2017 Young Adult Honors Performance Series at the renowned Carnegie Hall in New York City.
2. Faheem Muhammed, graduate student in FAMU-FSU College of Engineering, was awarded the 2017 Department of Defense (DoD) SMART (Science, Mathematics and Research for Transformation) Fellowship.
3. Jaffa Williams, College of Education, was appointed to the National Education Association’s (NEA) Advisory Committee for student members.

FACULTY ACHIEVEMENTS
1. Faculty member, Carol Scarlett, Ph.D., College of Science and Technology was awarded a patent in 2017 for her work in magnetic field gradients.
2. Dreamal Worthen, College of Agriculture and Food Sciences, was the recipient of the 2017 Rural Sociological Society Excellence in Extension Public Outreach Award.
3. Seth Ablordepey, College of Pharmacy and Pharmaceutical Sciences, received the 2016 William R. Jones Outstanding Mentor award from the Florida Education Fund.

PROGRAM ACHIEVEMENTS
1. FAMU programs in architecture (BS, MS), allied health (BS) and Pharmacy (PharmD) were ranked #1 in the production of degrees to African American in the Diverse Issues in Higher Education, Top 100 Producers of Minority Degrees 2017.
2. Three African American female students in the FAMU-FSU College of Engineering were awarded Ph.D. degrees in engineering.
3. The Health Information Management program was ranked #3 by the Healthcare Management Degree Guide, Top Degree Programs in 2017.

RESEARCH ACHIEVEMENTS
1. FAMU was awarded a $5M contract to work on NASA’s Space Exploration Project in collaboration with Lockheed Martin.
2. FAMU was the recipient of a $15.4 million award from the National Oceanic and Atmospheric Administration (NOAA) Educational Partnership Program (EPP) to establish the Center for Coastal and Marine Ecosystems (CCME).
3. FAMU was awarded a four-year, $2 million grant from the National Science Foundation (NSF) Historically Black Colleges and Universities Undergraduate Program (HBCU-UP) to help broaden the participation of minority graduates in the nation’s science and technology workforce.

INSTITUTIONAL ACHIEVEMENTS
2. U.S. News & World Report lists FAMU as the No. 1 public HBCU in the nation for the second year in a row and among the top 6 overall HBCUs, increasing its ranking from No. 7 to No. 6.
3. FAMU was listed as one of the four HBCUs in the Top 200 Institutions for federal research expenditures by the Center for Measuring University Performance.
## PERFORMANCE BASED FUNDING METRICS

### 1. Percent of Bachelor’s Graduates Enrolled or Employed ($25,000+)

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<tr>
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<td>59.4</td>
<td>66.5</td>
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<td>68.5</td>
<td>70.5</td>
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### 2. Median Wages of Bachelor’s Graduates Employed Full-time

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<td>34,000</td>
<td>34,700</td>
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Note: Beginning with the 2013-14 graduating class, the Board approved a change to this metric that uses wage data from all states that participate in the Wage Record Interchange System 2 (known as “WRIS 2”).

### 3. Average Cost to the Student [Net Tuition & Fees per 120 Credit Hours for Resident Undergraduates]

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### 4. FTIC Four-Year Graduation Rate

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<td>ACTUAL</td>
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<td>11.8</td>
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<td>25</td>
<td>30</td>
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### 5. Academic Progress Rate [Second Year Retention Rate with At Least a 2.0 GPA]

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<td>80</td>
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Note: For more information about the PBF model visit: http://www.flbog.edu/about/budget/performance_funding.php
PERFORMANCE BASED FUNDING METRICS (CONTINUED)

6. Percentage of Bachelor’s Degrees Awarded within Programs of Strategic Emphasis

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7. University Access Rate [Percent of Undergraduates with a Pell grant]

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8. Percentage of Graduate Degrees Awarded within Programs of Strategic Emphasis

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9. BOG Choice: Percent of Baccalaureate Degrees Awarded Without Excess Hours

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Note*: FAMU revised the data collection and reporting methodology to better capture the credit hours related to internships and personal hardships that are exempted from the Excess Hours calculation.

10. BOT Choice: Percent of R&D Expenditures Funded from External Sources

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Note: For more information about the PBF model visit: [http://www.flbog.edu/about/budget/performance_funding.php](http://www.flbog.edu/about/budget/performance_funding.php)
## KEY PERFORMANCE INDICATORS

### Teaching & Learning Metrics (from the 2025 System Strategic Plan that are not included in the PBF section)

#### Public University National Ranking

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#### Freshmen in Top 10% of High School Class

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#### Professional Licensure & Certification Exam First-time Pass Rates

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#### Exam Scores Relative to Benchmarks

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Note: This is the first time the Board of Governors is asking universities to provide out-year goals for each individual exam. As of 2016, CAPTE began reporting multi-year pass rates for every two years.
### Teaching & Learning Metrics

