



PROPOSAL TO ESTABLISH A NEW GRADUATE CERTIFICATE

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. The graduate certificate enables the university to respond to societal needs while promoting university cooperation with corporate, industrial, and professional communities.

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 CERTIFICATE

College/School: College of Liberal Arts and Sciences

Note: Program ownership is coded at the College/School level first and may not be a center, department or division apart from it.

Department/Division/School: School of Life Sciences

Proposing faculty group (if applicable): N/A

Name of proposed graduate certificate: Computational Life Sciences

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.

Requested effective term and year: Fall 2019

(The first semester and year for which students may begin applying to the certificate)

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

Plan Code:

CIP Code:



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PROPOSAL CONTACT

Name:	Melissa A. Wilson Sayres	Title:	Assistant Professor
	Kenneth H. Buetow		Professor
	480-727-6366		
Phone number:	480-727-9413	Email:	melissa.wilsonsayres@asu.edu
			kenneth.buetow@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 certificate program.

Note: An electronic signature, an email from the dean or dean's designee, or a PDF of the signed signature page is acceptable.

College/School/Division Dean name: Fabio Milner

Signature: Fabio Milner

Date: 9/19/18

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 (two readings), 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

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.

Rationale and need for the program: Graduate students in life sciences fields are now being required to work with ever-increasing sizes of biological data, which require skills in data analysis, and a strong grounding in hypothesis-driven and hypothesis-generating research methods. The School of Life Sciences (SOLS) has faculty that span a diverse background of scientific disciplines in computation and life sciences to uniquely address training in quantitative skills grounded in integrative biological frameworks. New and diverse big data types are emerging in the life sciences including biomarker data, long term monitoring data, longitudinal samples, genomic, transcriptomic, proteomic, and metabolomics data for human and non-human samples (including viruses, plants, animals, bacteria, the environment, and ecosystems). Being able to quantitatively combine and analyze these data types, and consider the ethical implications of large life sciences data (e.g., personalized genomics, or endangered species data) is critical for life sciences graduate students; SOLS is expertly poised to offer training in this area.

Glassdoor.com ranks data scientist at the top of its 50 Best Jobs in America. It reports that the average annual salary for computational biologists in the Phoenix area is \$82,112, and that the national average is \$104,313. The McKinsey Global Institute projects that the demand for deep analytical talent in the United States could be 50 to 60 percent greater than its projected supply by 2018, and a large portion of this is going to be in computational biology, requiring trainees with expertise in both fundamental life sciences and in computation. Job prospects for people with training in computational life sciences span academic institutions, and notably include growing life sciences industries like 23andMe, Monsanto, GlaxoSmithKline (Respective medians \$105,048, \$105,113, and \$101,452 per year).

Potential size and nature of target audience: The target audience includes all graduate students working with life sciences data who aim to gain expertise in the computational analysis of this data. The anticipated size of the target



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audience includes the more than 400 currently enrolled graduate students across the Life Sciences at ASU, and potentially 100 to be enrolled in the Certificate, which we anticipate will aid in recruitment of trainees at both the MS and PhD level.

Comparable programs at ASU: There are no comparable Certificates in Computational Life Sciences at ASU; The proposed certificate covers the broad range of data generated across life sciences, including ecological, longterm research site, genomic, transcriptomic, and proteomic that is not covered in any other unit. There are PhD and MS training programs in sub-fields of Computational Life Sciences, such as Bioinformatics, or Human Genomics, or Ecology, but this would be a unique interdisciplinary graduate certificate, to the best of our knowledge. There are two MS programs going through approval at the same time as this certificate. In particular, there is a MS in Biological Data Science program going through the governance review process from New College, from which we have received a statement of support. Also, College of Health Solutions also received approval to propose an MS in Biomedical Data Science. Both MS programs and this Certificate include an emphasis on statistics, but the proposed certificate focuses on a complementary area from the New College MS and Health Solutions MS, more on command line programming, and including a broader array of ecology and genomics.

