ESTABLISHING GRADUATE CERTIFICATES
ARIZONA STATE UNIVERSITY
GRADUATE EDUCATION

This form should be used by programs seeking to establish a new graduate certificate. All sections should be completed.

The graduate certificate is a programmatic or linked series of courses in a single field or in one that crosses disciplinary boundaries. The graduate certificate facilitates professional growth for people who already hold the baccalaureate degree, and it may be freestanding or linked to a degree program. The graduate certificate enables the university to respond to societal needs while promoting university cooperation with corporate, industrial, and professional communities.

Submit the completed and signed (chairs, unit deans) proposal to the **Office of Graduate Academic Programs** in Graduate Education. Mail code: 1003 and electronic copies to eric.wertheimer@asu.edu or amanda.morales-calderon@asu.edu.

Please type.

Contact Name(s): Andreas Spanias	**Contact Phone(s):** 480-965-1837
College: Ira A. Fulton Schools of Engineering (IAFSE)	
Department/School: School of Electrical, Computer and Energy Engineering (ECEE)	
Name of proposed Certificate: Sensor Signal and Information Processing	
Requested Effective Term and Year: Spring 2016 (*e.g. Fall 2014*)	
Do Not Fill in this information: Office Use Only **CIP Code:**	

1. OVERVIEW. Below, please provide a brief overview of the certificate, including the rationale and need for the program, potential size and nature of the target audience, information on comparable programs (at ASU and/or peer institutions), how this program would relate to existing programs at ASU, and any additional appropriate information.

Sensors and signal processing algorithms are now embedded in billions of mobile devices and have been deployed for several applications including health, security, sustainability and integrated media. The use of integrated sensing in tablets and mobile phones is in fact a *game changer* for several application areas. The Sensor Signal and Information Processing (SenSIP) center and the signal processing and communications (SPCOM) group in ECEE have taken the lead in establishing large programs, industry consortia and intellectual property in the area of signal processing for sensing systems. Although we have taken important steps such as establishing our federal research project portfolio and funded industry collaborations through our NSF SenSIP industry-university collaborative research center (I/UCRC) site, an equally important graduate education certificate is needed to support industry training and workforce creation in this area. The Sensor Signal and Information Processing (SENSIP) graduate certificate is proposed to address this need and enable the Ira A. Fulton Schools of Engineering (IAFSE) to provide certified training in this area.

In the valley alone, Freescale, Intel, and Honeywell are very active in sensor development and deployment and have training needs in improving the fidelity of inexpensive sensors using advanced signal processing algorithms. For example, Freescale, a member of SenSIP, develops inexpensive sensors for several automotive and hard drive applications which are integrated with Kalman type methods to improve detection accuracy. Intel, another member of SenSIP, develops sensors and embedded processors for health monitoring and activity modeling. General Dynamics, Boeing and other companies also have continuous training needs in these areas. Most or all of these companies have i-course MSE in Electrical Engineering students in ECEE through the Global Outreach and Extended Education (GOEE) program who are taking courses from the SPCOM area in ECEE at the Tempe campus. For example, ECEE has two dedicated SPCOM i-courses (EEE 509 DSP Algorithms and Software and EEE 510 Multimedia Signal Processing) that are offered through GOEE and several Tempe campus graduate courses that are also often offered as i-courses, namely, EEE 404, EEE455, EEE 407, EEE 505, EEE 554, EEE 556, EEE 591, EEE 606, EEE 581, and EEE 598. One new elective i-course (EEE 598 - Sensor Systems; Algorithms and Applications) will also be established to support further this training certificate and will be offered at the Tempe campus through GOEE.

The proposed *Sensor signal and information processing* (SENSIP) graduate certificate will be within the IAFSE with the goal to offer opportunities for focused study of signal processing and systems algorithms for sensor related applications. Certificate participants will be able to take both i-courses through GOEE and Tempe campus courses. The rationale for a professional SENSIP certificate is multifold: a) a master's degree is not needed to position an individual to work in the sensor industry, b) the certificate will enable students or professionals to have certified specialization in this area, c) the certificate will enable engineers in industry having somewhat dated degrees to retrain and position themselves to be redeployed in higher paying jobs, d) the certificate will support the creation of a specialized post-baccalaureate workforce in an area of state and national economic importance .