#### Time to Degree for FTICs in 120hr programs [in Calendar Years]

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#### Six-Year FTIC Graduation Rates [Full- & Part-time students]

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#### Bachelor’s Degrees Awarded [First Majors Only]

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#### Graduate Degrees Awarded [First Majors Only]

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#### Bachelor’s Degrees Awarded to African-American & Hispanic Students

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### Key Performance Indicators (continued)

#### Teaching & Learning Metrics

**Percentage of Adult (Aged 25+) Undergraduates Enrolled**

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<td>2020</td>
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<td>2021</td>
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#### Percent of Undergraduate FTE in Online Courses

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#### Percent of Bachelor’s Degrees in STEM & Health

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<th>PROPOSED GOALS</th>
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<td>2020-21</td>
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#### Percent of Graduate Degrees in STEM & Health

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#### Scholarship, Research and Innovation Metrics

**National Academy Memberships**

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#### Faculty Awards

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### Scholarship, Research and Innovation Metrics

#### Total Research Expenditures ($M)

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#### Percentage of Research Expenditures Funded from External Sources

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#### Utility Patents Awarded [from the USPTO]

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#### Number of Licenses/Options Executed Annually

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#### Number of Start-up Companies Created

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KEY PERFORMANCE INDICATORS (CONTINUED)

Institution Specific Goals
To further distinguish the university's distinctive mission, the university may choose to provide additional metric goals that are based on the university's own strategic plan.

1. Bachelor's Degrees Awarded to Minorities (Black, Asian, Hispanic, Native, Mixed)

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<tbody>
<tr>
<td></td>
<td>1,432</td>
<td>1,517</td>
<td>1,462</td>
<td>1,631</td>
<td>1,515</td>
<td>1,690</td>
<td>1,730</td>
<td>1,765</td>
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2. Number of Graduate Degrees awarded to African Americans

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<tbody>
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<td></td>
<td>519</td>
<td>475</td>
<td>468</td>
<td>445</td>
<td>447</td>
<td>465</td>
<td>475</td>
<td>485</td>
<td>495</td>
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3. Percent of Course Sections Offered via Distance and Blended Learning

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<tr>
<th>Semester</th>
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<th>Fall 2014</th>
<th>Fall 2015</th>
<th>Fall 2016</th>
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4. Number of students enrolled in graduate online programs

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<td>70</td>
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## ENROLLMENT PLANNING

### Actual & Planned Headcount Enrollment by Student Type (for all students at all campuses)

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<tr>
<td>FTIC (Regular Admit)</td>
<td>2,929</td>
<td>2,998</td>
<td>3,356</td>
<td>3,636</td>
<td>4,058</td>
<td>4,301</td>
<td>4,560</td>
<td>4,833</td>
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<tr>
<td>FTIC (Profile Admit)</td>
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<td>3,234</td>
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<td>1,594</td>
<td>1,554</td>
<td>1,515</td>
<td>1,477</td>
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<td>FCS AA Transfers</td>
<td>608</td>
<td>605</td>
<td>617</td>
<td>749</td>
<td>854</td>
<td>905</td>
<td>960</td>
<td>1,017</td>
<td>1,078</td>
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<tr>
<td>Other AA Transfers</td>
<td>192</td>
<td>159</td>
<td>123</td>
<td>138</td>
<td>77</td>
<td>82</td>
<td>87</td>
<td>92</td>
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<td>Post-Baccalaureates</td>
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<td>0</td>
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<tr>
<td>Other Undergraduates</td>
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<td>730</td>
<td>766</td>
<td>906</td>
<td>967</td>
<td>1,025</td>
<td>1,087</td>
<td>1,152</td>
<td>1,221</td>
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<tr>
<td><strong>Subtotal</strong></td>
<td>8,565</td>
<td>7,726</td>
<td>7,458</td>
<td>7,364</td>
<td>7,550</td>
<td>7,868</td>
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<tr>
<td>Master's</td>
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<td>578</td>
<td>645</td>
<td>668</td>
<td>708</td>
<td>751</td>
<td>796</td>
<td>843</td>
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<tr>
<td>Research Doctoral</td>
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<td>170</td>
<td>188</td>
<td>195</td>
<td>201</td>
<td>213</td>
<td>226</td>
<td>239</td>
<td>254</td>
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<tr>
<td>Professional Doctoral</td>
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<td>1,223</td>
<td>1,235</td>
<td>964*</td>
<td>995*</td>
<td>1,055</td>
<td>1,118</td>
<td>1,185</td>
<td>1,256</td>
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<tr>
<td><strong>Subtotal</strong></td>
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<td>1,976</td>
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<td>354</td>
<td>379</td>
<td>405</td>
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<td>Other¹</td>
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<td>141</td>
<td>149</td>
<td>158</td>
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<td>178</td>
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<td><strong>Subtotal</strong></td>
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<td>461</td>
<td>446</td>
<td>495</td>
<td>528</td>
<td>564</td>
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<td>642</td>
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<td>9,614</td>
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<td>10,372</td>
<td>10,866</td>
<td>11,393</td>
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</table>

Note: *The decline in PharmD is a methodological change (that no longer includes pre-PharmD undergraduate students in the graduate count) and not an actual drop in the program's enrollment.