Relation to existing programs at ASU: The graduate certificate in Computational Life Sciences will complement and extend initiatives across other units both within the College of Liberal Arts and Sciences (CLAS) (e.g., School of Mathematics and Statistical Sciences, School of Life Sciences, School of Molecular Sciences, Physics) and across the University (e.g., Engineering, Business, Health Solutions, and Law). In particular, CLAS is developing a Data Science undergraduate major, and this certificate will provide specialization in the Life Sciences. Further, there are students across more computational and analytical fields, such as mathematics, chemistry, and physics, who want to apply computation to addressing problems in the Life Sciences. We are creating a certificate that leverages the rich opportunities across the University, building expertise for our students that will aid them in a host of different career paths.

2. ADMINISTRATION AND RESOURCES

A. Administration

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 will be coordinated academically by a committee of 3 faculty involved in the program, with rotating three year terms. The committee responsibilities will include recommendations for admissions, approval of projects and coursework.

The certificate will be administered via the graduate office in the School of Life Sciences.

B. Resource requirements needed to launch and sustain the program

Describe any new resources required for this program's success such as new staff, new facilities, new library resources, new technology resources, etc. 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.

The Certificate in Computational Life Sciences will leverage and combine existing facilities (e.g., Research Computing) and Library resources (e.g., data science training). The supporting faculty, as a consortium, will provide resources necessary for individual student projects. All resources and staff are in SOLS and no additional resources are necessary for the certificate.



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C. Projected Enrollment:

How many new students do you anticipate enrolling in this program each year for the next three years?

3-YEAR PROJECTED ANNUAL ENROLLMENT			
Please utilize the following tabular format	1 st Year	2 nd Year (Yr. 1 continuing + new entering)	3 rd Year (Yr. 1 & 2 continuing + new entering)
Number of students in certificate (Headcount)	10	25	50

3. STUDENT LEARNING OUTCOMES AND ASSESSMENT

- A. List the knowledge, competencies and skills** students should have attained by graduation from the proposed degree program. (Examples of program Learning Outcomes can be found at <https://uoeee.asu.edu/>. Go to the Assessment accordion dropdown and select Assessment Plan to view sample outcomes.)

Please see attached Assessment Plan (reviewed and approved by UOEEE) in Appendix II.

- B. Describe the plans and methods to assess** whether students have achieved the knowledge, competencies and skills identified in the Learning Outcomes listed above. Please list measures and scales for each outcome. (You can find examples of assessment methods at <https://uoeee.asu.edu/>. Go to the Assessment accordion dropdown and select Assessment Plan to view sample measures.)

Please see attached Assessment Plan (reviewed and approved by UOEEE) in Appendix II.

4. ACADEMIC REQUIREMENTS

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

16 credit hours

- B. As applicable, please describe culminating experience if required** (e.g., applied project, portfolio, capstone course, etc.)

All students will produce a portfolio (0 credits) at the end of their certificate that documents research in Computational Life Sciences done either as part of a final project in a course, or as part of faculty-led research experience.

- C. Please state the satisfactory student academic progress standards and** guidelines (including any time limits for completion). All coursework used to complete an ASU graduate certificate must be completed within a six-year time limit, maintaining continuous enrollment.

Students will be required to have a B average in all courses in the Certificate program.

- D. 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. No more than 40% of coursework towards the requirements of a graduate certificate can be completed prior to admission to the certificate program.)

Yes, up to 12 hours may be shared.



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- E. 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 ChangeMaker online course proposal submission system before this initiative is put on the University Graduate Council and CAPC agendas.

Note: a minimum of 2/3 of the courses required for a graduate certificate must be at the 500-level or above.

