

This form should be used for academic units wishing to propose a new concentration for existing graduate degrees.

A concentration is a subspecialty within a degree and major. It indicates the fulfillment of a designated, specialized course of study, which qualifies the student with skills and training in one highly concentrated area of the major. Concentrations are formally-recognized educational designations (including the assignment of a university plan code for reporting/record-keeping purposes and appearance on the ASU transcript). Concentrations are distinguished from more informal academic distinctions such as “emphases,” “tracks,” “foci,” “options,” etc.

This proposal template should be completed in full and submitted to the University Provost’s Office [mail to: curriculumplanning@asu.edu]. It must undergo all internal university review and approval steps including those at the unit, college, and university levels. A program **may not** be implemented until the Provost’s Office notifies the academic unit that the program may be offered.

GRADUATE CONCENTRATION

College/School:	Ira A. Fulton Schools of Engineering
<i>Note: Program ownership is coded at the College/School level first and may not be a center, department or division apart from it.</i>	
Department/Division/School:	School of Biological and Health Systems Engineering (CBIOENG)
Proposing faculty group (if applicable):	N/A

Existing graduate degree and major under which this concentration will be established:	Master of Science (MS) in Robotics and Autonomous Systems
Name of proposed concentration:	Biomedical Engineering
Requested effective term and year:	Spring 2021
(The first semester and year for which students may begin applying to the concentration)	
Is a program fee required?	No, a program fee is not required.

Note: for more information about program fee requests, visit <https://provost.asu.edu/curriculum-development/changemaker/form-instructions#fees>

Is the unit willing and able to implement the program if the fee is denied? Not applicable.

Delivery method and campus or location options: *select all locations that apply*

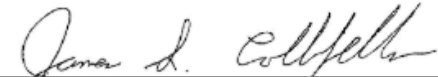
- Downtown Phoenix Polytechnic Tempe Thunderbird West Other: _____
- Both** on-campus **and** ASU Online* - (check applicable campus(es) from options listed above)
- ASU Online only (all courses online and managed by ASU Online)

Note: Once students elect a campus or Online option, students will not be able to move between the on-campus and the ASU Online options. Approval from the Office of the University Provost and Philip Regier (Executive Vice Provost and Dean) is required to offer programs through ASU Online. Please complete the ASU Online Offering form in Curriculum ChangeMaker to begin this request. Prior to completing the online Curriculum ChangeMaker form, please contact EdPlus at asuonline@asu.edu who can provide you with additional information regarding the online request process.

Do Not Fill in this information: Office Use Only	CIP Code:
Plan Code:	

PROPOSAL CONTACT

Name:	Pat Phelan	Title:	Assistant Dean of Engineering Graduate Programs
Phone number:	480-965-1625	Email:	phelan@asu.edu

DEAN APPROVAL(S)	
This proposal has been approved by all necessary unit and college/school levels of review, and the college/school(s) has the resources to offer this degree program. I recommend implementation of the proposed concentration.	
<i>Note: An electronic signature, an email from the dean or dean's designee, or a PDF of the signed signature page is acceptable.</i>	
College/School/Division Dean name:	James S. Collofello
Signature:	 Date: 4/29/2020

Please note: Proposals for new concentrations also require the review and recommendation of approval from the University Graduate Council, Curriculum and Academic Programs Committee (CAPC), the Academic Senate (Information item only), and the Office of the Provost before they can be put into operation.

The final approval notification will come from the Office of the Provost.

1. OVERVIEW

Provide a brief description (*no more than 150 words*) of the new concentration (including the focus of the new concentration, relationship to other concentrations within this degree program, etc.).

The Biomedical Engineering concentration joins the other four existing concentrations (Artificial Intelligence, Electrical Engineering, Mechanical and Aerospace Engineering, and Systems Engineering) in the MS in Robotics and Autonomous Systems program. The biomedical engineering concentration will enable students to focus their education in the growing field of medical robotics, while at the same time allowing them to take a broad array of interdisciplinary courses and to interact with faculty in a variety of programs within the Fulton Schools of Engineering. The proposed concentration complements the existing concentrations by providing an option for students interested in biomedical engineering, where previously such students had to enroll in one of the other concentrations or not enroll at all.

2. IMPACT ASSESSMENT

A. Explain the unit's need for the new concentration (e.g., market demand, research base, direction of the discipline, and interdisciplinary considerations). How will the new concentration complement the existing degree program, including enrollment, national ranking, etc.?

Robotics and automation are increasingly important in biomedical engineering. Robots are used in surgeries, such as the Da Vinci surgical systems which have reportedly been used in more than six million operations globally (<https://www.davincisurgery.com/>). They are also used in care-giving, including robotic nurses such as those by AnyBot Inc. (<http://anybots.com/>). The proposed concentration will join the four existing concentrations in the recently established (2019) MS in Robotics and Autonomous Systems degree to enable greater specialization in this emerging field. This new MS degree program has attracted more than 200 applications in its first year of operation, leading to about 120 enrolled students, indicating the great level of interest in this burgeoning field. Furthermore, the proposed concentration in biomedical engineering is in accord with the ASU Design Aspiration to "Fuse Intellectual Disciplines" by integrating five of the six schools within the Ira A. Fulton Schools of Engineering into a single academic program, allowing students to take courses and interact with faculty from various disciplines..

The worldwide medical robotics market was estimated at \$7.24 billion in 2015, and is projected to grow to \$20 billion by 2023 (Creedence Research, 2016, cited at <https://www.asme.org/engineering-topics/articles/bioengineering/top-6-robotic-applications-in-medicine>). A job search in Indeed.com under "Robotic

Medical Device Engineer" revealed a total of 698 available positions (4/2/2019). Similarly, glassdoor.com revealed a total of 356 available jobs under "medical robotics."

- B. Please identify other related ASU programs and describe how the new concentration will complement these existing ASU programs?** If applicable, statements of support from affected academic unit administrators should be included with this proposal submission.

The Biomedical Engineering concentration joins the existing four concentrations (Artificial Intelligence, Electrical Engineering, Mechanical and Aerospace Engineering, and Systems Engineering) under the MS in Robotics and Autonomously Systems degree and enables a partnership between five of the six schools within the Fulton Schools of Engineering: the School of Biological and Health Systems Engineering (SBHSE), the School for Engineering of Matter, Transport and Energy (SEMTE), the Polytechnic School (POLY), the School of Computing, Informatics, and Decision Systems Engineering (SCIDSE), the School of Electrical, Computer, and Energy Engineering (SECEE). Each school houses one concentration: SEMTE (Mechanical & Aerospace Engineering), POLY (Systems Engineering), SCIDSE (Artificial Intelligence), SECEE (Electrical Engineering), and SBHSE (the proposed Biomedical Engineering concentration). Support from these impacted schools is indicated by statements of support from the relevant school directors. In addition, statements of support have been requested from the College of Health Solutions, the Edson College of Nursing and Health Innovation, and others.

Within the College of Health Solutions, arguably the two most related master's programs are the MS in Biomedical Diagnostics (an online degree) and the MS in Biomedical Informatics (an on-campus degree). Neither of these existing programs, however, appears to offer any instruction related specifically to biomedical robotics. Within the Edson College of Nursing and Health Innovation, arguably the most related master's program is the relatively new MS in Health Care Simulation, but again this program does not appear to offer any instruction related specifically to biomedical robotics. Therefore, the overlap with these existing programs appears minimal.

- C. Is this an interdisciplinary concentration?** If yes, please address the relationship of the proposed concentration to other existing degree programs and any parallel or similar concentrations in those degree programs. (Please include relevant Memoranda of Understanding regarding this interdisciplinary concentration from all applicable academic units.)

Similar to the other existing concentrations, students in the Biomedical Engineering concentration are required to take courses from the other schools involved in the degree program, per the curricular structure described below. Support from these impacted schools is indicated by statements of support from the relevant school directors.