Notes: This table reports the number of students enrolled at the university by student type categories. The student type for undergraduates is based on the Type of Student at Time of Most Recent Admission. The student type for graduates is based on the degree that is sought and the student CIP code. Unclassified refers to a student who has not yet been formally admitted into a degree program but is enrolled. (1) 'Other Unclassified' students include Post-Baccalaureates who are not seeking a degree.
### 2018 ACCOUNTABILITY PLAN

**Florida A&M University**

**ENROLLMENT PLANNING (CONTINUED)**

Actual & Planned FTE Enrollment by Residency & Student Level

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<tr>
<td>LOWER</td>
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<td>3,480</td>
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<td>460</td>
<td>534</td>
<td>547</td>
<td>572</td>
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<td>629</td>
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<td>1,147</td>
<td>1,184</td>
<td>1,212</td>
<td>1,269</td>
<td>1,329</td>
<td>1,394</td>
<td>1,463</td>
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<tr>
<td>LOWER</td>
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<td>617</td>
<td>508</td>
<td>528</td>
<td>592</td>
<td>606</td>
<td>634</td>
<td>665</td>
<td>697</td>
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<td>435</td>
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<td>477</td>
<td>500</td>
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<td>111</td>
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<td>130</td>
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<td>116</td>
<td>119</td>
<td>124</td>
<td>130</td>
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<td>143</td>
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<td><strong>TOTAL</strong></td>
<td>1,625</td>
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<td>1,264</td>
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<td>1,244</td>
<td>1,274</td>
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<td>1,397</td>
<td>1,464</td>
<td>1,537</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td>11,704</td>
<td>10,517</td>
<td>9,885</td>
<td>9,618</td>
<td>9,380</td>
<td>9,605</td>
<td>10,053</td>
<td>10,532</td>
<td>11,043</td>
<td>11,588</td>
</tr>
</tbody>
</table>

Note: Full-time Equivalent (FTE) student is a measure of all instructional activity (regardless of fundability) that is based on the number of credit hours that students enroll. FTE is based on the standard national definition, which divides undergraduate credit hours by 30 and graduate credit hours by 24. Distance Learning is a course in which at least 80 percent of the direct instruction of the course is delivered using some form of technology when the student and instructor are separated by time, space, or both (per 1009.24(17), F.S.). Classroom/Traditional, is a course in which less than 50% of the direct instruction of the course is delivered using some form of technology when the student and instructor are separated by time, space or both. This designation can include activities that do not occur in a classroom (ie, labs, internships, practica, clinicals, labs, etc) – see SUDS data element #2052.

### Actual & Planned FTE Enrollment by Method of Instruction (for all students at all campuses)

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>UNDERGRADUATE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance (80-100%)</td>
<td>50</td>
<td>73</td>
<td>131</td>
<td>172</td>
<td>297</td>
<td>369</td>
<td>554</td>
<td>830</td>
<td>1,245</td>
<td>1,868</td>
</tr>
<tr>
<td>Hybrid (50-79%)</td>
<td>0</td>
<td>0</td>
<td>27</td>
<td>79</td>
<td>113</td>
<td>257</td>
<td>308</td>
<td>370</td>
<td>444</td>
<td>533</td>
</tr>
<tr>
<td>Classroom (0-50%)</td>
<td>9,582</td>
<td>8,583</td>
<td>7,932</td>
<td>7,535</td>
<td>7,024</td>
<td>6,987</td>
<td>7,107</td>
<td>7,148</td>
<td>7,064</td>
<td>6,784</td>
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<tr>
<td><strong>Subtotal</strong></td>
<td>9,632</td>
<td>8,656</td>
<td>8,090</td>
<td>7,786</td>
<td>7,435</td>
<td>7,613</td>
<td>7,969</td>
<td>8,348</td>
<td>8,753</td>
<td>9,185</td>
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<tr>
<td><strong>GRADUATE</strong></td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>Distance (80-100%)</td>
<td>84</td>
<td>47</td>
<td>52</td>
<td>45</td>
<td>56</td>
<td>64</td>
<td>65</td>
<td>67</td>
<td>68</td>
<td>69</td>
</tr>
<tr>
<td>Hybrid (50-79%)</td>
<td>0</td>
<td>0</td>
<td>14</td>
<td>10</td>
<td>10</td>
<td>17</td>
<td>18</td>
<td>18</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>Classroom (0-50%)</td>
<td>1,989</td>
<td>1,814</td>
<td>1,729</td>
<td>1,777</td>
<td>1,879</td>
<td>1,911</td>
<td>2,002</td>
<td>2,099</td>
<td>2,203</td>
<td>2,314</td>
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<tr>
<td><strong>Subtotal</strong></td>
<td>2,073</td>
<td>1,861</td>
<td>1,795</td>
<td>1,832</td>
<td>1,945</td>
<td>1,992</td>
<td>2,085</td>
<td>2,184</td>
<td>2,290</td>
<td>2,403</td>
</tr>
</tbody>
</table>