Required Core Courses for the Certificate			
Prefix and Number	Course Title	New Course?	Credit Hours
BIO 611	Current Topics in Responsible Conduct of Research (RCR) in Life Sciences	No	1
<i>Section sub-total:</i>			1
Elective or Research Courses <i>(as deemed necessary by supervisory committee)</i>			
Prefix and Number	Course Title	New Course?	Credit Hours
BIO 543	Molecular Genetics and Genomics	No	3
BIO 598	Topic: Genomic Analysis	No	3
BIO 614	Biometry	No	4
BIO 549	Phylogenetic Biology and Analysis	No	4
BIO 545	Populations: Evolutionary Genetics	No	3
BIO/EVO 539	Computing for Research	Yes	3
EVO 598	Topic: Principles of Programming for Biologists	No	3
MCB 540	Functional Genomics	No	3
NEU 591	Seminar: Data Analysis in Neuroscience	No	3
BIO 598	Topic: Software Carpentry	No	3
BIO 591	Seminar: Ecological Modeling	No	3
NEU 591	Seminar: Computation in Neuroscience	No	3
EVO 598	Topic: Spatial Analysis and Landscape Genetics	No	3
EVO 598	Topic: Current Topics in Systematics	No	3
EVO 598	Topic: Discovering Biodiversity	No	3
EVO 598	Topic: Meta-Analysis in Ecology and Evolution	No	3
EVO 598	Topic: Species, Traits, and Trees	No	3
EVO 598	Topic: Advanced Programming for Biology	No	3
EVO 598	Topic: Evolutionary Data Analysis	No	3
EVO 598	Topic: The Human Genome	No	3



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CHM 598	Topic: Quantitative Foundation of Modern Biochemistry	No	3
CHM 598	Topic: Unraveling the Noise: Data Driven Models and Analysis	No	3
BMI 555	Statistics Learning for Data Mining	No	3
BMI 598	Topic: Biostatistics with Computational Applications	No	3
Section sub-total:			15
Culminating Experience (if applicable) <i>E.g. – Capstone course, portfolio, written comprehensive exam or applied project</i>			Credit Hours
Portfolio			0
Section sub-total:			0
Total required credit hours			16

1. List all required core courses and total credit hours for the core (required courses other than internships, capstone course, etc.).
2. Omnibus numbered courses cannot be used as core courses.
3. Permanent numbers must be requested by submitting a course proposal to Curriculum ChangeMaker for approval.

F. 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
Melissa A. Wilson Sayres	Asst Prof	Ph.D.	Comparative and Evolutionary Genomics	Co-chair
Kenneth H. Buetow	Prof.	Ph.D.	Complex Systems, Computational Genomics	Co-chair
Stephen Pratt	Asst. Prof.	Ph.D.	Biostatistics, Ant biology	faculty
John Szabo	Prof.	Ph.D.	Ecology, Ecosystems	faculty
Emilia Martins	Prof.	Ph.D.	Statistics, phylogenetics	faculty
Jeff Jensen	Prof.	Ph.D.	Population genetics	faculty
Susanne Pfeifer	Asst. Prof.	Ph.D.	Conservation genetics	faculty
Kenro Kusumi	Prof.	Ph.D.	Regeneration; Genomics	faculty
Reed Cartwright	Asst. Prof.	Ph.D.	Computational and statistical methods	faculty
Michael Lynch	Prof.	Ph.D.	Evolution, Single cell genomics	faculty
Nico Franz	Prof.	Ph.D.	Systematics and taxonomy	faculty
Sharon Crook	Prof.	Ph.D.	Mathematical modeling	faculty
Beckett Sterner	Asst. Prof.	Ph.D.	Philosophy, Big data, Ethics	faculty
Karin Ellison	Admin. Prof.	Ph.D.	Ethics in big data	faculty
Benjamin Blonder	Asst. Prof.	Ph.D.	Ecology	faculty
Carlo Maley	Asst. Prof.	Ph.D.	Modeling, Genomics	faculty
Manfred Laubichler	Prof.	Ph.D.	Evolution, Complexity	faculty

5. COURSES

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

No new courses are required for the certificate



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6. 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
- B. Impact statements of heads of impacted academic units (programs with similar names/content, utilizing courses, faculty, etc.)



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APPENDIX I

OPERATIONAL INFORMATION FOR GRADUATE CERTIFICATES

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

1. **Proposed name of certificate:** Computational Life Sciences

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

Computational approaches are transforming the life sciences. In silico approaches complement traditional bench-based approaches to gain novel insights across the spectrum of life sciences. Successful completion of this program will give graduate students the knowledge and ability to apply computational approaches in the life sciences.