3. STUDENT LEARNING OUTCOMES AND ASSESSMENT

Attach a PDF copy of the assessment plan printed from the University Office of Evaluation and Educational Effectiveness assessment portal demonstrating UOEEE's approval of your assessment plan for this program. Visit the assessment portal at <https://uoeee.asu.edu/assessment-portal> or contact uoeee@asu.edu with any questions.

See Appendix II.

4. CURRICULAR STRUCTURE

Please ensure that all *new core* course proposals have been submitted to the Provost's office through the Curriculum ChangeMaker online course proposal submission system before this initiative is put on the University Graduate Council and CAPC agendas.

Core Courses for the Degree			
<i>Ensure the core listed below is the same as for the standalone degree</i>			
Prefix and Number	Course Title	New Course?	Credit Hours
MAE 501	Linear Algebra in Engineering	No	3
MAE 547	Modeling and Control of Robots	No	3
<i>Section sub-total:</i>			6
Required Concentration Courses			
Prefix and Number	Course Title	New Course?	Credit Hours
BME 564	Cyber Biomedical Systems	Yes	3
<i>3 additional credit hours of graduate-level (500-level and above) BME courses, selected from the following:</i>			
BME 507	Introduction to Digital Image Processing and Analysis	No	3
BME 521	Neuromuscular Control Systems	No	3
BME 526	Introduction to Neural Engineering	No	3
BME 527	Biomedical Device Design	No	3
BME 556	Human Systems Neuroscience	No	4
BME 561	Clinical Neuroscience	No	3
BME 565	Magnetic Resonance Imaging	No	3
BME 566	Medical Imaging Instrumentation	No	3
BME 567	Tissue Engineering and Regenerative Medicine	No	3
BME 568	Human Factors and System Design in Assistive Technologies	No	3
<i>Section sub-total:</i>			6
Elective or Research Courses			
<i>(as deemed necessary by supervisory committee)</i>			
Prefix and Number	Course Title	New Course?	Credit Hours
	At least two courses (6 credit hours) must be selected from among the courses approved for the other four concentrations. Additional electives must be graduate courses in science, engineering, mathematics, or others approved by the Graduate Program Committee.	No	12 or 15
<i>Section sub-total:</i>			12 or 15
Culminating Experience(s)			Credit Hours
<i>E.g. – Capstone course, portfolio, written comprehensive exam, applied project, thesis (must be 6 credit hours with oral defense), dissertation (must be 12 credit hours with oral defense)</i>			
Students are free to choose one of the following culminating experiences:			
BME 593 Applied Project			3
BME 599 Thesis			6
<i>Section sub-total:</i>			3 or 6
Total required credit hours			30

3. **A. Please describe the culminating experience(s) required for completion of the existing degree and major, and the proposed concentration (e.g., thesis, dissertation, comprehensive exams, capstone course, portfolio, applied project).**

Students are free to choose from either of the following culminating experiences:

- Thesis (requires 6 credit hours of BME 599); written thesis and defense
- Applied Project (requires 3 credit hours of BME 593); written report and oral presentation

The Applied Project is considered the default culminating experience. Students are welcome to switch to doing a thesis, however, if a faculty member agrees to serve as their thesis advisor.

B. Please describe any other requirements for completion of the existing degree and major, and the proposed concentration (e.g., internships, clinical requirements, field studies, foreign language exam etc.).

None

5. COMPREHENSIVE EXAMS

(Please choose what is appropriate for the degree type selected)

A. Master's Comprehensive Exam (when applicable), please select from the appropriate option.

N/A

6. COURSES

A. New Courses Required for Proposed Program: Provide course prefix, number, title, credit hours and brief description for any new courses required for this program.

BME 564 Cyber Biomedical Systems (3)

This class will train Biomedical Engineering students in the engineering principles involved in the development of computational systems for biomedical and healthcare applications. The focus is on core conceptual principles rather than on the nuts-and-bolts of designing and synthesizing such systems. As embedded computing becomes more common in healthcare in the form of devices involved in prostheses, diagnosis, monitoring and therapy, in clinical, home, hand-held or on-body settings, it is increasingly critical to understand how to design and develop robust and reliable embedded systems while preserving optimality in power, performance and form factors. This class will cover engineering principles involved in the modeling, design and analysis of hybrid systems that involve computers controlling and interacting with biomedical systems.

7. ADMINISTRATION AND RESOURCES

A. Administration: How will the proposed concentration be administered (including recommendations for admissions, student advisement, retention etc.)? Describe the administering body in detail, especially if the proposed concentration is part of a larger interdisciplinary initiative. How will the graduate support staffing needs for this proposed concentration program be met?

A Graduate Program Chair (GPC) is appointed by the Ira A. Fulton Schools of Engineering Dean. This person oversees the Graduate Program Committee, which currently consists of two faculty representatives each from the Polytechnic School, the School for Engineering of Matter, Transport and Energy, the School of Computing, Informatics, and Decision Systems Engineering, and the School of Electrical, Computer, and Energy Engineering (i.e., from the four schools with existing concentrations). For the proposed Biomedical Engineering concentration, two faculty representatives from the the School of Biological and Health Systems Engineering will be added to the Graduate Program Committee. The Graduate Program Committee will continue to define admissions criteria and make admissions decisions, and make curriculum changes as needed.

Applicants must select one of five concentrations: artificial intelligence, electrical engineering, mechanical and aerospace engineering, systems engineering, or the proposed biomedical engineering. Academic advising will be provided from the School most closely aligned with each concentration (SBHSE = biomedical engineering, SEMTE = mechanical & aerospace engineering, POLY = systems engineering, ECEE = electrical engineering, SCIDSE = artificial intelligence). The graduate support staff of each school will handle the paperwork for their respective concentrations including correspondence with prospective students, preparing applications for review by the Graduate Program Committee, corresponding with the Graduate College on admissions, filing programs of study, and reporting exam results (if necessary).

B. Projected Enrollment: How many students will be admitted immediately following final approval of the concentration? What are enrollment projections for the next three years?

3-YEAR PROJECTED ANNUAL ENROLLMENT			
Please utilize the following tabular format	1st Year	2nd Year <small>(Yr. 1 continuing + new entering)</small>	3rd Year <small>(Yr. 1 & 2 continuing + new entering)</small>
Number of Students in concentration (Headcount)	5	12	17

C. Resource requirements needed to launch and sustain the program: Describe any new resources required for this concentration’s success such as new staff, new facilities, new library resources, new technology resources, etc. and include projected budget needs. If multiple units/programs will collaborate in offering this concentration, please discuss the resource contribution of each participating program. Letters of support must be included from all academic units that will commit resources to this concentration.

New resources are not required to launch and sustain the program.

D. Current Faculty: Complete the table below for all current faculty members who will teach in the program.

Name	Rank	Highest Degree	Area of Specialization/Expertise	Estimated Level of Involvement
Christopher Buneo	Associate Professor	PhD	Neural engineering, neuromodulation, neurorehabilitation, neurophysiology, sensorimotor control	High
Stephen Helms Tillary	Associate Professor	PhD	Cortical neurophysiology, neural control of movement, neuroprosthetics, neural engineering ethics	Low
Jit Muthuswamy	Associate Professor	PhD	Neural Interfaces, neuromodulation, BioMEMS	Medium
Marco Santello	Professor & School Director	PhD	Neural control of movement, sensorimotor learning, neuromodulation, neuroimaging, prosthetics	Low
Benjamin Bartelle	Assistant Professor	PhD	Molecular fMRI of neuroinflammation and degeneration, in vivo synthetic biology of reporters sensors and actuators, genetic and biomolecular circuits	Low
Emma Frow	Assistant Professor	PhD	Bioengineering, policy and society, governing emerging biotechnologies	Low
Mehdi Nikkah	Associate Professor	PhD	Micro and nanoscale technologies, disease modeling, tissue engineering, cancer, tumor microenvironment models	Low
Sung-Min Sohn	Assistant Professor	PhD	Bio-inspired electrical circuits and systems, medical imaging instrumentation development, MRI electronics	Low

8. REQUIRED SUPPORTING DOCUMENTS

(Please label accordingly, i.e., Appendix or Attachment A, B, etc.)