Note: Full-time Equivalent (FTE) student is a measure of all instructional activity (regardless of fundability) that is based on the number of credit hours that students enroll. FTE is based on the standard national definition, which divides undergraduate credit hours by 30 and graduate credit hours by 24. Distance Learning is a course in which at least 80 percent of the direct instruction of the course is delivered using some form of technology when the student and instructor are separated by time, space, or both (per 1009.24(17), F.S.). Classroom/Traditional, is a course in which less than 50% of the direct instruction of the course is delivered using some form of technology when the student and instructor are separated by time, space or both. This designation can include activities that do not occur in a classroom (ie, labs, internships, practica, clinicals, labs, etc) – see SUDS data element #2052.
ACADEMIC PROGRAM COORDINATION

New Programs For Consideration by University in AY 2018-19

The S.U.S. Council of Academic Vice Presidents (CAVP) Academic Program Coordination Work Group will review these programs as part of their on-going coordination efforts. The programs listed below are based on the 2017 Work Plan list for programs under consideration for 2018-20.

<table>
<thead>
<tr>
<th>PROGRAM TITLES</th>
<th>CIP CODE 6-digit</th>
<th>AREA OF STRATEGIC EMPHASIS</th>
<th>OTHER UNIVERSITIES WITH SAME PROGRAM</th>
<th>OFFERED VIA DISTANCE LEARNING IN SYSTEM</th>
<th>PROJECTED ENROLLMENT in 5th year</th>
<th>PROPOSED DATE OF SUBMISSION TO UBOT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BACHELOR’S PROGRAMS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cybersecurity</td>
<td>11.1003</td>
<td>STEM</td>
<td>None</td>
<td>N</td>
<td>60</td>
<td>Spring 2019</td>
</tr>
<tr>
<td>Business Analytics</td>
<td>52.1301</td>
<td>STEM</td>
<td>FIU, UF</td>
<td>N</td>
<td>50</td>
<td>Spring 2019</td>
</tr>
<tr>
<td>Digital Media</td>
<td>09.0702</td>
<td>STEM</td>
<td>FAU, FGCU, FIU, FSU</td>
<td>N</td>
<td>80</td>
<td>Spring 2019</td>
</tr>
<tr>
<td><strong>MASTER’S, SPECIALIST AND OTHER ADVANCED MASTER’S PROGRAMS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction Engineering and Technology</td>
<td>15.1001</td>
<td>STEM</td>
<td>FIU, UF</td>
<td>N</td>
<td>30</td>
<td>Spring 2019</td>
</tr>
<tr>
<td>Cybersecurity</td>
<td>11.1003</td>
<td>STEM</td>
<td>FIU</td>
<td>Y</td>
<td>30</td>
<td>Spring 2019</td>
</tr>
<tr>
<td><strong>DOCTORAL PROGRAMS</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sustainability</td>
<td>30.3301</td>
<td>STEM</td>
<td>None</td>
<td>N</td>
<td>20</td>
<td>Spring 2019</td>
</tr>
</tbody>
</table>

New Programs For Consideration by University in 2019-21

These programs will be used in the 2017-18 Accountability Plan list for programs under consideration for 2019-20.