Additional reasons and byproducts of such a program are: a) offering a certificate option with i-courses through GOEE will bring in more students from a nationwide or even worldwide pool (GOEE has large global relations with Vietnam and SenSIP has MOUs signed with Tech de Monterrey (ITESM), University of Cyprus (UCy), Imperial College, and University of British Columbia (UBC) as part of our NSF I/UCRC research activities), b) a certificate will boost ECEE's class enrollment and SenSIP's industry engagement and it will provide additional compelling reasons for attracting I/UCRC members to support graduate research, and c) it will enable us to enrich training activities planned with our minority institution partners Prairie View A&M (PVAMU) and Florida International University in our NSF Phase 3 Education and NSF traineeship grant collaborations.

2. ADMINISTRATION AND RESOURCES

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

The certificate program director will be Dr. Andreas Spanias who is Professor and center director and PI of an I/UCRC site. He holds a Ph.D. in Electrical and Computer Engineering; he is a Fellow of IEEE and a Senior Sustainability Scientist.

The program will be coordinated through Dr. Joseph Palais, Graduate Program Chair for ECEE, and Dr. Lauren Levin, Assistant Director, Academic Services in ECEE.

The coordinators will report to the ECEE school director. Courses will be overseen by ECEE appropriate committees.

The ECEE advising office will coordinate the admissions process. A recommendation for admission will be first made by the certificate director after evaluation by the certificate faculty listed later. An approval will be sought from the Graduate program chair and entered in the system of Graduate Education. Student advisement will be handled by dedicated graduate academic advisors with oversight from our SENSIP certificate faculty. Retention will be monitored and documented by the certificate faculty and the graduate academic advising staff.

The program will maintain files for every enrolled student and monitor their academic performance. ECEE standards will be applied at all levels.

B. What are the resource implications for the proposed certificate, including projected budget needs?

Will new books, library holdings, equipment, laboratory space and/or personnel be required now or in the future? If multiple units/programs will collaborate in offering this certificate, 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 certificate program.

We do not anticipate any additional budget needs other than minor logistics which can be handled by overheads derived from our I/UCRC. A certificate fee is not planned for now but we may consider establishing a small enrollment fee if non-anticipated budgetary needs emerge after we establish and run the certificate.

We do not anticipate heavy use of administrative staff actions.
We have enough faculty to cover the courses which are scheduled regularly. Note that all SENSIP required courses are offered as i-courses by GOEE and nearly all electives also have i-course versions at the Tempe campus.

Sufficient library holdings, space and equipment currently exist.

3. ADMISSIONS PROCEDURES AND CRITERIA

A. Admission criteria – Applicants must meet the admissions criteria for Graduate Education. Please also include any other additional admission requirements, e.g. type of undergraduate degree, minimum GPA, tests and/or entry-level skills that are required for this certificate program. (http://graduate.asu.edu/sites/default/files/GraduatePolicies_1.pdf)

All certificate applicants will be required to apply using the online graduate application which will require official transcripts and a statement of purpose. Regular admission will be granted for applicants that have at least 3.0 (or equivalent) GPA (scale of 4) and are competitive in the applicant pool. All prerequisites to the SENSIP required courses must be in place (EEE 203 and EEE 350 or signals and systems and random signals course equivalents from other universities).

Degree(s): Applicants who hold a Bachelor's degree in engineering or science discipline such as Physics, Mathematics, and Computer Science from an accredited institution can apply to the program.

GPA: Minimum of a 3.00 cumulative GPA (scale is 4.0=A) in the last 60 hours of a student's first bachelor's degree program. Minimum of 3.00 cumulative GPA (scale is 4.0 = A) in the applicable Master's degree.

English Proficiency Requirement for International Applicants: (See Graduate Education policies and procedures) (**http://graduate.asu.edu/admissions/international/english_proficiency**):

Same as Graduate Education policy

Required Admission Examinations: ☐GRE ☐GMAT ☐Millers Analogies ☒ None required

B. Application Review Terms

Indicate all terms for which applications for admissions are accepted and the corresponding application deadline dates, if any:

☒ Fall Deadline (month/year): March 2016

☒ Spring Deadline (month/year): October 2015

- Applications will be open every fall/spring semesters after that.