Please include the following with your proposal:

- A.** Statements of support from all deans (See Appendix III).
- B.** Impact statements of heads of impacted academic units (programs with similar names/content, utilizing courses, faculty, etc.) (See Appendix III).

APPENDIX I

OPERATIONAL INFORMATION FOR GRADUATE PROGRAMS

(This information is used to populate the Graduate Programs Search/catalog website.)

1. **Proposed name of concentration:** Biomedical Engineering

2. **Marketing description** *(Optional - 50 words maximum. The marketing description should not repeat content found in the program description.)*

This is an advanced degree, emphasizing competency in the rapidly growing fields of robotics and autonomous systems, with applications in biomedical engineering and medicine.

3. **Provide a brief program description** *(Catalog type (i.e. will appear in Degree Search) – no more than 150 words. Do not include any admission or curriculum information)*

The biomedical engineering concentration is one of five concentrations in the multidisciplinary MS program in robotics and autonomous systems, which emphasizes robotics, controls, autonomous systems, artificial intelligence and related fields. This concentration is appropriate for students who wish to focus on applications in biomedical engineering. Biomedical engineers work at the interface of technology and medicine on challenges that are critical to the advancement of health and scientific discovery.

4. **Delivery/Campus Information Options:** On-campus only (ground courses and iCourses)

5. **Campus(es) where program will be offered:**

ASU Online curriculum consists of courses that have no face-to-face content. iCourses are online courses for students in on-campus programs. iCourses may be included in a program, but may not comprise the entirety of a program. On-campus programs must have some face-to-face content

Note: Office of the Provost approval is needed for ASU Online campus options.

ASU Online only (all courses online and managed by ASU Online)

All other campus or location options (please select all that apply):

Downtown Phoenix Polytechnic Tempe West Other: _____

Both on-campus and ASU Online* - (check applicable campus(es) from options listed above)

**Note: Once students elect a campus or Online option, students will not be able to move between the on-campus and the ASU Online options. Approval from the Office of the University Provost and Philip Regier (Executive Vice Provost and Dean) is required to offer programs through ASU Online. Please complete the ASU Online Offering form in [Curriculum ChangeMaker](#) to begin this request. Prior to completing the online Curriculum ChangeMaker form, please contact EdPlus at asuonline@asu.edu who can provide you with additional information regarding the online request process*

6. **Admission Requirements**

Applicants must fulfill the requirements of both the Graduate College and the Ira A. Fulton Schools of Engineering.

Applicants are eligible to apply to the program if they have earned a bachelor's or master's degree in engineering, science, mathematics or related field, from a regionally accredited institution.

Applicants must have a minimum cumulative GPA of 3.00 (scale is 4.00 = "A") in the last 60 hours of their first bachelor's degree program, or applicants must have a minimum cumulative GPA of 3.00 (scale is 4.00 = "A") in an applicable master's degree program.

All applicants must submit:

1. graduate admission application and application fee
2. official transcripts
3. GRE scores
4. letter of intent or written statement

- 5. professional resume
- 6. proof of English proficiency

Additional Application Information

An applicant whose native language is not English must provide proof of English proficiency regardless of current residency.

7. Application Review Terms (if applicable session):

Indicate the first term and year in which applications will be opened for admission. Applications will be accepted on a rolling basis after that time.

Note: It is the academic unit's responsibility to display program deadline dates on their website.

Terms	Years	University Late Fee Deadline
<input checked="" type="checkbox"/> Fall (regular) <input type="checkbox"/> Session B	(year): 2021 (year):	July 1st October 1st
<input checked="" type="checkbox"/> Spring (regular) <input type="checkbox"/> Session B	(year): 2021 (year):	December 1st February 8th
<input type="checkbox"/> Summer (regular) <input type="checkbox"/> Summer B	(year): (year):	May 14th May 14th
<p><i>Note: Session B is only available for approved online programs.</i></p>		

Program admission deadlines website address: <https://ras.engineering.asu.edu/>

8. Curricular Requirements:

Curricular Structure Breakdown for the Academic Catalog:
(To be completed by the Graduate College)

30 credit hours and an applied project (BME 593), or
30 credit hours and a thesis

Required Core (6 credit hours)

MAE 501 Linear Algebra in Engineering (3)
MAE 547 Modeling and Control of Robots (3)

Concentration (6 credit hours)

BME 564 Cyber Biomedical Systems (3)
Choose one course from the following:
BME 507 Introduction to Digital Image Processing and Analysis (3)
BME 521 Neuromuscular Control Systems (3)
BME 525 Surgical Techniques (3)
BME 526 Introduction to Neural Engineering (3)
BME 527 Biomedical Device Design (3)
BME 556 Human Systems Neuroscience (4)
BME 561 Clinical Neuroscience (3)
BME 565 Magnetic Resonance Imaging (3)
BME 566 Medical Imaging Instrumentation (3)
BME 567 Tissue Engineering and Regenerative Medicine (3)
BME 568 Human Factors and System Design in Assistive Technologies (3)

Electives or Research (12 or 15 credit hours)

Culminating Experience (3 or 6 credit hours)

BME 593 Applied Project (3) or
BME 599 Thesis (6)

Additional Curriculum Information

Students are required to select one of the approved culminating experiences for the concentration.

Elective or research coursework must be selected from among the courses listed for the other three concentrations. Additional electives must be graduate courses in science, engineering, mathematics or others approved by the Graduate Program Committee.

9. Allow 400-level courses: Yes No

Note: No more than six credit hours of 400-level coursework may be included on a graduate student plan of study.

10. Keywords: List all keywords that could be used to search for this concentration. Keywords should be specific to the proposed concentration – limit 10 keywords.

robotics, autonomous systems, artificial intelligence, controls, biomedical, medicine

11. Area(s) of Interest

A. Select **one (1)** primary area of interest from the list below that applies to this program.

- | | |
|--|--|
| <input type="checkbox"/> Architecture & Construction | <input type="checkbox"/> Interdisciplinary Studies |
| <input type="checkbox"/> Arts | <input type="checkbox"/> Law & Justice |
| <input type="checkbox"/> Business | <input type="checkbox"/> Mathematics |
| <input type="checkbox"/> Communication & Media | <input type="checkbox"/> Psychology |
| <input type="checkbox"/> Education & Teaching | <input type="checkbox"/> STEM |
| <input checked="" type="checkbox"/> Engineering & Technology | <input type="checkbox"/> Science |

- | | |
|--|---|
| <input type="checkbox"/> Entrepreneurship | <input type="checkbox"/> Social and Behavioral Sciences |
| <input type="checkbox"/> Health & Wellness | <input type="checkbox"/> Sustainability |
| <input type="checkbox"/> Humanities | |

B. Select one (1) secondary area of interest from the list below that applies to this program.

- | | |
|--|---|
| <input type="checkbox"/> Architecture & Construction | <input type="checkbox"/> Interdisciplinary Studies |
| <input type="checkbox"/> Arts | <input type="checkbox"/> Law & Justice |
| <input type="checkbox"/> Business | <input type="checkbox"/> Mathematics |
| <input type="checkbox"/> Communications & Media | <input type="checkbox"/> Psychology |
| <input type="checkbox"/> Education & Teaching | <input checked="" type="checkbox"/> STEM |
| <input type="checkbox"/> Engineering & Technology | <input type="checkbox"/> Science |
| <input type="checkbox"/> Entrepreneurship | <input type="checkbox"/> Social and Behavioral Sciences |
| <input type="checkbox"/> Health & Wellness | <input type="checkbox"/> Sustainability |
| <input type="checkbox"/> Humanities | |

12. Contact and Support Information:

Office Location - Building Code & Room: <i>(Search ASU map)</i>	Engineering Center G Wing, Suite 334
Campus Telephone Number: <i>(may not be an individual's number)</i>	480/965-3028
Program Email Address: <i>(may not be an individual's email)</i>	sbhse@asu.edu
Program Website Address: <i>(if one is not yet created, use unit website until one can be established)</i>	https://ras.engineering.asu.edu/
Program Director (Name):	Christopher Buneo
Program Director (ASURITE):	cbuneo
Program Support Staff (Name):	Laura Hawes
Program Support Staff (ASURITE):	lhawes
Admissions Contact (Name):	Jessica Meeker
Admissions Contact (ASURITE):	jkentge