<table>
<thead>
<tr>
<th>PROGRAM TITLES</th>
<th>CIP CODE 6-digit</th>
<th>AREA OF STRATEGIC EMPHASIS</th>
<th>OTHER UNIVERSITIES WITH SAME PROGRAM</th>
<th>OFFERED VIA DISTANCE LEARNING IN SYSTEM</th>
<th>PROJECTED ENROLLMENT in 5th year</th>
<th>PROPOSED DATE OF SUBMISSION TO UBOT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BACHELOR’S PROGRAMS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biological and Physical Sciences</td>
<td>30.0101</td>
<td>STEM</td>
<td>NCF, USF-T, UWF</td>
<td>N</td>
<td>50</td>
<td>Spring 2020</td>
</tr>
<tr>
<td>Education, Child, and Family Studies</td>
<td>13.0101</td>
<td>EDUCATION</td>
<td>FAU, FGCU, UF</td>
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<td>50</td>
<td>Spring 2020</td>
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<tr>
<td>Data Science</td>
<td>11.0802</td>
<td>STEM</td>
<td>FPU</td>
<td>N</td>
<td>30</td>
<td>Spring 2020</td>
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<tr>
<td>Global Security</td>
<td>43.9999</td>
<td></td>
<td>FAU</td>
<td>N</td>
<td>30</td>
<td>Spring 2021</td>
</tr>
<tr>
<td>Public Health</td>
<td>51.2201</td>
<td>HEALTH</td>
<td>FGCU, FSU, UF, USF-T</td>
<td>N</td>
<td>50</td>
<td>Spring 2021</td>
</tr>
<tr>
<td><strong>MASTER’S, SPECIALIST AND OTHER ADVANCED MASTER’S PROGRAMS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aerospace Engineering</td>
<td>14.0201</td>
<td>STEM</td>
<td>UCF, UF</td>
<td>Y</td>
<td>30</td>
<td>Spring 2020</td>
</tr>
<tr>
<td>Computer Engineering</td>
<td>14.0901</td>
<td>STEM</td>
<td>FAU, FIU, UCF, UF, USF-T</td>
<td>Y</td>
<td>30</td>
<td>Spring 2021</td>
</tr>
<tr>
<td>Health Informatics</td>
<td>51.0706</td>
<td>HEALTH</td>
<td>UCF</td>
<td>Y</td>
<td>30</td>
<td>Spring 2021</td>
</tr>
<tr>
<td><strong>DOCTORAL PROGRAMS</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biology</td>
<td>26.0101</td>
<td>STEM</td>
<td>FAU, FIU, FSU</td>
<td>N</td>
<td>20</td>
<td>Fall 2019</td>
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<tr>
<td>Doctor of Nursing Practice (DNP)</td>
<td>51.3818</td>
<td>HEALTH</td>
<td>FAU, FGCU, UCF, UF, UNF, USF-T</td>
<td>Y</td>
<td>60</td>
<td>Spring 2021</td>
</tr>
<tr>
<td>Public Health</td>
<td>51.2201</td>
<td>HEALTH</td>
<td>FIU, UF, USF-T</td>
<td>Y</td>
<td>25</td>
<td>Spring 2021</td>
</tr>
</tbody>
</table>
Subject: Four Year Graduation Rate Improvement Plan

Rationale: In response to the “Florida Excellence in Higher Education Act of 2018,” Florida A&M University proposes a plan to improve its undergraduate 4-year graduation rate.

Summary: Our plan identifies the four components as specified, which aligns with several of the goals and objectives in the University’s strategic plan for improving the graduation rate in a timely manner within the expected four years.

- Academic
- Financial
- Policy
- Curricular Incentives

Attachment: Proposed Four Year Graduation Rate 2018 Improvement Plan

Recommendation: It is recommended that the Board of Trustees approve the Four Year Graduation Rate 2018 Improvement Plan.
Purpose:
In response to the “Florida Excellence in Higher Education Act of 2018,” Florida A&M University proposes a plan to improve its undergraduate 4-year graduation rate. Our plan identifies the four components as specified, which aligns with several of the goals and objectives in the University’s strategic plan for improving the graduation rate in a timely manner within the expected four years.

1. Academic, financial, policy, and curricular incentives and disincentives for timely graduation.

Academic:
- Implement and communicate a four-year graduation campaign (“Finish in Four”), starting with the 2018 Cohort.
- Strengthen and enhance academic support services, which include increasing the number of full-time professional advisors; using best practices for intrusive advisement and academic coaching; expanding the number of living learning communities; and enhancing and expanding tutoring and peer mentoring services.
- Leverage technology and use of predictive analytics, early warning monitoring and academic mapping to closely monitor and enhance student progression.
- Expand and enhance the freshman experience using high impact practices such as Meta-majors, block scheduling, freshmen/sophomore certified courses and learning communities.
- Develop a comprehensive summer (before the start of and after freshman year) academic plan to ensure all students are on-track by the start of the sophomore year.

Financial:
- Implement a model for students who are nearing completion within four-years by utilizing funding from the “Save Our Students” initiative which rewards students who are on track to graduate in four years.
- Provide special recognition and/or scholarships to students who are in need of financial assistance and have successfully completed 30 credit hours within their major with a 3.4 cumulative GPA or better at the end of each academic year.
- Provide financial assistance to students enrolling in the summer semester courses.
- Develop and implement an “On-Track Pell Award” to reward students, who stay on track at the beginning of each academic year and need financial assistance by providing a maximum Pell Grant award of $300.
- Strengthen the financial literacy program aimed to inform students on ways to reduce student debt.

Policy:
- Implement policies to require students to take a minimum of 15 credit hours per semester based on their academic maps.
- Establish and implement policies on the maximum number of times and/or frequency a student can fail or retake courses to avoid a mandatory major change.
- Implement policies to require students with an overall first year GPA below a 2.0 to complete a minimum of six credit hours of courses in the summer either on campus or online at FAMU.