C. Projected annual admission/enrollment. *How many students will be admitted immediately following final approval of the certificate? What are enrollment projections for the next three years?*

We anticipate starting with 10 participants and by the third year having 25-30 students enrolled.

4. ACADEMIC REQUIREMENTS

A. Minimum credit hours required for certificate (15 credit hour minimum)

Participants will be required to complete 18 credits mostly from EEE 5XX graduate courses (see list). However, only two EEE 591 courses will be allowed in the certificate plan of study as elective coursework.

B. Please describe the primary course delivery mode, (e.g., online, face-to-face, off-site etc.). *Please note: If this proposed initiative will be offered completely online, clearly state that in this section.*

This proposal is not for an online certificate. However, the course delivery mechanisms will be i-courses offered through GOEE at the Tempe campus and campus (face to face) course enrollment at the Tempe campus.

C. As applicable, please describe culminating experience required (e.g., internship, project, research paper, capstone course, etc.)

There will be no culminating experience.

D. What knowledge, competencies, and skills (learning outcomes) should graduates have when they complete this proposed certificate program? *Examples of program learning outcomes can be found at (https://uoeee.asu.edu/program-outcomes).*

After completion of the certificate the students will possess following competencies:

1. Signal Processing Fundamentals
   a) Students will acquire skills aiding in in-depth analysis of linear filters and their design.
   b) Students are able handle data with noise and perform various estimation steps.
2. Sensor Feature Extraction and Pattern Recognition Algorithms
   a) Students are able to use standard pattern recognition and detection and estimation algorithms and apply them on sensor data to detect and classify events of interest.
   b) Students can apply signal processing and spectral estimation algorithms to analyze data.
3. Sensor Signal processing and Real-Time DSP System Design
   a) Students learn MATLAB and C implementation of signal processing algorithms.
   b) Students will learn about interdisciplinary applications of sensor systems.

E. Will students be assessed and evaluated in achieving the knowledge, competencies, and skills outlined in 4.D. above? *Examples of assessment methods can be found at (http://www.asu.edu/oue/assessment.html).*

Students will be evaluated by successful completion of all certificate courses in the SENSIP Plan of study including homework, exams, and class report evaluation (when applicable).

More specifically,

1. Signal Processing Fundamentals

   Students will demonstrate competency in filter design and spectral estimation by completing successfully computer exercises and tests assigned in core course EEE 509. Students must complete the course achieving a final grade of B or higher.

2. Sensor Feature Extraction and Pattern Recognition Algorithms

   Students will demonstrate knowledge in calculating signal parameters that can be used as features for classification. Students must complete successfully all projects and tests in core courses EEE 554 and EEE 556 and earn a grade of B or higher.

3. Sensor signal processing and Real-Time DSP System Design

   Students will demonstrate knowledge in real-time programming of signal and array processing algorithms by completing successfully all computer assignments in core courses EEE 509 and EEE 510. Students must earn a B or higher in these courses. Basic knowledge on Interdisciplinary applications will be gained through elective courses which students must complete with a grade of B or higher.

F. Please state the satisfactory student academic progress standards and guidelines (including any time limits for completion).

The certificate must be completed in at most 5 years with 3 or more credits taken every academic year. We have 5 years so that students may elect to pursue a Masters degree in parallel. Students must maintain a 3.0 cumulative, graduate and iPOS GPA average.

G. Will this proposed certificate program allow sharing of credit hours from another ASU degree program to be used as part of this certificate program? *(Please note that a maximum of 12 graduate-level credit hours taken as a non-degree student at ASU, including as a part of a certificate program, may be used towards a future graduate degree at ASU).*

The objective of the certificate will be to provide training opportunities to students from a variety of backgrounds in science and engineering and simultaneously provide opportunities to further education to participants through a master's degree. Students from this program may use credits from this certificate towards a master's program subject to Graduate Education policies and school and advisor approvals.

H. Below, please list all required and elective courses in the appropriate boxes (you may attach additional pages if necessary).