13. Application and iPOS Recommendations: List the Faculty and Staff that will input admission/POS recommendations to Gportal **and** indicate their approval for Admissions and/or POS:

NAME	ASURITE	ADMSN	POS
Laura Hawes	lhawes	X	X
Jessica Meeker	jkentge	X	X

APPENDIX II
ASSESSMENT PLAN

University Office of Evaluation and Educational Effectiveness 03-27-2020
Academic Program Assessment Plan

MS in Robotics and Autonomous Systems (Biomedical Engineering)

Status: UOEEE Provisional Approval

Comments: UOEEE provisional approval

Element Outcome Measure Description

AP_2Goal 0

Outcome	1	0	Students completing the MS in Robotics & Autonomous Systems (Biomedical Engineering Concentration) will be able to apply concepts related to system dynamics, controls and artificial sensing and perception.
Plan_2Concepts	1		The essence of robotics & autonomous systems is to apply sensing, modeling, and control approaches to achieve desired system dynamics through appropriate actuation mechanisms.
Plan_3Competencies	1		Graduates will have the ability to design robotic and other autonomous systems through application of sensing, modeling, and control approaches.
AP_1Process	1	1	For Measure 1.1 the written applied project report or thesis, and the project presentation or thesis oral defense will be used. This generally occurs during the student's last semester. For Measure 1.2 the Graduate Alumni Survey (GAS) will be used approximately 3 years after graduation. For both Measures the Graduate Program Chair, in consultation with the Graduate Program Committee, will use the results to improve the learning experiences related to the aforementioned concepts.
Measure	1	1	For students selecting the option of either thesis or applied project, the assessment measure will be to successfully defend their project that should involve analysis and application of the aforementioned key concepts before an appointed committee of program faculty.
PC	1	1	At least 80% of the students will successfully defend their thesis or present their applied project, and at least 80% of the students will meet or exceed expectations using a faculty-developed rubric.
Measure	1	2	Program alumni will be surveyed to determine their ability, approximately 3 years after graduation, to apply the aforementioned concepts.
PC	1	2	At least 80% of the surveyed alumni rate their performance as 'satisfactory' or better.

Outcome	2	0	Students completing the MS in Robotics & Autonomous Systems (Biomedical Engineering Concentration) will be able to apply concepts related to forward/inverse kinematics & differential kinematics, and dynamics & controls, for robotic arms.
Plan_2Concepts	2		Robotic arms are a fundamental component of many robotic systems, and the ability to design and control their motion is crucial for a wide variety of applications.
Plan_3Competencies	2		Graduates will have the ability to develop computational approaches, such as with Matlab, to model and control a robotic arm.
AP_1Process	2	1	For Measure 2.1 the written final project report for MAE 547 will be used. This course is taken by all students, any time within their degree program. For Measure 2.2 the Graduate Alumni Survey (GAS) will be used approximately 3 years after graduation. For both Measures the Graduate Program Chair, in consultation with the Graduate Program Committee, will use the results to improve the learning experiences related to the aforementioned concepts.
Measure	2	1	The final project in the required core course MAE 547 Modeling and Control of Robots will be used to assess a student's ability to develop a computational tool to model and control a robotic arm for a user with minimal robotics background.
PC	2	1	At least 80% of the students will meet or exceed expectations using a faculty-developed rubric.
Measure	2	2	Program alumni will be surveyed to determine their ability, approximately 3 years after graduation, to apply the aforementioned concepts.
PC	2	2	At least 80% of the surveyed alumni rate their performance as 'satisfactory' or better.

Element Outcome Measure Description

Outcome	3	0	Students completing the MS in Robotics & Autonomous Systems (Biomedical Engineering Concentration) will be able to analyze and apply key robotics concepts and methods used in the field of biomedical engineering.
Plan_2Concepts	3		Biomedical robotics applications require specialized knowledge in modeling and design in order to implement the precise dynamics needed in medicine and related fields.
Plan_3Competencies	3		Graduates will have the ability to model, design, and implement biomedical robotic systems.
AP_1Process	3	1	For Measure 3.1 the written final project report for BME 598 Cyber Biomedical Systems will be used. This course is taken by all students, any time within their degree program. For Measure 3.2 the First Destination Survey will be used around the time of graduation. For both Measures the Graduate Program Chair, in consultation with the Graduate Program Committee, will use the results to improve the learning experiences related to the aforementioned concepts.
Measure	3	1	The final project in the required concentration course BME 598 Cyber Biomedical Systems will be used to assess a student's ability to a) model and simulate biomedical systems using physical, mathematical and computing concepts, b) design and develop real-time control systems to achieve desired performance specifications for the biomedical systems and/or c) design, synthesize, implement and test hybrid cyber-biomedical solutions using the Intel Galileo or Arduino processor platforms.
PC	3	1	At least 80% of the students will meet or exceed expectations using a faculty-developed rubric.
Measure	3	2	Graduates will be employed in an area utilizing the knowledge and skills developed in the degree, or be accepted for further graduate study within one year of graduation.
PC	3	2	At least 80% of the survey respondents will be employed in a related area, or pursuing further graduate study, within three years of graduation.

If you have questions, please e-mail assessment@asu.edu or call UOEEE at (480) 727-1731.

APPENDIX III

Statements of Collaboration and Impact

Ira A. Fulton Schools of Engineering – Official Submission

From: [Sergio Quiros](#)
To: [Curriculum Planning](#)
Cc: [Jeremy Helm](#); [Patrick Phelan \(Professor\)](#); [Jessica Meeker](#); [Christopher Buneo](#); [Jitendran Muthuswamy](#)
Subject: RE: Establishment of a graduate concentration - MS in Robotics and Autonomous Systems (Biomedical Engineering)
Date: Wednesday, April 29, 2020 11:16:17 AM
Attachments: [FSE Establishment MS Robotics Autonomous Systems BME Concentration.pdf](#)
[new-graduate-concentration-proposal MS Robotics Autonomous Systems BME Concentration \(Mar 20 2020\).docx](#)

Hello,

Attached is the following proposal for review:

Ira A. Fulton Schools of Engineering
School of Biological & Health Systems Engineering
Establishment of a graduate concentration
[MS in Robotics and Autonomous Systems \(Biomedical Engineering\)](#)

Best,

Sergio G. Quiros

Specialist Senior, Academic, and Student Affairs
Ira A. Fulton Schools of Engineering
Arizona State University
Tempe, AZ 85287-8109
Phone: 480/727-5770
Email: Sergio.Quiros@asu.edu

School of Electrical, Computer and Energy Engineering, Ira A. Fulton Schools of Engineering

From: [Stephen Phillips](#)
To: [Patrick Phelan \(Professor\)](#); [Lenore Dai](#); [Sandeep Gupta](#); [Ann McKenna](#)
Cc: [Sergio Quiros](#)
Subject: RE: Statement of support for a proposed biomedical engineering concentration for the MS in Robotics & Autonomous Systems
Date: Tuesday, April 28, 2020 12:42:04 PM

If this is just adding more concentrations to the existing structure then ECEE will support it.

From: Patrick Phelan (Professor) <phelan@asu.edu>
Sent: Tuesday, April 28, 2020 12:13 PM
To: Lenore Dai <Lenore.Dai@asu.edu>; Sandeep Gupta <Sandeep.Gupta@asu.edu>; Ann McKenna <Ann.McKenna@asu.edu>; Stephen Phillips <Stephen.Phillips@asu.edu>
Cc: Sergio Quiros <Sergio.Quiros@asu.edu>
Subject: Statement of support for a proposed biomedical engineering concentration for the MS in Robotics & Autonomous Systems

Lenore, Sandeep, Ann, & Steve:

We are proposing a new biomedical engineering (BME) concentration for the MS in Robotics & Autonomous Systems degree, to join the other 4 existing concentrations. We therefore need a statement of support from each of the impacted Schools:

SEMTE
SCIDSE
POLY
ECEE

If you approve, would you please respond to this email to indicate your support of this proposed BME concentration?

