

New Academic Program Workflow Form

General

Proposed Name: Cell and Molecular Biology

Transaction Nbr: 00000000000102

Plan Type: Specialization

Academic Career: Undergraduate

Degree Offered: Undergraduate Certificate

Do you want to offer a minor? N

Anticipated 1st Admission Term: Spring 2021

Details

Department(s):

SCNC

DEPTMNT ID	DEPARTMENT NAME	HOST
0417	Molecular & Cellular Biology	Y

Campus(es):

MAIN

LOCATION	DESCRIPTION
TUCSON	Tucson

ONLN

LOCATION	DESCRIPTION
ONLN	Online

Admission application terms for this plan: Spring: Y Summer: Y Fall: Y

Plan admission types:

Freshman: Y Transfer: Y Readmit: N Graduate: Y

Non Degree Certificate (UCRT only): N

Other (For Community Campus specifics): N

Plan Taxonomy: 26.0406, Cell/Cellular and Molecular Biology.

Program Length Type: Program Length Value: 0.00

Report as NSC Program:

SULA Special Program:

Print Option:

Diploma: Y Cell and Molecular Biology for Health Careers

Transcript: Y Cell and Molecular Biology for Health Careers

Conditions for Admission/Declaration for this Major:

1. Completion of MCB 181R, MCB 181L, ECOL 182R, and ECOL 182L or equivalent courses
2. Approval of Department

Requirements for Accreditation:

NA

Program Comparisons

University Appropriateness

This certificate aligns with the University mission by leveraging existing courses and faculty expertise to provide additional courses work in cell biology, molecular biology, and genetics to students planning on applying to professional or graduate school. Offering these courses through Arizona online will allow returning students who need additional coursework in cell or molecular biology.

Arizona University System

NBR	PROGRAM	DEGREE	#STDNTS	LOCATION	ACCRDT
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Peer Comparison

ASU Undergraduate Certificate in Biomedical Research

Similarities: Upper division coursework in molecular biology, cell biology, and genetics

Differences: Required course work in Statistics for Researchers
Four units of research required
Not available in 100% online

NAU Undergraduate Certificate in Biotechnology

Similarities: Upper division coursework in molecular biology, cell biology, biochemistry, and genetics

Differences: 23-25 units required
 Research required
 Not available as stand alone
 Not available in 100% online

Faculty & Resources

Faculty

Current Faculty:

INSTR ID	NAME	DEPT	RANK	DEGREE	FCLTY/%
01369657	Angel Pimentel	0417	Assit. Prof. Pract.	Doctor of Philosophy	.50
15508795	Lisa Rezende	0417	Assoc. Prof. Pract.	Doctor of Philosophy	.10
17700519	Stephanie Capaldi	0417	Lecturer	Doctor of Philosophy	.40

Additional Faculty:

None

Current Student & Faculty FTE

DEPARTMENT	UGRD HEAD COUNT	GRAD HEAD COUNT	FACULTY FTE
0417	458	37	24.00

Projected Student & Faculty FTE

DEPT	UGRD HEAD COUNT			GRAD HEAD COUNT			FACULTY FTE		
	YR 1	YR 2	YR 3	YR 1	YR 2	YR 3	YR 1	YR 2	YR 3
0417	500	525	525	35	40	40	24.00	24.00	24.00

Library

Acquisitions Needed:

None

Physical Facilities & Equipment

Existing Physical Facilities:

None

Additional Facilities Required & Anticipated:

None

Other Support

Other Support Currently Available:

Advising support from MCB advisor Justin Schneider

Other Support Needed over the Next Three Years:

None

Comments During Approval Process

4/20/2021 1:37 PM

LREZENDE

Comments
Approved.

4/20/2021 1:55 PM

RGOMEZ

Comments
Approved.

5/3/2021 4:26 PM

YISSELS

Comments
The earliest opportunity for New Programs in the ONLN campus are SP22/FA22



UNDERGRADUATE CERTIFICATE – ADDITIONAL INFORMATION FORM

Note: Certificate programs offered at the University of Arizona, at the undergraduate or graduate level, are not approved as eligible programs for federal student financial aid. Although students enrolled in certificate programs are not eligible for any federal student aid programs, students may be eligible for private loans, outside scholarships, and University of Arizona department funding. For more information, please see [Federal Student Financial Aid Eligibility for Programs](#).

- I. **CERTIFICATE DESCRIPTION**- provide a catalog description of this program to be used to market the certificate. Include information regarding the main content, knowledge areas, key questions to be explored, skillsets to be developed and opportunities for application of the subject matter. The description should match departmental and college websites, handouts, promotional materials, etc.