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*)

Students will develop expertise in the understanding, interpretation, and analysis of diverse data types generated from a range of life sciences disciplines including, but not limited to, ecology, botany, evolutionary biology, neuroscience, molecular and cellular biology and animal behavior.

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*

If the certificate program is ground only, it will only be open to international students who are already enrolled in a degree program at ASU and they must complete the certificate before the degree is awarded. If this certificate is ground only, please indicate this in the additional application information below.

6. **Admission Requirements**

An applicant must fulfill the requirements of both the Graduate College and the College of Liberal Arts and Sciences.

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

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



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Applicants are required to submit:

1. graduate admission application and application fee
2. official transcripts
3. professional resume
4. written statement
5. proof of English proficiency

Additional Application Information

Applicants whose native language is not English (regardless of current residency) must provide proof of English proficiency.

The professional resume should show the applicant's skills and previous training.

The written statement will ask about future career goals, to better assist the student with selecting the most applicable set of courses in computational life sciences.

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): 2019 (year):	July 1st October 1st
<input checked="" type="checkbox"/> Spring (regular) <input type="checkbox"/> Session B	(year): 2020 (year):	December 1st February 8th
<input checked="" type="checkbox"/> Summer (regular) <input type="checkbox"/> Summer B	(year): 2020 (year):	May 14th May 14th
<p><i>Note: Session B is only available for approved online programs.</i></p>		

Program admission deadlines website address: sols.asu.edu

8. Curricular Requirements:

Curricular Structure Breakdown for the Academic Catalog:

(To be completed by the Graduate College)

Required Core (1 credit hour)

BIO 611 Current Topics in Responsible Conduct of Research (RCR) in Life Sciences (1)

Electives (15 credit hours)



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Culminating Experience (0 credit hours)
portfolio (0)

Additional Curriculum Information

Elective coursework is selected from a restricted list in consultation with the academic unit.

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

computation, data, algorithm, database, genomics, transcriptomics, modeling, programming

10. **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 type="checkbox"/> Engineering & Technology | <input checked="" 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 | |

11. **Contact and Support Information:**

Office Location - Building Code & Room: (Search ASU map)	LSA 181
Campus Telephone Number: (may not be an individual's number)	480-965-7490
Program Email Address: (may not be an individual's email)	sols.grad@asu.edu
Program Website Address: (if one is not yet created, use unit website until one can be established)	sols.asu.edu
Program Director (Name):	Melissa A. Wilson Sayres (mwilsons@asu.edu)
Program Director (ASURITE):	mwilsons



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Program Support Staff (Name):	Wendi Simonson
Program Support Staff (ASURITE):	wsimonso
Admissions Contact (Name):	Wendi Simonson
Admissions Contact (ASURITE):	wsimonso

12. 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
Melissa A. Wilson Sayres	mwilsons	X	X
Kenneth H. Buetow	kbuetow	X	X
Wendi Simonson	wsimonso	X	X
Amina Hajdarovic	ahajdaro	X	X

APPENDIX II

Assessment Plan

Certificate in Computational Life Sciences

Status: UOEEE Provisional Approval

Comments: UOEEE Approved

Element Outcome Measure Description

Outcome	1		Students graduating with a Certificate in Computational Life Sciences will be able to summarize key computational concepts, such as algorithms and relational databases, and their applications in the life sciences, and apply statistical concepts used in computational life sciences.
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Plan_2Concepts	1		
Plan_3Competencies	1		
Measure	1	1	Students will be able to identify and describe the tools and methods used in Computational Life Sciences. Courses (e.g. BIO 543: Molecular Genetics and Genomics and EVO 598: Evolutionary Data Analysis both allow students to develop these skills and are already being taught in SOLS).
PC	1	1	80% of students will score 3.8 or above on a faculty-developed rubric of a 1-5 scale of this measure.
Measure	1	2	Students will be able to describe the application of computational tools to life sciences data. (For example, MCB 540: Functional Genomics is already taught in SOLS).
PC	1	2	80% of students will score 3.8 or above on a faculty-developed rubric for this metric.