Thanks,
Pat

Patrick Phelan
[Arizona State University](#)
Professor, [Mechanical & Aerospace Engineering](#) &
[Professional Science Master's in Solar Energy Engineering & Commercialization](#)
Assistant Dean of [Graduate Programs, Ira A. Fulton Schools of Engineering](#)
Assistant Director, [ASU Industrial Assessment Center](#)
Section Editor-in-Chief, [Energies](#), Energy and Buildings
Senior Sustainability Scientist, [Global Institute of Sustainability](#)
Honors Faculty, [Barrett, The Honors College](#)
<http://faculty.engineering.asu.edu/pphelan/>

Mailing Address:

School for Engineering of Matter, Transport & Energy
501 E Tyler Mall ECG303
Tempe, AZ 85287-6106
Tel: (480)965-1625
Fax: (480)727-9321
phelan@asu.edu

Office Location: ERC 463 (Engineering Research Center)

School of Computing, Informatics, and Decision Systems Engineering, Ira A. Fulton Schools of Engineering

From: [Sandeep Gupta](#)
To: [Stephen Phillips](#); [Patrick Phelan \(Professor\)](#); [Lenore Dai](#); [Ann McKenna](#)
Cc: [Sergio Quiros](#); [Sandeep Gupta](#)
Subject: RE: Statement of support for a proposed biomedical engineering concentration for the MS in Robotics & Autonomous Systems
Date: Tuesday, April 28, 2020 12:43:20 PM

Dear Pat,

Fine with CIDSE as well.

Thanks!

Best,

-sg

From: Stephen Phillips <Stephen.Phillips@asu.edu>
Sent: Tuesday, April 28, 2020 12:42 PM
To: Patrick Phelan (Professor) <phelan@asu.edu>; Lenore Dai <Lenore.Dai@asu.edu>; Sandeep Gupta <Sandeep.Gupta@asu.edu>; Ann McKenna <Ann.McKenna@asu.edu>
Cc: Sergio Quiros <Sergio.Quiros@asu.edu>
Subject: RE: Statement of support for a proposed biomedical engineering concentration for the MS in Robotics & Autonomous Systems

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To: Lenore Dai <Lenore.Dai@asu.edu>; Sandeep Gupta <Sandeep.Gupta@asu.edu>; Ann McKenna <Ann.McKenna@asu.edu>; Stephen Phillips <Stephen.Phillips@asu.edu>
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SCIDSE
POLY
ECEE

If you approve, would you please respond to this email to indicate your support of this proposed BME concentration?

Thanks,
Pat

Patrick Phelan
[Arizona State University](#)
Professor, [Mechanical & Aerospace Engineering & Professional Science Master's in Solar Energy Engineering & Commercialization](#)
Assistant Dean of [Graduate Programs, Ira A. Fulton Schools of Engineering](#)
Assistant Director, [ASU Industrial Assessment Center](#)
Section Editor-in-Chief, [Energies](#), Energy and Buildings
Senior Sustainability Scientist, [Global Institute of Sustainability](#)
Honors Faculty, [Barrett, The Honors College](#)
<http://faculty.engineering.asu.edu/pphelan/>

Mailing Address:

School for Engineering of Matter, Transport & Energy
501 E Tyler Mall ECG303
Tempe, AZ 85287-6106
Tel: (480)965-1625
Fax: (480)727-9321
phelan@asu.edu

Office Location: ERC 463 (Engineering Research Center)

School for Engineering of Matter, Transport and Energy, Ira A. Fulton Schools of Engineering

From: [Lenore Dai](#)
To: [Patrick Phelan \(Professor\)](#); [Sandeep Gupta](#); [Ann McKenna](#); [Stephen Phillips](#)
Cc: [Sergio Quiros](#); [Marcus Herrmann](#); [Mia Kroeger](#)
Subject: RE: Statement of support for a proposed biomedical engineering concentration for the MS in Robotics & Autonomous Systems
Date: Tuesday, April 28, 2020 12:51:33 PM

Thanks, Pat and SEMTE will be supportive.

From: Patrick Phelan (Professor) <pwhelan@asu.edu>
Sent: Tuesday, April 28, 2020 12:13 PM
To: Lenore Dai <Lenore.Dai@asu.edu>; Sandeep Gupta <Sandeep.Gupta@asu.edu>; Ann McKenna <Ann.McKenna@asu.edu>; Stephen Phillips <Stephen.Phillips@asu.edu>
Cc: Sergio Quiros <Sergio.Quiros@asu.edu>
Subject: Statement of support for a proposed biomedical engineering concentration for the MS in Robotics & Autonomous Systems

Lenore, Sandeep, Ann, & Steve:

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SEMTE
SCIDSE
POLY
ECEE

If you approve, would you please respond to this email to indicate your support of this proposed BME concentration?

Thanks,
Pat

Patrick Phelan
[Arizona State University](#)
Professor, [Mechanical & Aerospace Engineering](#) &
[Professional Science Master's in Solar Energy Engineering & Commercialization](#)
Assistant Dean of [Graduate Programs, Ira A. Fulton Schools of Engineering](#)
Assistant Director, [ASU Industrial Assessment Center](#)
Section Editor-in-Chief, [Energies](#), Energy and Buildings
Senior Sustainability Scientist, [Global Institute of Sustainability](#)
Honors Faculty, [Barrett, The Honors College](#)
<http://faculty.engineering.asu.edu/pwhelan/>

The Polytechnic School, Ira A. Fulton Schools of Engineering

From: [Ann McKenna](#)
To: [Sandeep Gupta](#); [Stephen Phillips](#); [Patrick Phelan \(Professor\)](#); [Lenore Dai](#)
Cc: [Sergio Quiros](#)
Subject: Re: Statement of support for a proposed biomedical engineering concentration for the MS in Robotics & Autonomous Systems
Date: Tuesday, April 28, 2020 8:11:22 PM

Pat,
TPS supports the proposed BME concentration. We assume it will follow the same guidelines as the other concentration regarding two required MAE courses, etc. If there is a different approach please let us know.

Thanks,
Ann

From: Sandeep Gupta <Sandeep.Gupta@asu.edu>
Date: Tuesday, April 28, 2020 at 12:43 PM
To: Stephen Phillips <Stephen.Phillips@asu.edu>, "Patrick Phelan (Professor)" <phelan@asu.edu>, Lenore Dai <Lenore.Dai@asu.edu>, Ann McKenna <Ann.McKenna@asu.edu>
Cc: Sergio Quiros <Sergio.Quiros@asu.edu>, Sandeep Gupta <Sandeep.Gupta@asu.edu>
Subject: RE: Statement of support for a proposed biomedical engineering concentration for the MS in Robotics & Autonomous Systems

Dear Pat,

Fine with CIDSE as well.

Thanks!
Best,
-sg

From: Stephen Phillips <Stephen.Phillips@asu.edu>
Sent: Tuesday, April 28, 2020 12:42 PM
To: Patrick Phelan (Professor) <phelan@asu.edu>; Lenore Dai <Lenore.Dai@asu.edu>; Sandeep Gupta <Sandeep.Gupta@asu.edu>; Ann McKenna <Ann.McKenna@asu.edu>
Cc: Sergio Quiros <Sergio.Quiros@asu.edu>
Subject: RE: Statement of support for a proposed biomedical engineering concentration for the MS in Robotics & Autonomous Systems

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From: Patrick Phelan (Professor) <phelan@asu.edu>
Sent: Tuesday, April 28, 2020 12:13 PM
To: Lenore Dai <Lenore.Dai@asu.edu>; Sandeep Gupta <Sandeep.Gupta@asu.edu>; Ann McKenna <Ann.McKenna@asu.edu>; Stephen Phillips <Stephen.Phillips@asu.edu>

College of Health Solutions

From: [Deborah Helitzer \(Dean\)](#)
To: [Sergio Quiros](#)
Cc: [James Collofello](#); [Patrick Phelan \(Professor\)](#); [Jeremy Helm](#)
Subject: Re: Establishment of a graduate concentration - MS in Robotics and Autonomous Systems (Biomedical Engineering)
Date: Friday, April 17, 2020 11:24:00 AM
Attachments: [image001.png](#)

The College of Health Solutions sees no negative impact on our programs and we are delighted to support the development of your new degree.