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

Please note: a minimum of 2/3 of the courses required for a graduate certificate must be at the EEE 500-level or above *on the student's iPOS*.

Required Courses			**Credit Hours**
(Prefix & Number)	*(Course Title)*	*(New Course?) Yes or No?*	**(Insert Section Sub-total)** **12**
EEE 509 OR EEE 407	DSP Algorithms and Software Digital Signal Processing	N	3
EEE 554	Random Signal Theory	N	3
EEE 510	Multimedia Signal Processing	N	3
EEE 556 OR EEE 606	Detection and Estimation Theory Adaptive Signal Processing	N	3
Electives (Students choose two courses for a total of 6 credit hours. There may be an instance where students have an excess of 1 credit hour if they take EEE 508 as an elective course.			**Credit Hours** **(Insert Section Sub-total)** **6**

(Prefix & Number)	*(Course Title*	*(New Course?) Y or N?*	
EEE 591	Topic: Communication Systems	N	4
EEE 591	Topic: Communication Networks	N	3
EEE 505	Time Frequency Signal Processing	N	3
EEE506	Digital Spectral Analysis	N	3
EEE 508	Digital Image and Video Processing and Compression	N	4
EEE 511	Artificial Neural Computation	N	3
EEE 552	Digital Communications	N	3
EEE 606	Adaptive Signal Processing	N	3
EEE 557	Broadband Networks	N	3
EEE 581	Filtering of Stochastic Processes	N	3
EEE 589	Linear Algebra and Convex Optimization	N	3
BMI 501	Introduction to Biomedical Informatics	N	3
CSE 575	Statistical Machine Learning	N	3
EEE591	Topic: Real-time DSP Systems	N	4
EEE 598	Topic: Sensor Systems; Algorithms and Applications	Y	3
BME 598	Topic: Biomedical Signal Processing	N	3
EEE 598	Topic: Theory and Algorithms for Big Data Analytics	N	3
Culminating Experience (if applicable)			**Credit Hours (Insert Section Sub-total)**
N/A			
Total credit hours			**18**

5. PRIMARY FACULTY PARTICIPANTS - Please list all primary faculty participants for the proposed certificate, including home unit and title. You may attach additional pages if necessary.

Name	Home Unit	Title
Andreas Spanias	Electrical Computer and Energy Engineering	Professor and Center Director
Pavan Turaga	Electrical Computer and Energy Engineering / Arts Media and Engineering	Assistant Professor
Cihan Tepedelenlioglu	Electrical Computer and Energy Engineering	Associate. Professor
Visar Berisha	Electrical Computer and Energy Engineering / Speech and Hearing Science	Assistant Professor
Brian Mears	Electrical Computer and Energy Engineering	Research Professor
David Frakes	Electrical Computer and Energy Engineering / School of Biological and Health Systems Engineering	Associate Professor

6. REQUIRED SUPPORTING DOCUMENTS
(Please label accordingly, i.e., Appendix or Attachment A, B, etc.)

Please include the following with your proposal:

A. Sample plans of study for students in the proposed program (See Appendix II)

B. Statements of support from all deans and heads of impacted academic units (See Appendix IV)

7. APPROVALS - If the proposal submission involves multiple units, please include letters of support from those units.

DEPARTMENT CHAIR or SCHOOL DIRECTOR (PRINT/TYPE)	
STEPHEN M. PHILLIPS	
SIGNATURE	DATE 2-11-15

DEAN (PRINT/TYPE)	
James S Collofello	
SIGNATURE	DATE 2-2-15

The following section will be completed by Graduate Education following the recommendations of faculty governance bodies.

VICE PROVOST FOR GRADUATE EDUCATION	
SIGNATURE	**DATE**

Please note: Proposals for new certificates also require the review and recommendation of approval from the University Graduate Council, Curriculum and Academic Programs Committee (CAPC), the Academic Senate, 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.