Curricular Incentives:
- Develop four-year academic maps that take into consideration the student’s starting point.
- Provide opportunities for advanced curriculum-based studies during the summer semesters.
- Expand the living-learning environment to the sophomore year.
- Expand opportunities for students’ internships through promotion of electives.
2. Implementation of a proactive financial aid program:

Florida A&M University will implement the following initiatives to provide financial assistance to full-time students.

- The “On-Track Pell Award” to reward students, who stay on track at the beginning of each academic year and need financial assistance by providing a maximum Pell Grant award of $300.
- Develop and implement a model for students who are on-track and require financial assistance utilizing funding from the “Save Our Students” initiative.
- Develop and implement a model for students who are nearing completion within four-years and require financial assistance utilizing funding from the “Save Our Students” initiative which rewards students who are on track to graduate in four years.
- Devise incentives for students who passed 30 credit hours (in sequence) as outlined in their curriculum map to be eligible for various financial rewards (semester free books, meal plan, or parking; opportunity to win gift cards and gift certificates from local businesses and alumni; and obtain out-of-state waivers).
- Assess the new state policy to refund the excess hour surcharge for up to 12 credit hours to any FTIC student who completes a baccalaureate degree program within 4 years will be assessed.

3. The signature below of the Chair of the university board of trustees certifies that the information in this plan is true and correct to the best of my knowledge and that the board of trustees provides assurances that there will be no increased cost to students associated with the above plans, per Section 1001.706(5) of the Florida Statutes.

Certification: ___________________________ Date: ______________

(Chair, University of Board of Trustees)
Subject: Academic and Student Affairs Updates

Summary: Updates will be provided on Academic and Student Affairs.

- New BOG Regulation – 8.006 Civic Literacy
- Industrial Hemp Research Project
- Anti-Hazing Update
- 2 + 2 Program
Informational Presentation:
Industrial Hemp Pilot Program

PRESENTED BY

Timothy E. Moore, Ph.D.
Vice President for Research
June 2018

Florida Agricultural and Mechanical University
Purpose

To provide an overview of the recent legislative actions within the state of Florida regarding the emerging Industrial Hemp market sector - SB 1726 and Rule 5B-57.013 - and the upcoming role for Florida A&M University in conducting Industrial Hemp Research and the mandated approval from the FAMU BOT.
Recent Communication to FAMU BOT Members From Governmental Relations

To: Members, Board of Trustees

From: Barbara Cohen-Pippen

As you know, the 2017 Florida Legislature passed the Industrial Hemp legislation (CS/CS/SB 1726) which empowers the Florida Department of Agriculture and Consumer Services (FDACS) to oversee the development of the industrial hemp pilot projects at the University of Florida (UF) and Florida Agricultural and Mechanical University (FAMU). The purpose of these pilot projects is to conduct research in the cultivation, management, processing, testing, commercial application, and marketing for the commercialization of industrial hemp in Florida.

Rule 5B-57.013- Industrial Hemp Planting Permits, has been filed with the Department of State and will take effect this Thursday, April 12, 2018.

You may have received inquiries from those interested in partnering or collaborating with FAMU in the pilot project. To move forward with our Industrial Hemp project, FAMU must receive specific authorization from you, the Board of Trustees to implement a project. Staff are developing a board presentation which will include an overview of the Industrial Hemp State rule, specific related duties and responsibilities of the Trustees, as well as the University’s plan of action.
Background - Key State of Florida Legislative and Rule Actions

SB 1726 legislative dates for enactment and becoming law:

Enacted (passed by legislature): May 5, 2017

Signed by Governor: June 16, 2017

Chapter 2017-124

Rule 5B-57.013-Industrial Hemp which went into effect April 12, 2018
Background - FAMU’s Authorization

Authorization for the proposed FAMU Industrial Hemp Research Project:

- Agricultural Act 2014, 7 U.S.C. s. 5849
- Schedule 1 Permit, Forms 225 & 1301.18
- Florida Statutes CS/CS/SB 1726 Section 1004.4473, F.S.
- FDACS Rule 5B-57.013

*Cannabis sativa (Industrial Hemp vs Marijuana)*

Industrial Hemp: NTE 0.3% *delta-9 tetrahydrocannabinol (THC)*

Marijuana: > 0.3% *delta-9 tetrahydrocannabinol (THC)*
Hemp vs. Marijuana

What’s the difference between Hemp and Marijuana?

From a plant / genomic standpoint – not much.

These distinct varieties share almost 99+% of homologous DNA – since both come from the plant species *Cannabis sativa L*.

Over decades of genetic selection / breeding and manipulation resulted in the emergence of two basic varieties:

- one variety for medicinal and recreational purposes - Marijuana;
- the other variety for agricultural and industrial uses - Hemp.