Deborah

DEBORAH L. HELITZER, Sc.D.

Dean and Professor

College of Health Solutions

Arizona State University

Email: deborah.helitzer@asu.edu

Phone: 602.496.2511

For information or appointments, please contact Daniel Eckstrom (Daniel.Eckstrom@asu.edu)



From: Sergio Quiros <Sergio.Quiros@asu.edu>
Date: Friday, April 17, 2020 at 8:52 AM
To: "Deborah Helitzer (Dean)" <Deborah.Helitzer@asu.edu>
Cc: James Collofello <JAMES.COLLOFELLO@asu.edu>, "Patrick Phelan (Professor)" <phelan@asu.edu>, Jeremy Helm <JEREMY.HELM@asu.edu>
Subject: Establishment of a graduate concentration - MS in Robotics and Autonomous Systems (Biomedical Engineering)

Sent on behalf of Dr. James S. Collofello

Hello,

I am writing to request an impact/support letter (email will suffice) for our proposed [MS in Robotics and Autonomous Systems \(Biomedical Engineering\)](#). This degree program is offered by the School of Biological & Health Systems Engineering. Let me know if you have any questions or concerns.

jim

James S. Collofello

Vice Dean for Academic and Student Affairs

Professor of Computer Science and Engineering

School of Computing Informatics and Decision Systems Engineering

Ira A. Fulton Schools of Engineering

Arizona State University

Edson College of Nursing and Health Innovation

From: [Katherine Kenny](#)
To: [Sergio Quiros](#)
Cc: [James Collofello](#); [Jeremy Helm](#)
Subject: RE: MS in Robotics and Autonomous Systems (Biomedical Engineering)
Date: Monday, July 20, 2020 7:44:48 AM
Attachments: [image001.png](#)

Dear Sergio – thank you for requesting review of your proposal to add a new graduate concentration. There is a great need for individuals with this level of education and training in health and health organizations. This concentration addresses some of these needs.

On behalf of the Edson College of Nursing and Health Innovation we support your proposal and with you the best moving it forward through University approval processes.

Kathy

Katherine (Kathy) Kenny, DNP, RN, ANP-BC, FAANP, FAAN
Associate Dean of Academic Affairs
Clinical Professor



550 N. 3rd Street | Phoenix, AZ 85004
(P) 602-496-1719
(F) 602-496-0545
Katherine.kenny@asu.edu
<https://nursingandhealth.asu.edu/>

From: Sergio Quiros <Sergio.Quiros@asu.edu>
Sent: Thursday, July 16, 2020 13:15
To: Katherine Kenny <Katherine.Kenny@asu.edu>
Cc: James Collofello <JAMES.COLLOFELLO@asu.edu>; Jeremy Helm <JEREMY.HELM@asu.edu>
Subject: MS in Robotics and Autonomous Systems (Biomedical Engineering)

Sent on behalf of Dr. James S. Collofello

Hello,

I am writing to request an impact/support letter (email will suffice) for our proposed [MS in Robotics and Autonomous Systems \(Biomedical Engineering\)](#) concentration. This degree program is offered by the School of Biological & Health Systems Engineering. Please let me know if you have any questions or concerns.

jim

James S. Collofello
Vice Dean for Academic and Student Affairs
Professor of Computer Science and Engineering
School of Computing Informatics and Decision Systems Engineering
Ira A. Fulton Schools of Engineering
Arizona State University

The College of Liberal Arts and Sciences

From: Fabio Milner <milner@asu.edu>
Sent: Wednesday, September 23, 2020 1:32 PM
To: Sergio Quiros <Sergio.Quiros@asu.edu>; James Collofello <JAMES.COLLOFELLO@asu.edu>
Cc: Jeremy Helm <JEREMY.HELM@asu.edu>; Fabio Milner <milner@asu.edu>
Subject: Re: MS in Robotics and Autonomous Systems (Biomedical Engineering)

Dear Jim,

The College does not see any impact and supports this new program.

Best,

Fabio

Fabio Augusto Milner, PhD

Associate Dean of Graduate Initiatives

Assistant Director, SA Levin MCMS Center

[The College of Liberal Arts and Sciences](#)

Director of Mathematics for STEM Education

[School of Mathematical and Statistical Sciences](#)

[Arizona State University](#)

Armstrong Hall, Office 285

P: 480/965-5877 | F: 480/965-2110

milner@asu.edu

URL: <https://clas.asu.edu/content/fabio-milner>

From: Sergio Quiros <Sergio.Quiros@asu.edu>
Date: Thursday, July 16, 2020 at 13:12
To: Fabio Milner <milner@asu.edu>
Cc: Jeremy Helm <JEREMY.HELM@asu.edu>, James Collofello <JAMES.COLLOFELLO@asu.edu>
Subject: MS in Robotics and Autonomous Systems (Biomedical Engineering)
Resent-From: <milner@asu.edu>

Sent on behalf of Dr. James S. Collofello

Hello,

I am writing to request an impact/support letter (email will suffice) for our proposed [MS in Robotics and Autonomous Systems \(Biomedical Engineering\)](#) concentration. This degree program is offered by the School of Biological & Health Systems Engineering. Please let me know if you have any questions or concerns.

Jim

James S. Collofello
Vice Dean for Academic and Student Affairs
Professor of Computer Science and Engineering
School of Computing Informatics and Decision Systems Engineering

New College of Interdisciplinary Arts and Sciences

From: [Patricia Friedrich](#)
To: [Sergio Quiros](#)
Cc: [Jeremy Helm](#); [James Collofello](#)
Subject: Re: MS in Robotics and Autonomous Systems (Biomedical Engineering)
Date: Tuesday, July 21, 2020 11:49:48 PM
Attachments: [image001.png](#)

Thank you for your patience. New College foresees no impact on our programs.

Thanks again,

Patty

Patricia Friedrich, PhD
She, Her, Hers
Associate Dean of Academic Programs and Faculty Affairs,
New College of Interdisciplinary Arts and Sciences
Professor of Sociolinguistics,
School of Social and Behavioral Sciences



Arizona State University
P. O. Box 37100
4701 W. Thunderbird Rd. Mail Code 3051
Phoenix, AZ, USA 85069-7100
voice 602 543-6046

From: Sergio Quiros <Sergio.Quiros@asu.edu>
Date: Thursday, July 16, 2020 at 1:15 PM
To: Patricia Friedrich <Patricia.Friedrich@asu.edu>
Cc: Jeremy Helm <JEREMY.HELM@asu.edu>, James Collofello <JAMES.COLLOFELLO@asu.edu>
Subject: MS in Robotics and Autonomous Systems (Biomedical Engineering)

Sent on behalf of Dr. James S. Collofello

Hello,

I am writing to request an impact/support letter (email will suffice) for our proposed [MS in Robotics and Autonomous Systems \(Biomedical Engineering\)](#) concentration. This degree program is offered by the School of Biological & Health Systems Engineering. Please let me know if you have any questions or concerns.

jim

James S. Collofello
Vice Dean for Academic and Student Affairs
Professor of Computer Science and Engineering
School of Computing Informatics and Decision Systems Engineering
Ira A. Fulton Schools of Engineering
Arizona State University

College of Integrative Sciences and Arts

From: [Duane Roen \(Dean\)](#)
To: [Sergio Quiros](#)
Cc: [Jeremy Helm](#); [James Collofello](#)
Subject: RE: MS in Robotics and Autonomous Systems (Biomedical Engineering)
Date: Thursday, July 16, 2020 2:36:22 PM