Outcome	2		Students graduating with a Certificate in Computational Life Sciences will be able to use bioinformatics tools, command-line bioinformatics tools and write simple computer scripts to find, retrieve, and organize various types of biological data and interpret the ethical, legal, medical, and social implications of biological data.
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Plan_2Concepts	2		
Plan_3Competencies	2		
Measure	2	1	Students will be able to understand the unique features of different types of computational life sciences data, and apply the tools and approaches for analyzing this data reproducibly (BIO/EVO 539: Computing for Research, NEU 591: Data Analysis in Neuroscience and BIO 614: Biometry address these criterion and are being taught in SOLS).
PC	2	1	80% of students will score a 3.8 or above on a faculty-developed rubric of this metric.
Measure	2	2	Students will be able to describe the ethical issues associated with the use of life sciences data. BIO 611: Current Topics in Responsible Conduct of Research (RCR) in Life Sciences is currently offered in SOLS.
PC	2	2	80% of students will score a 3.8 or above on a faculty-developed rubric of this metric.

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

APPENDIX III
Letters of Support/Impact

College of Liberal Arts and Sciences – Official Submission

Please accept attached proposal to establish a new graduate certificate in Computational Life Sciences.

Thank you,

PL

PAUL C. LEPORE, Ph.D.

Associate Dean

College of Liberal Arts and Sciences

Armstrong Hall, Suite 152-H

Arizona State University | P.O. Box 872601 | Tempe, Arizona 85287-2601

480.965.6506 | Fax: 480.965.2110 | e-mail: paul.lepore@asu.edu

ASU College of Liberal Arts and Sciences — *First Year Forward*



July 27, 2018

Dear Colleagues,

I enthusiastically support the proposed graduate certificate in Computational Life Sciences. As you are aware, datasets of ever-increasing size and new computational approaches are becoming the norm in Life Sciences. Experimental and observational data types include biomarker data, long term monitoring data, longitudinal samples, genomic, transcriptomic, proteomic, and metabolomics data for human and non-human samples (including viruses, plants, animals, bacteria, the environment, and ecosystems); each with multiple associated computational approaches. The School of Life Sciences programs span ecology, evolution, molecular and cellular biology, neuroscience, immunology, genetics, and philosophy. To be successful, our students need training to be able to understand life sciences data formats and computational tools, understand how to combine and analyze life sciences data types, and be able to discuss the ethical implications of computational life sciences research. By completing the proposed certificate in Computational Life Sciences our graduate students will have domain specific knowledge and practical competency in these areas.

As chair of the School of Life Sciences, I verify that the proposed certificate in graduate Computational Life Sciences has received faculty approval through appropriate governance procedures in the unit and that the unit has the resources to support the certificate as presented in the proposal, without impacting core program resources.

This certificate will provide training and recognition of skills in Computational Life Sciences that are critical for the future success of our students. We anticipate that this certificate will not only train life sciences in computational skills, but it will allow students with quantitative and computational skills across ASU to complement their foundational training and apply them in the life sciences.

Sincerely,

A handwritten signature in black ink, appearing to read "Bert Jacobs".

Bert Jacobs
Professor and Director, School of Life Sciences

College of Integrative Sciences and Arts – Impact Statement

----- Forwarded message -----

From: **Duane Roen** <Duane.Roen@asu.edu>

Date: Sun, Aug 26, 2018 at 6:59 PM

Subject: RE: Response requested: Impact of Graduate Certificate in Computational Life Sciences

To: Melissa A. Wilson Sayres <melissa.wilsonsayres@asu.edu>

Cc: Kenneth Buetow <Kenneth.Buetow@asu.edu>, Myrna Hanaoka <Myrna.Hanaoka@asu.edu>, Nancy Gonzales <nancy.gonzales@asu.edu>

Melissa,

The proposed graduate certificate in Computational Life Sciences will complement work done in CISA, so we are happy to support it.

We are delighted that you will consider courses taught in the Science and Mathematics unit of CISA as electives for the certificate.