*Industrial hemp and marijuana are different varieties of the same plant species.*
WRT Marijuana, the plant's flowering tops and leaves contain the psychoactive elements, namely tetrahydrocannabinol (THC) that is commonly referred to as marijuana.

By contrast, Hemp uses seeds and fibers — primarily from the stalk — and contains low levels of THC and high levels of cannabidiol (CBD). The federal statute states that Hemp must not contain more than 0.3 percent THC content on a dry-weight basis — exceeding this limit crosses over into Schedule I narcotic category.

Phenotypically, Cannabis/Marijuana plants tend to be shorter and wider than Hemp.

The primary goal in Marijuana production is flower density, where the THC is concentrated in the plant.

Generally, Hemp plants are taller and present a more narrow profile:

The primary goal in Hemp production is to produce strong fiber for manufacturing and oils for naturopathic uses.
Hemp - a Historical Perspective

• Hemp is one of the oldest domesticated crops – George Washington grew it at Mount Vernon.

• In 17th Century, applicable laws directed American farmers to grow Indian hemp.

• The 1850 U.S. census documented approximately 8,400 hemp plantations with at least 2000 acres.

• In the early 18th century, a person could be sentenced to jail if they did not grow hemp on their land. Hemp was considered to be legal tender for almost 150 years.

• Hemp has been cultivated for millennia with scientific evidence indicating that weaving of hemp fiber occurred over 10,000 years ago. Wild or native may date back to ~8000 B.C.

• Henry VIII encouraged English farmers to plant Hemp to meet the needs for the British Naval fleet. Hemp was needed for the construction of ships - riggings, pendants, pennants, and sails.
Hemp contains Cannabidiol (CBD), which is one of many compounds that are found in the cannabis plant. CBD is not psychoactive. However, it does appear to have medicinal / health benefits.

CBD has been used for:

- Natural pain relief or anti-inflammatory properties
- Smoking cessation and drug withdrawals
- Epilepsy and other mental health disorders
- Anxiety disorders
  - Post Traumatic Stress Disorder
  - General anxiety disorder
  - Panic disorder
  - Social Anxiety
- Obsessive-Compulsive Disorder (OCD)
- Type 1 diabetes
- Alzheimer's disease
Why FAMU?

As one of the two authorized entities in the state of Florida, FAMU is poised to support the emerging Hemp market sector to become a significant contributor to the state’s economy.

Secondarily, FAMU’s broad academic enterprise – CAFS, JCOE, SOE, SBI, et al. – will allow us to support our stakeholders to earn productive positions in this emerging market sector.

FAMU has the potential to develop long term equity positions in commercial enterprises where we have generated intellectual knowhow.
FAMU’s Role in Industrial Hemp Research

To participate in Industrial Hemp Research Project and comply with state guidelines, FAMU is required to do the following:

- Obtain authorization from FAMU Board of Trustees.
- Develop Plan of Research/Proposal.
- Select an industry partner(s) to jointly undertake the project (Section 1004.4473(f) F.S.).
- Submit application to DEA Schedule I Permit, Forms 225 & 1301.18 to import/purchase hemp seeds.
- Submit application for an Industrial Hemp Planting Permit to Florida Department of Agriculture and Consumer services (5B-57.013).
- Implement project and provide report to the Governor of Florida and Florida Legislature.
FAMU’s Role in Industrial Hemp Research

To participate in Industrial Hemp Research Project and comply with state guidelines, our Industry Partner’s Role Must:

- Meet statutory requirement
- Develop research plan
- Provide investment and operating capital
- Provide technical expertise
- Provide market penetration
FAMU’s Role in Industrial Hemp Research

Proposed Research Goal:
To participate and conduct research on industrial hemp over two years at either FAMU Quincy Farm or the Brooksville Agricultural and Environmental Research Station (BAERS).

Proposed Research Objectives:
- Evaluate several industrial hemp species (5) to determine productivity and suitability under Florida condition.
- Evaluate agronomic traits, invasiveness and environmental impact of the hemp species.
- Identify best management practices for commercialization of the hemp species.
- Site security and access control in order to prevent off-site release or spillage.