Sergio, Jeremy, and Jim,

CISA is happy to support FSE's proposal for an MS in Robotics and Autonomous Systems (Biomedical Engineering)

Best,
Duane

Duane Roen
Vice Provost, Polytechnic campus
Dean, College of Integrative Sciences and Arts
Arizona State University
Mail Code: 2780
7271 E Sonoran Arroyo Mall
Mesa, AZ 85212-6415
P: 480-727-1415

From: Sergio Quiros
Sent: Thursday, July 16, 2020 1:16 PM
To: Duane Roen (Dean) <Duane.Roen@asu.edu>
Cc: Jeremy Helm <JEREMY.HELM@asu.edu>; James Collofello <JAMES.COLLOFELLO@asu.edu>
Subject: MS in Robotics and Autonomous Systems (Biomedical Engineering)

Sent on behalf of Dr. James S. Collofello

Hello,

I am writing to request an impact/support letter (email will suffice) for our proposed [MS in Robotics and Autonomous Systems \(Biomedical Engineering\)](#) concentration. This degree program is offered by the School of Biological & Health Systems Engineering. Please let me know if you have any questions or concerns.

jim

James S. Collofello
Vice Dean for Academic and Student Affairs
Professor of Computer Science and Engineering
School of Computing Informatics and Decision Systems Engineering
Ira A. Fulton Schools of Engineering
Arizona State University

College of Global Futures

(Now houses the *School of Sustainability* and *School for the Future of Innovation in Society*)

From: Christopher Boone
Sent: Monday, September 14, 2020 12:12 PM
To: Sergio Quiros <Sergio.Quiros@asu.edu>
Cc: Jeremy Helm <JEREMY.HELM@asu.edu>; James Collofello <JAMES.COLLOFELLO@asu.edu>; Amanda Morales-Calderon <AMANDA.MORALES-CALDERON@asu.edu>; Jason Bobis <jbobis@asu.edu>; Erin Froncek <Erin.Froncek@asu.edu>; Kimberly Fullerton <kim.fullerton@asu.edu>
Subject: RE: MS in Robotics and Autonomous Systems (Biomedical Engineering)

The College of Global Futures is happy to support the proposal for the MS in Robotics and Autonomous Systems.

Christopher Boone

Dean, College of Global Futures
Professor, School of Sustainability

<https://collegeofglobalfutures.asu.edu/>

PO Box 875502, Tempe, AZ 85287-5502

Executive Assistant: Lorraine.Protocollo@asu.edu

480-965-2236

The College of Global Futures embraces ASU's mission as being a comprehensive public research university, measured not by whom it excludes, but rather by whom it includes and how they succeed; advancing research and discovery of public value; and assuming fundamental responsibility for the economic, social, cultural and overall health of the communities it serves. We support and foster a culture of inclusiveness, tolerance, and respect that promotes equal opportunity and diversity among faculty, staff, and students and through our engagement with diverse communities within and beyond the University.

From: Sergio Quiros <Sergio.Quiros@asu.edu>
Sent: Monday, September 14, 2020 11:45 AM
To: Christopher Boone <Christopher.G.Boone@asu.edu>
Cc: Jeremy Helm <JEREMY.HELM@asu.edu>; James Collofello <JAMES.COLLOFELLO@asu.edu>; Amanda Morales-Calderon <AMANDA.MORALES-CALDERON@asu.edu>; Jason Bobis <jbobis@asu.edu>; Erin Froncek <Erin.Froncek@asu.edu>; Kimberly Fullerton <kim.fullerton@asu.edu>
Subject: RE: MS in Robotics and Autonomous Systems (Biomedical Engineering)

Hello Dr. Boone,

The Graduate College is requesting that we provide your statement of support for the [MS in Robotics and Autonomous Systems \(Biomedical Engineering\)](#) concentration before it can move forward in the university review process. An email response is sufficient. Please let me know if you have any questions or concerns.

Thank you,

Sergio Quiros
Specialist Senior, Academic and Student Affairs
Ira A. Fulton Schools of Engineering
Arizona State University

Tempe, AZ 85287-8109
Phone: 480/727-5770
Email: Sergio.Quiros@asu.edu

From: Sergio Quiros
Sent: Thursday, July 16, 2020 1:16 PM
To: Christopher Boone <Christopher.G.Boone@asu.edu>
Cc: Jeremy Helm <JEREMY.HELM@asu.edu>; James Collofello <JAMES.COLLOFELLO@asu.edu>
Subject: MS in Robotics and Autonomous Systems (Biomedical Engineering)

Sent on behalf of Dr. James S. Collofello

Hello,

I am writing to request an impact/support letter (email will suffice) for our proposed [MS in Robotics and Autonomous Systems \(Biomedical Engineering\)](#) concentration. This degree program is offered by the School of Biological & Health Systems Engineering. Please let me know if you have any questions or concerns.

jim

James S. Collofello
Vice Dean for Academic and Student Affairs
Professor of Computer Science and Engineering
School of Computing Informatics and Decision Systems Engineering
Ira A. Fulton Schools of Engineering
Arizona State University

Watts College of Public Service and Community Solutions



July 18, 2020

James S. Collofello
Vice Dean for Academic and Student Affairs
Ira A. Fulton Schools of Engineering
Arizona State University

Dear James,

The Watts College of Public Service and Community Solutions is supportive of the proposed MS degree in Robotics and Autonomous Systems. Please let me know if there is anything further you need at this stage.

A handwritten signature in black ink, appearing to read "W. Terrill".

William Terrill, PhD
Associate Dean
Watts College of Public Service and Community Solutions
Arizona State University

Office of the Dean
Mail code 3520, 411 N. Central Ave., Suite 750, Phoenix, AZ 85004-2163
(602) 496-0600 FAX (602) 496-0955
publicservice.asu.edu

Thunderbird School of Global Management

From: [Lena Booth](#)
To: [Sergio Quiros](#)
Cc: [James Collofello](#); [Jeremy Helm](#)
Subject: Re: MS in Robotics and Autonomous Systems (Biomedical Engineering)
Date: Thursday, July 23, 2020 2:11:28 PM
Attachments: [image002.png](#)

Hi Sergio,

Thunderbird is happy to support the proposed MS in Robotics and Autonomous Systems - Biomedical Engineering concentration. We wish you all the success in this new program.

Lena

Lena C. Booth, Ph.D. | Associate Dean of Academic Programs and Finance Professor | Thunderbird School of Global Management | 400 E Van Buren, Suite 800 | Phoenix, AZ 85004 | Phone: 602-496-7061 | Email: lena.booth@thunderbird.asu.edu | Website: <http://www.thunderbird.edu>

> [Apply today](#) > [Refer a Future Thunderbird](#) |

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Times Higher Education/Wall Street Journal 2019



Thunderbird is a unit of the Arizona State University Enterprise

From: Sergio Quiros <Sergio.Quiros@asu.edu>
Date: Thursday, July 16, 2020 at 1:13 PM
To: Lena Booth <Lena.Booth@thunderbird.asu.edu>
Cc: James Collofello <JAMES.COLLOFELLO@asu.edu>, Jeremy Helm <JEREMY.HELM@asu.edu>
Subject: MS in Robotics and Autonomous Systems (Biomedical Engineering)

Sent on behalf of Dr. James S. Collofello

Hello,

I am writing to request an impact/support letter (email will suffice) for our proposed [MS in Robotics and Autonomous Systems \(Biomedical Engineering\)](#) concentration. This degree program is offered by the School of Biological & Health Systems Engineering. Please let me know if you have any questions or concerns.

jim

James S. Collofello

Vice Dean for Academic and Student Affairs

Professor of Computer Science and Engineering

School of Computing Informatics and Decision Systems Engineering

W. P. Carey School of Business

From: [Amy Hillman \(DEAN\)](#)
To: [Sergio Quiros](#)
Cc: [Jeremy Helm](#); [James Collofello](#)
Subject: Re: MS in Robotics and Autonomous Systems (Biomedical Engineering)
Date: Thursday, July 23, 2020 1:49:13 PM
Attachments: [image001.png](#)

Hi,

W. P. Carey has no objections and happy to help in any way we can for the new MS in Robotics and Autonomous Systems (Biomedical Engineering).