GF1112G-89

APPENDIX I

OPERATIONAL INFORMATION FOR GRADUATE CERTIFICATES

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

1. **Provide a brief** (catalog type - no more than 150 words) **program description.**

The Sensor Signal and Information Processing graduate certificate provides background and training in processing and interpreting signals acquired from sensors. The focus is on knowledge and skill building in several sensor network applications. The certificate is a professional graduate program. The area of sensor information extraction and interpretation is an enabler for several applications including health, sustainability, media, communications, defense, and security. The program will integrate courses on algorithms for sensor information processing. The certificate may be completed with on-campus coursework and i-courses. Course topics include digital signal processing, detection and estimation, sensor systems, big data, and machine learning.

Breakdown of requirements for the academic catalog:

Core (12)

Electives (6)

Total hours required for the program (18)

2. **Contact and Support Information:**

Office Location (Building & Room): GWC 411F	**Campus mail code:** 5706
Campus Telephone Number: 480-965-1837	**Program Director (Name):** Andreas Spanias
Program email address: ASKEE@ASU.EDU	**Program Support Staff (Name):** Lauren Levin, ECEE
Program website address: http://ecee.engineering.asu.edu/	**Admissions Contact (Name):** Joseph Palais, ECEE

3. **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	ADMSN	POS
Andreas Spanias	Yes	Yes
Joseph Palais	Yes	Yes
Lauren Levin	Yes	Yes
Esther Korner	Yes	Yes

4. Campus(es) where program will be offered:

☐	Downtown	☒	**Tempe**
	Online	☐	West
☐	Polytechnic		

Note: The i-courses will be delivered in collaboration with the office of Global Outreach & Extended Education in the Fulton Schools of Engineering Dean's Office at the Tempe campus.

5. Keywords: (List all keywords that could be used to search for this program. Keywords should be specific to the proposed program.)

Digital signal processing, sensor networks, Communication networks

6. Area(s) of Interest:

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

- ☐ Architecture & Construction Architecture & Construction Architecture & Construction Construction Architecture & Construction
- ☐ Arts
- ☐ Business
- ☐ Communications & Media
- ☐ Education & Teaching
- ☒ Engineering & Technology
- ☐
- ☐ Entrepreneurship
- ☐ Health & Wellness
- ☐ Humanities
- ☐ Interdisciplinary Studies
- ☐ Law & Justice
- ☐ Mathematics
- ☐ Psychology
- ☐ STEM
- ☐ Science
- ☐ Social and Behavioral Sciences
- ☐ Sustainability

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

- ☐ Architecture & Construction Architecture & Construction Architecture & Construction Construction Architecture & Construction
- ☐ Arts
- ☐ Business
- ☐ Communications & Media
- ☐ Education & Teaching
- ☐ Engineering & Technology
- ☐ Entrepreneurship
- ☐ Health & Wellness
- ☐ Humanities
- ☐ Interdisciplinary Studies
- ☐ Law & Justice
- ☐ Mathematics
- ☐ Psychology
- ☐ STEM
- ☒ Science
- ☐ Social and Behavioral Sciences
- ☐ Sustainability

APPENDIX II

SAMPLE PLANS OF STUDY

SAMPLE 1

EEE 509	DSP Algorithms and Software	**3**	**Fall**
EEE 554	Random Signal Theory	**3**	**Fall**
EEE 606	Adaptive Signal Processing	**3**	**Spring**
EEE 510	Multimedia Signal Processing	**3**	**Fall**
EEE 556	Detection and Estimation	**3**	**Spring**
CSE 575	Statistical Machine Learning	**3**	**Spring**
	Total Credits	**18**	

[+]Only two EEE591 courses can be in a plan of study for SENSIP as elective coursework.

SAMPLE 2

EEE 509	DSP Algorithms and Software	**3**	**Fall**
EEE 554	Random Signal Theory	**3**	**Fall**
EEE 556	Detection and Estimation Theory	**3**	**Spring**
EEE 510	Multimedia Signal Processing	**3**	**Spring**
BME 598	Biomedical Signal Processing	**3**	**Fall**
BMI 501	Introduction to Biomedical Informatics	**3**	**Spring**
	Total Credits	**18**	

[+]Only two EEE 591 courses can be in a plan of study for SENSIP as elective coursework.