Source: Industrialhemp.ces.ncsu.edu
Source: Google- Industrial Hemp
Proposed Next Steps

1. The University will require FAMU BOT approval for the Hemp Pilot Project Program
   - Project-by-Project approval vs. Overarching programmatic structure approval

2. Approval needs to occur July 2018 in order for FAMU to engage potential partners and launch research pilot project(s)

3. Project partner qualification/readiness and overall programmatic structure need to be provided to the FAMU BOT before the “Go/No Go” decision
   - guidelines will need to be developed so that all potential partners are evaluated in a consistent manner
   - guidelines regarding termination of active project for non-compliance need to be established

4. Designated Initial Project Location – Quincy vs. BAERS
Key Components of the Hemp Pilot Research Project

1. Design, Scope and Layout of Experimental Area
2. Containment and Security System
3. Decontamination Plan
4. Security Plan
5. Limited Access Area
6. Meeting Requirements of Section 1004.4473(5)(b)F.S.
7. Management Structure and Chain of Command
8. Chain of Control of Hemp Materials
9. Testing Facility and Schedule
10. Destroying Hemp > 0.3% THC
11. Genetic Research Plan to Ensure Non-synthesizing of Psychotropic Compounds
12. Plan for Economic Impact Study
13. Maintaining Compliance with Federal and State Statute
Recommended Executive Board - Hemp Pilot Project

Proposed Members of Executive Board

Dr. Timothy Moore, Vice-President of Research, FAMU – Chairperson
Dr. Robert Taylor, Dean and Director of Land-Grant Programs, CAFS
Dr. Fred Gainous, Executive Director, BAERS
Attorney David Self, Asst. General Counsel, FAMU
1 x FAMU Faculty Member
Industry Partner Representative
Industry Partner Representative
Industry Partner Representative
Ex-officio, FAMU
Ex-officio, Industry Partner
Projected Milestones/ Timeline - 6 Months

June
- FAMU BOT Informational Briefing on Industrial Hemp Pilot Project
- Technical Advisory Panel Established

July
- FAMU BOT Approval for Industrial Hemp Pilot Project
- Pilot Project Partners Submit Research Proposals
- Partner Selection Notification(s)
- IPR Update to FAMU President/SLT
- O/O FAMU BOT Update

August
- FAMU Designated Pilot Location Preparation
- IPR Update to FAMU President/SLT

September
- Project Launch

October
- Project Execution
- IPR Update to FAMU President/SLT
- FAMU BOT IPR
- IPR Update to FAMU President/SLT

November
- FAMU BOT 6 Month Project Update

December
- Lessons Learned
- Consideration of Additional Project Locations
Conclusions

1. FAMU is clearly authorized by both Federal and recent State Statutes to engage in Industrial Hemp Research

2. FAMU is drawing high interest from prospective industrial partners

3. Industrial Hemp is poised to become a significant commodity product in Florida

4. FAMU has the skills, knowledge, and land to support Industrial Hemp Research

5. FAMU will need to exercise rigorous control and oversight to avoid confusion and maintain clear with Federal and State laws

6. Rigorous control will start with FAMU BOT, through the President and to the Executive Board

7. FAMU MAY be able to generate new revenue streams as this industry expands
Questions?
Hazing Prevention Initiatives

PRESENTED BY

Bryan F. Smith, JD

Florida Agricultural and Mechanical University
Division of Student Affairs
Tallahassee, FL
Hazing Prevention Activities

There were four hazing allegations reported during the Spring 2018 Semester.

Safety meetings are being coordinated with the Office of Student Activities. The safety meetings will include hazing prevention education for clubs & organizations and Greek letter organizations.

Hazing Prevention Education seminars will be conducted during the Summer at New Student Orientation and will be scheduled for the athletic teams, residence life staff, ROTC programs and for the Music Department ensembles to begin the Fall Semester.
Hazing Prevention Initiatives

Outreach & Consultation

- Presented at the University of Houston on April 26, 2018, on the subject, “An All Encompassing Haze: An examination of Florida A&M University’s High Impact Hazing Prevention Program”

- Presented at the SUS Hazing Prevention Summit at UCF, on May 18, 2018, on the subject, “First 48: Crisis Management in the Wake of an High Profile Hazing Incident”
FAMU Ignite Pilot Program

PRESENTED BY

William Hudson Jr., Ph.D.

Florida Agricultural and Mechanical University
Division of Student Affairs
Tallahassee, FL 32307
FAMU Ignite Pilot Program

Partner Institutions:

- Broward College
- Florida Gateway College
- Florida State College at Jacksonville
- Miami-Dade College
- Palm Beach State College
- Pasco-Hernando State College
- Santa Fe College
- St. Petersburg College
- Tallahassee Community College
- Valencia College
VENOM PATHWAYS

Academic Pathways: 47
Academic Pathways Completed: 39
Academic Pathways Incomplete: 8
IGNITE PARTICIPANTS SPRING 2018

- Broward College: 42
- Miami-Dade College: 22
- Santa Fe College: 17
- Tallahassee Community College: 489
- St. Petersburg College: 22
- Pal Beach State College: 24
- Valencia College: 21
GRADUATION RATES FOR AA TRANSFER STUDENTS FROM FLORIDA COLLEGE SYSTEM FOUR-YEAR RATES

2009-11: 67%
2010-12: 63%
2011-13: 61%
2012-14: 57%
2013-15: 56%
2014-16: 62%
2015-17: 66%

Source: Office of Institutional Research
“At FAMU, Great Things Are Happening Every Day.”

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