Best,

Duane

Duane Roen

Vice Provost, Polytechnic campus

Dean, College of Integrative Sciences and Arts

Dean, University College

Arizona State University

Mail Code: 2780

7271 E Sonoran Arroyo Mall

Mesa, AZ 85212-6415

P: 480-727-6513

W. P. Carey School of Business – Impact Statement

----- Forwarded message -----

From: **Kay Faris** <KAY.FARIS@asu.edu>

Date: Mon, Aug 27, 2018 at 12:35 PM

Subject: RE: Response requested: Impact of Graduate Certificate in Computational Life Sciences

To: Melissa A. Wilson Sayres <melissa.wilsonsayres@asu.edu>

Cc: Kenneth Buetow <Kenneth.Buetow@asu.edu>, Naomi Aide <Naomi.Aide@asu.edu>, Kay Faris <KAY.FARIS@asu.edu>

Hi Melissa,

I have heard from the department and we do not believe there will be any negative impact to W. P. Carey. Given that this information is so specific, we do not see that any of our courses would be value add for you.

I wish you the best on this certificate!

Kay

Kay A. Faris

Senior Associate Dean, Academic Programs

W. P. Carey School of Business

Arizona State University

Tempe, AZ 85287-3406

Phone: 480-965-7587

Fax: 480-965-3846

Kay.Faris@asu.edu



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Ira A. Fulton Schools of Engineering – Impact Statement

----- Forwarded message -----

From: **Ann McKenna** <Ann.McKenna@asu.edu>

Date: Wed, Aug 29, 2018 at 1:10 PM

Subject: Re: Response requested: Impact of Graduate Certificate in Computational Life Sciences

To: Sergio Quiros <Sergio.Quiros@asu.edu>, Melissa A. Wilson Sayres <melissa.wilsonsayres@asu.edu>, Kenneth Buetow <Kenneth.Buetow@asu.edu>

CC: Marco Santello <Marco.Santello@asu.edu>, Sandeep Gupta <Sandeep.Gupta@asu.edu>, Jeremy Helm <JEREMY.HELM@asu.edu>, Amy Wolsey <Amy.Wolsey@asu.edu>, Bradley Rogers <BRADLEY.ROGERS@asu.edu>, Larry Olson <larry.olson@asu.edu>

Hello Sergio,

This certificate most closely aligns with our Environmental Resource and Management program (ERM). We do not have any concerns and are supportive of the proposed certificate. We suggest that ERM 494/598 Algal Bioprocess and Biosystems Engineering be considered as an elective in the certificate.

Best wishes,

Ann

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Ann F. McKenna, PhD
Professor and Director, The Polytechnic School
Ira A. Fulton Schools of Engineering
Arizona State University
[6049 S Backus Mall](#), Sutton Hall 140
Mesa, AZ 85212
Phone: 480-727-5121
Email: ann.mckenna@asu.edu

College of Nursing and Health Innovation – Impact Statement

----- Forwarded message -----

From: **Katherine Kenny** <Katherine.Kenny@asu.edu>

Date: Thu, Aug 30, 2018 at 3:17 PM

Subject: Re: Response requested: Impact of Graduate Certificate in Computational Life Sciences

To: Melissa A. Wilson Sayres <melissa.wilsonsayres@asu.edu>

Cc: Kenneth Buetow <Kenneth.Buetow@asu.edu>

Dear Melissa and Ken,

Thank you for asking me to review your proposal for the Graduate Computational Life Sciences Certificate. This certificate does not compete or conflict with any of the current degree programs or certificates that we offer in CONHI. I welcome the opportunity to collaborate on which of our courses could be considered for electives in this certificate. On behalf of the College of Nursing and Health Innovation I support your moving this proposal forward. Good luck as you complete the process.

Best,

Kathy

Katherine Kenny, DNP, RN, ANP- BC, FAANP, FAAN

Associate Dean of Academic Affairs

College of Nursing and Health Innovation

Arizona State University

602-496-1719

Katherine.kenny@asu.edu

Sandra Day O'Connor College of Law – Support Statement

----- Forwarded message -----

From: **Adam Chodorow** <Adam.Chodorow@asu.edu>

Date: Mon, Sep 17, 2018 at 10:03 PM

Subject: RE: Response requested: Impact of Graduate Certificate in Computational Life Sciences

To: Melissa A. Wilson Sayres <melissa.wilsonsayres@asu.edu>

Cc: Kenneth Buetow <Kenneth.Buetow@asu.edu>

Dear Melissa,

Sorry of the delay in responding. The prior email must have slipped through the cracks. We support the degree and anticipate no conflicts with any current or future programming here at the law school.