APPENDIX III

CORE COURSE DESCRIPTIONS

Core Course	Course Catalog Description	Texts and Pre-reqs
EEE 407 Digital Signal Processing (DSP)	The purpose of this course is to introduce senior students to the principles and applications of Digital Signal Processing. Topics: Difference equations, Digital Filters, FIR and IIR Digital Filter Design, impulse invariant methods, the bilinear transform, frequency-domain analysis, dft, fft, deterministic and random sequences, stationary and ergodic sequences, the mean and the autocorrelation.	Prerequisites: EEE 203 or equivalent. Texts: Oppenheim and Schafer, "Discrete-time Signal Processing", 3rd Ed, Prentice Hall, 2009
EEE 509 DSP Algorithms and Software Online only	Introduction to DSP, Use of MATLAB in DSP, Design of FIR and IIR digital filters using MATLAB, The z transform and its properties, MATLAB programming and code examples for Butterworth, Chebychev, and Elliptic Filter, Spectral Estimation using the FFT, MATLAB & J-DSP code examples of the FFT, Stationary and Ergodic Signals, The power spectrum, Adaptive Filters, Adaptive noise cancellation, speech processing applications with MATLAB, Speech and audio coding.	Prerequisites: EEE 203 or equivalent. Texts: Signal Processing, A Computer-Based Approach, Sanjit K. Mitra, 2001 3rd Edition, McGraw-Hill
EEE 510 Multimedia Signal Processing	DSP review, sensory audio data, Speech and audiocoding algorithms, PCM/QADPCM, sub-band/transform coding algorithms, open and close loop LPC coders, MPEG audio and video algorithms, audio sensor arrays and coding.	Prerequisites: EEE 509 or equivalent. Painter and Atti, Audio Signal Processing and Coding, Wiley 2007.
EEE 556 Detection and Estimation Theory	Monte Carlo simulations, Neyman-Pearson theorem, Detection of deterministic and random signals in noise, bias, variance, Cramer-Rao bound, Bayesian estimation, applications including biomedicine, sensors, communications, radar, and sonar.	Prerequisites: EEE 554 or equivalent in Random Signal Theory. S. M. Kay, Fundamentals of Statistical Signal Processing, Volume 2: Detection Theory. Prentice Hall, 1998.
EEE 554 Random Signal Theory	Review of probability theory: Axioms of probability, experiments, outcomes, events, conditional probability and independence. , Continuous and discrete distribution and density functions, mean, variance, moments, characteristic functions, joint distributions, joint moments and characteristic functions, conditional distributions, Stochastic processes, white noise, Gaussian random processes, stationary processes, power spectrum, Markov chains.	Prerequisites: EEE 350 or equivalent. S. Kay, Intuitive Probability and Random Processes using MATLAB, Springer 2005.
EEE 606 Adaptive Signal Processing	Adaptive linear combiner, Mean square error, Wiener least-squares solution, Autocorrelation matrices, eigenvalues - eigenvectors and geometrical interpretation, Gradient search and performance surfaces, The LMS and the RLS algorithms, Block time and frequency domain LMS FIR and IIR adaptive filters, The Equation error model, Convergence, Noise and Echo Cancellation, Array processing, Intro to Neural Nets, Adaptive methods for sensor monitoring and control.	Adaptive Filter Theory by S. Haykin, Prentice Hall – 5th Edition – 2013

APPENDIX IV

SUPPORT STATEMENTS

Ira A. Fulton Schools of Engineering - Official Submission

From: Jeremy Helm
Sent: Monday, March 02, 2015 4:55 PM
To: Curriculum Planning
Cc: James Collofello; Stephen Phillips; Andreas Spanias; Lauren Levin
Subject: RE: Ira A Fulton Schools of Engineering 2015-2016 Academic Plan Follow-up

Hello,

Please find attached a signed proposal to **establish: Certificate in Sensor Signal and Information Processing** (graduate)

Jeremy Helm

Director, Academic Administration & Student Success

Ira A. Fulton Schools of Engineering

Arizona State University

Tempe, AZ 85287-8109

(480) 965-8931 voice

(480) 965-8095 fax

School of Electrical, Computer and Energy Engineering

Support Statement

ARIZONA STATE UNIVERSITY

March 6th, 2015

To Whom It May Concern:

I have reviewed the proposed certificate on Sensor Signal and Information Processing (SENSIP) which requires 19 credit hours. The certificate will be within the Ira A. Fulton Schools of Engineering and will provide opportunities for training for graduate students and other certificate participants.