Amy

Amy Hillman, PhD
Dean
Charles J. Robel Dean's Chair
W. P. Carey School of Business
amy.hillman@asu.edu | Ph: 480.965.3402



Where Business Is Personal®

From: Sergio Quiros <Sergio.Quiros@asu.edu>
Date: Thursday, July 16, 2020 at 1:16 PM
To: Amy Hillman <AMY.HILLMAN@asu.edu>
Cc: Jeremy Helm <JEREMY.HELM@asu.edu>, James Collofello <JAMES.COLLOFELLO@asu.edu>
Subject: MS in Robotics and Autonomous Systems (Biomedical Engineering)

Sent on behalf of Dr. James S. Collofello

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jim

James S. Collofello

Vice Dean for Academic and Student Affairs

Professor of Computer Science and Engineering

School of Computing Informatics and Decision Systems Engineering

Ira A. Fulton Schools of Engineering

Mary Lou Fulton Teachers College

From: [Carole Basile \(Dean\)](#)
To: [Sergio Quiros](#)
Cc: [Jeremy Helm](#); [James Collofello](#)
Subject: Re: MS in Robotics and Autonomous Systems (Biomedical Engineering)
Date: Thursday, July 16, 2020 1:33:15 PM

MLFTC has no concerns and is in full support. We wish you the best in pursuing this new program.

cb

Carole G. Basile
Dean
Arizona State University
Mary Lou Fulton Teachers College
[P.O. Box 871811, Tempe, AZ 85281-1811](#)

O: [480.965.3463](tel:480.965.3463) | M: [480.310.6887](tel:480.310.6887)

On Jul 16, 2020, at 3:17 PM, Sergio Quiros <Sergio.Quiros@asu.edu> wrote:

Sent on behalf of Dr. James S. Collofello

Hello,

I am writing to request an impact/support letter (email will suffice) for our proposed [MS in Robotics and Autonomous Systems \(Biomedical Engineering\)](#) concentration. This degree program is offered by the School of Biological & Health Systems Engineering. Please let me know if you have any questions or concerns.

jim

James S. Collofello
Vice Dean for Academic and Student Affairs
Professor of Computer Science and Engineering
School of Computing Informatics and Decision Systems Engineering
Ira A. Fulton Schools of Engineering
Arizona State University

Sandra Day O'Connor College of Law

From: [Tamara Herrera](#)
To: [Sergio Quiros](#)
Cc: [Jeremy Helm](#); [James Collofello](#)
Subject: Re: MS in Robotics and Autonomous Systems (Biomedical Engineering)
Date: Monday, July 20, 2020 8:34:01 AM

Good morning,

The College of Law has reviewed the linked proposal for an MS concentration and supports this proposal.

Please let us know if you need anything additional.

Tamara

Tamara Herrera
Associate Dean of Faculty Development
Clinical Professor of Law
Sandra Day O'Connor College of Law
Arizona State University
111 E. Taylor Street
Phoenix, Arizona 85004-4467
tamara.herrera@asu.edu
480-727-7194

From: Sergio Quiros <Sergio.Quiros@asu.edu>
Sent: Thursday, July 16, 2020 1:16 PM
To: Tamara Herrera <Tamara.Herrera@asu.edu>
Cc: Jeremy Helm <JEREMY.HELM@asu.edu>; James Collofello <JAMES.COLLOFELLO@asu.edu>
Subject: MS in Robotics and Autonomous Systems (Biomedical Engineering)

Sent on behalf of Dr. James S. Collofello

Hello,

I am writing to request an impact/support letter (email will suffice) for our proposed [MS in Robotics and Autonomous Systems \(Biomedical Engineering\)](#) concentration. This degree program is offered by the School of Biological & Health Systems Engineering. Please let me know if you have any questions or concerns.

jim

James S. Collofello
Vice Dean for Academic and Student Affairs
Professor of Computer Science and Engineering
School of Computing Informatics and Decision Systems Engineering
Ira A. Fulton Schools of Engineering

Herberger Institute for Design and the Arts

From: [Stephani Etheridge Woodson](#)
To: [Sergio Quiros](#)
Subject: Re: MS in Robotics and Autonomous Systems (Biomedical Engineering)
Date: Tuesday, July 28, 2020 2:18:14 PM
Attachments: [image001.png](#)

Hello, we have consulted with our School of Arts, Media and Engineering and they find that your proposed MS degree in Robotics and Autonomous Systems does not impact any of our degree programs current or imagined. Your proposed degree sounds very interesting and we wish you the best.

with appreciation, Stephani

Stephani Etheridge Woodson
Interim Associate Dean of Students
Herberger Institute for Design and the Arts
The FDT Evelyn Smith Professor | School of Music, Dance and Theatre
Director, Design and Arts Corps | herbergerinstitute.asu.edu/design-and-arts-corps
She/Her/Hers



COVID-19 Resources for Students

From: Sergio Quiros <Sergio.Quiros@asu.edu>
Date: Thursday, July 16, 2020 at 1:17 PM
To: Stephani Etheridge Woodson <swoodson@asu.edu>
Cc: Jeremy Helm <JEREMY.HELM@asu.edu>, James Collofello <JAMES.COLLOFELLO@asu.edu>
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James S. Collofello
Vice Dean for Academic and Student Affairs
Professor of Computer Science and Engineering
School of Computing Informatics and Decision Systems Engineering
Ira A. Fulton Schools of Engineering
Arizona State University

(NEW GRADUATE INITIATIVES)

PROPOSAL PROCEDURES CHECKLIST

Academic units should adhere to the following procedures when requesting new curricular initiatives (degrees, concentrations or certificates).

Obtain the required approval from the Office of the Provost to move the initiative forward for internal ASU governance reviews/approvals. Please see the academic strategic plan website at: <https://provost.asu.edu/curriculum-development>.

Submit any new courses that will be required for the new curricular program to the Curriculum ChangeMaker online course approval system for review and approval.

- Additional information can be found at the Provost's Office Curriculum Development website: [Courses link](#)
- For questions regarding proposing new courses, send an email to: courses@asu.edu

Prepare the applicable proposal template and operational appendix for the proposed initiative.

Obtain letters or memos of support or collaboration (if applicable).

- When resources (faculty or courses) from another academic unit will be utilized
- When other academic units may be impacted by the proposed program request
- if the program will have an online delivery option support will be required from the Provost's office and ASU Online. *(Please complete the ASU Online Offering form in Curriculum ChangeMaker to begin this request.)*

Obtain the internal reviews/approvals of the academic unit.

- Internal faculty governance review committee(s)
- academic unit head (e.g. Department Chair or School Director)
- academic unit Dean (will submit approved proposal to the curriculumplanning@asu.edu email account for further ASU internal governance reviews (as applicable, University Graduate Council, CAPC and Senate)

Additional Recommendations

All new graduate programs require specific processes and procedures to maintain a successful degree program. Below are items that the Graduate College strongly recommends that academic units establish after the program is approved for implementation.

Establish satisfactory academic progress policies, processes and guidelines – Check within the proposing academic unit and/or college to see if there are existing academic progress policies and processes in place. If none have been established, please go to http://graduate.asu.edu/faculty_staff/policies and scroll down to the **academic progress review and remediation processes** (for faculty and staff) section to locate the reference tool and samples for establishing these procedures.

Establish a Graduate Student Handbook for the new degree program – Students need to know the specific requirements and milestones they must meet throughout their degree program. A Graduate Student Handbook provided to students when they are admitted to the degree program and published on the website for the new degree gives students this information. Include in the handbook the unit/college satisfactory academic progress policies, current degree program requirements (outlined in the approved proposal) and provide a link to the Graduate Policies and Procedures website. Please go to http://graduate.asu.edu/faculty_staff/policies to access Graduate Policies and Procedures.