Adam

Adam Chodorow

Professor of Law

Associate Dean for Academic Affairs

Willard H. Pedrick Distinguished Research Scholar

Sandra Day O'Connor College of Law, Arizona State University

Mail Code 9529, 111 E. Taylor St, Phoenix, AZ 85004

Tel: (480) 727-8574

Fax: (480) 965-2427

Email: Adam.Chodorow@asu.edu

SSRN: <http://ssrn.com/author=474399>

School of Mathematical and Statistical Sciences, College of Liberal Arts and Sciences – Support Statement

----- Forwarded message -----

From: **Albert Boggess** <boggess@asu.edu>

Date: Mon, Sep 3, 2018 at 11:27 AM

Subject: Re: Response requested: Impact of Graduate Certificate in Computational Life Sciences

To: Melissa A. Wilson Sayres <melissa.wilsonsayres@asu.edu>

CC: Kenneth Buetow <Kenneth.Buetow@asu.edu>

Dr. Sayres - SoMSS is supportive of your plans for the Computational Life Sciences Certificate in SoLS.

Good luck...

Al

School of Human Evolution and Social Change, College of Liberal Arts and Sciences – Support Statement

----- Forwarded message -----

From: **Kaye Reed** <kaye.reed@asu.edu>

Date: Mon, Sep 17, 2018 at 10:05 PM

Subject: Re: Response requested: Impact of Graduate Certificate in Computational Life Sciences

To: Melissa A. Wilson Sayres <melissa.wilsonsayres@asu.edu>

Dear Melissa,

I think that this is wonderful. I can imagine that some of our students will be interested in this certificate. SHESC sees no conflict with your certificate.

Best,

Kaye

--

Kaye E. Reed, President's Professor
Director, School of Human Evolution and Social Change
Research Associate, Institute of Human Origins
Arizona State University
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Tempe, AZ 85287
(480) 965-9813
www.kayereed.com

Department of Physics, College of Liberal Arts and Sciences – Support Statement

----- Forwarded message -----

From: **Michael Treacy** <treacy@asu.edu>

Date: Wed, Sep 19, 2018 at 3:33 AM

Subject: Re: Response requested: Impact of Graduate Certificate in Computational Life Sciences

To: Melissa A. Wilson Sayres <melissa.wilsonsayres@asu.edu>

Cc: Kenneth Buetow <Kenneth.Buetow@asu.edu>, Ashley Meyers <Ashley.N.Meyers@asu.edu>

Dear Melissa, Ken:

I have looked over the two proposals for: (a) “Graduate Certificate in Computational Life Sciences” and; (b) the “Undergraduate Certificate in Computational Life Sciences”

(a) “Graduate Certificate in Computational Life Sciences”

(i) I support this certificate. As computers and their software and algorithms become more powerful, they offer us unprecedented tools for gaining deeper mechanistic insights into many fields of science. Life Sciences is an extraordinarily complex field, with important contributions to medicine – a topic of great public interest. Computational Life Sciences could offer us a tool for bringing to light some of the deeper mechanisms from cell biology, and medicine, all the way to the social complexities of society.

(ii) I can see no conflicts within the Department of Physics. If students were to take elective courses in physics, this would require some mathematical competency on the part of the student. We do offer 300- and 400-level biophysics courses, but it is hard to avoid the math.

(b) “Undergraduate Certificate in Computational Life Sciences”

(i) I support this certificate for the same reasons as in (a)(i) above

(ii) I can see no conflicts within the Department of Physics. If students were to do elective courses in physics I would recommend the PHY 121/131/252 sequence if there is reasonable math competency. If the math is too intense, then the PHY 111/112 sequence would be a good option for beginner-level physics, with less math (no calculus).