The certificate will provide opportunities to participants to obtain certified training and specialization in the SENSIP area. Most of the courses, required and elective, are within Electrical Engineering. Elective courses listed in the certificate proposal can also be from Computer Science, Biomedical Engineering and Biomedical Informatics.

The certificate will not require the establishment of any new fees and all the facilities and infrastructure are currently in place. Only one new course will be created for the certificate POS. This will be on the theory and applications of sensors with emphasis on signal processing algorithms that improve the fidelity and precision of inexpensive sensors. The course is titled "Sensor Systems; Theory and Applications" and will be offered initially as a EEE598 special topics course. ECEE will support the creation of the course which will also be offered online through GOEE if enrolment warrants. The certificate will enable ECEE and the SenSIP center (which is also an NSF Industry University Collaborative Research center (I/UCRC) site) to offer training programs to several entities including engineers from I/UCRC member industries. The proposed plans of study and the listed courses will be administered based on ECEE standards and IAFSE curriculum policies. All prerequisites needed for courses listed the SENSIP certificate will have to be taken by certificate participants.

The director of the certificate will work with our graduate program office to coordinate admissions and secure that the entire program is run in a manner consistent with ECEE and IAFSE standards. ECEE supports the new certificate program and we do not envision any conflicts with existing programs in Engineering

Sincerely,

Stephen M. Phillips, Ph.D., P.E.
Professor of Electrical Engineering
Director of the School

IRA A. FULTON SCHOOLS OF ENGINEERING
School of Electrical, Computer and Energy Engineering
PO Box 875706 TEMPE, AZ 85287-5706
(480) 965-3424 FAX: (480) 965-3837

School of Biological and Health Systems Engineering

Support Statement

certificate file

Marco Santello <Marco.Santello@asu.edu> Mon, Feb 9, 2015 at 3:46 PM
To: Stephen Helms Tillery <stillery@asu.edu>, Jeffrey Kleim <jakleim@asu.edu>
Cc: Andreas Spanias <spanias@asu.edu>

Andreas,

I concur with the feedback from the SBHSE graduate and undergraduate program chairs that there's no conflict between your certificate program and our program.

Best,

Marco

Marco Santello, PhD

Director, School of Biological and Health Systems Engineering

Harrington Endowed Chair and Professor

501 East Tyler Mall, ECG Building, Suite 334C

Ira A. Fulton Schools of Engineering, Arizona State University

Tempe, AZ 85287-9709

ph.: (480) 965-8279; fax: (480) 727-7624

email: marco.santello@asu.edu

webpage: http://faculty.engineering.asu.edu/santello

Department of Biomedical Informatics

Support Statement

Maria Hanlin Mar 19 (1 day ago)
to me, George

Dear Dr. Spanias,

We hereby approve your request to include the course: **BMI 501 Introduction to Biomedical Informatics** as an elective in the SENSIP graduate certificate.

Sincerely, Maria Hanlin

Maria Hanlin, MA
Graduate Programs Coordinator
Department of Biomedical Informatics
International School of Biomedical Diagnostics
College of Health Solutions
Arizona State University
Mayo Clinic – Samuel C. Johnson Research Building
13212 E. Shea Blvd, Scottsdale, AZ 85259
(480) 884-0234
bmi.asu.edu | chs.asu.edu/isbd

(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.**

- Establishment of new curricular initiative requests; degrees, concentrations, or certificates
- Rename requests; existing degrees, concentrations or certificates
- Disestablishment requests; existing degrees, concentrations or certificates

☒ **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.**

- New degree, concentration and certificate templates (contain proposal template and operational appendix) can be found at the Provost's Office Curriculum Development website: Academic Programs link

☒ **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

☒ **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 Graduate Education strongly recommends that academic units establish after the program is approved for implementation.

☐ **Set-up a Graduate Faculty Roster for new PhD Programs** – This roster will include the faculty eligible to mentor, co-chair or chair dissertations. For more information, please go to http://graduate.asu.edu/graduate_faculty_initiative.

☒ **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.