I hope that this helps?

Best Regards

Mike Treacy

Professor of Physics, Honors Faculty,

Associate Chair (Academic Affairs), Department of Physics, Bateman Building, PSB-147

Arizona State University | P.O. Box 871504 | Tempe, Arizona 85287-1504

Phone: [480.965.5359](tel:480.965.5359) | Fax: [480.965.7565](tel:480.965.7565) | e-mail: treacy@asu.edu

New College of Interdisciplinary Arts and Sciences – Impact Statement

----- Forwarded message -----

From: **Stephen Wirkus** <Stephen.Wirkus@asu.edu>

Date: Thu, Oct 25, 2018 at 11:17 AM

Subject: Re: Impact statement of Graduate Certificate in Computational Life Sciences

To: Melissa A. Wilson Sayres <melissa.wilsonsayres@asu.edu>, Tosha Ruggles <tosha.ruggles@asu.edu>

Cc: Kenneth Buetow <Kenneth.Buetow@asu.edu>

Hi Melissa,

While there is some overlap in your proposed graduate certificate with our proposed MS in Biological Data Science, we believe that the student population you are targeting is different than those targeted by our degree. Thus, we feel the impact of your certificate on our program will be minimal.

Assuming our degree and corresponding courses are approved and yours is as well, we should probably have a conversation in a year or two about whether listing some of each other's courses as electives may be a wise option.

Stephen

Stephen A. Wirkus, Ph.D. email: swirkus@asu.edu

Professor, **Interim Director**

School of Mathematical & Natural Sciences

Honors Faculty, Parents Association Professor

Arizona State University

phone: 602-543-8236 fax: 602-543-6073

Office: CLCC 270

College of Health Solutions – Impact Statement

On Fri, Nov 2, 2018 at 9:15 AM Kate Lehman <KATE.LEHMAN@asu.edu> wrote:

Melissa: Do you need a more lengthy letter, or will this brief response from the BMI faculty suffice?

Thanks,

Kate Lehman

From: Maria Hanlin
Sent: Friday, November 2, 2018 9:10 AM
To: Kate Lehman <KATE.LEHMAN@asu.edu>
Subject: Re: letter of support for computational biology certificate

Hi Kate,

The BMI Academic Programs Committee has reviewed the updates and supports the computational biology certificate. They appreciate the changes that were made. Please let me know if a more formal letter is needed.

Thank you, Maria

----- Forwarded message -----

From: Kate Lehman <KATE.LEHMAN@asu.edu>
Date: Thu, Aug 30, 2018 at 12:58 PM
Subject: RE: Response requested: Impact of Graduate Certificate in Computational Life Sciences
To: Melissa A. Wilson Sayres <melissa.wilsonsayres@asu.edu>
CC: Julie Liss <JULIE.LISS@asu.edu>

Melissa:

This is sent on behalf of Associate Dean Julie Liss:

Thank you for sharing the proposal. We were concerned that the certificate might too closely mirror our degree in Biomedical Informatics, so we forwarded your proposal to that program. The Academic Programs Committee (APC) of Biomedical Informatics reviewed the proposal and suggests the following revisions:

1. Please make clear the differentiation between computational biology (the focus of this certificate program) and bioinformatics (not covered by this certificate program). References to bioinformatics should be removed.
2. Please revise the "overview" section to accurately reflect the listed coursework. In particular, biomarker discovery and integrated analysis of multi-omics data is not reflected in the coursework and should be removed from the "overview" section, as well as long-term data monitoring. This will provide accurate scoping and avoid overgeneralization of this certificate program.

Our faculty are happy to collaborate, suggest BMI courses for possible electives and provide feedback on the revised version.

Sincerely,

Kate Lehman

Senior Director Academic Affairs and Innovation
Academic Integrity Officer

Arizona State University | College of Health Solutions
[550 N. 3rd Street, Phoenix, AZ 85004](https://www.asu.edu) | Health North Room 508D
602-496-0241 | kate.lehman@asu.edu | chs.asu.edu

(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 program. Below are items that 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.