Cell and Molecular Biology for Health Careers: This undergraduate certificate program is designed for students who want to supplement their major course work with additional courses in molecular biology, cell biology, biochemistry, and genetics. Courses in the certificate program meet the requirements for upper-division biology electives needed for some professional and graduate schools. Students completing the certificate will have a strong foundation in the basic science needed to pursue a career in biomedicine or health care.

- II. **PURPOSE**- discuss the primary intent of this certificate and describe what makes this program distinct from other existing programs on campus.

This certificate brings together the upper-division biology course work now required for many medical school programs. This certificate serves two main audiences: current University of Arizona students in majors outside of Molecular and Cellular Biology who need additional upper-division coursework to strengthen their applications to medical school or other health-care related professional schools, and non-degree seeking students who need to complete the prerequisites for professional or graduate school and need to take additional upper-division biology coursework. This certificate is unique in that the core courses will be offered as asynchronous online courses co-convened between University of Arizona main campus and Arizona Online. Main campus students can complete the certificate over the summer without needing to stay in Tucson while returning students will be able to complete rigorous upper-division coursework without coming to campus or disrupting their work schedules.

- III. **PROGRAM AFFILIATION** – specify whether the UA offers an affiliated undergraduate program – the affiliated program may or may not have the same name as the proposed certificate.

Molecular and Cellular Biology Bachelor of Science and Minor

- IV. **CERTIFICATE DEMAND**– *is there sufficient student demand for the certificate?*

1. What is the anticipated student enrollment for this certificate by the third year the certificate is offered? Please provide measurable indicators of student interest in the certificate (survey results of current students or alumni) and with reference to similar programs elsewhere. Provide market analysis or other tangible evidence to support projected enrollment numbers. Curricular Affairs can provide a job posting/demand report by skills obtained/outcomes of the

proposed certificate. Please contact [Office of Curricular Affairs](#) to request the report(s) for your proposal.

We anticipate enrolling at least 100 students into this program by the third year it is offered. This estimate is based on three sources.

Current demand for MCB courses by non-MCB majors: With the introduction of new upper-division biology requirements for some medical schools, our advisors saw an uptick in requests from students outside of MCB to enroll in our MCB courses. To meet this demand and assure these courses are available to both main campus and Arizona online students, we created online versions of two courses (MCB 410 Cell Biology and MCB 422 Problem Solving with Genetic Tools) that are offered every year and are developing a third (MCB 411 Molecular Biology). Increasing enrollment is shown in the table below:

Course	MCB 410 Cell Biology	MCB 422 Problem Solving with Genetic Tools
2016-2017 enrollment	51 students	61 students
2017-2018 enrollment	76 students	62 students
2018-2019 enrollment	79 students	65 students
2019-2020 enrollment	102 students	76 students

It is important to note that MCB 410 is not open to MCB majors, so this represents a cohort of life science students who require or elect to take upper division MCB courses for another major or program requirement. MCB 422 is taken by both MCB and non-MCB majors. It fulfills both a laboratory requirement and a writing intensive course requirement.

Survey of Undergraduates: In Fall 2020, we surveyed students enrolled in MCB 181L (Introductory to Biology I Lab), a foundation course for all life science majors. Of the 221 students who responded, 87.8% (194) were not Molecular and Cellular Biology majors. These students were asked further questions about their career plans and interest in the certificate program. Of these students, 90.5% (173 students) report that they plan on applying to either a health care related professional school or a Ph.D. program in a biological science, with medical school (63.8%) being the most common choice.

Of the students not currently majoring in MCB, 47.4% (92 students) said they would be interested in earning a certificate in Molecular and Cellular Biology for taking four upper division courses in cell biology, molecular biology, genetics, biochemistry, or bioethics. An additional 39.7% (77 students) responded that they might be interested in this opportunity.

Similar programs created at other universities: Undergraduate certificate programs that allow students to take upper division molecular and cellular biology courses are available at other universities, including:

- [George Mason University: Career Changer's Biological Sciences Undergraduate Certificate](#)
- [Georgia Tech Biological Sciences Certificate](#)
- [Indiana University Bloomington: Human Biology Undergraduate Certificate](#)
- [University of Missouri-St. Louis Undergraduate Certificate in Biotechnology](#)
- [NC State University Undergraduate Certificate in Microbiology](#)
- [University of Pittsburgh Undergraduate Certificate in Life Science Research](#)

2. What community needs, preparation for professional certification exams, degree program recruitment, or employability enhancements will this certificate provide? Please provide evidence of feedback from potential employers regarding the value of the proposed program.

The Cell and Molecular Biology for Health Careers Undergraduate Certificate includes courses that meet the Biochemistry/Genetics, Upper Division Molecular Biology of Nucleic Acids, and Upper Division Cell Biology, Histology, Microbiology, Pharmacology, Pathology, or Immunology requirements for the University of Arizona College of Medicine Tucson, as well as the Biochemistry and Genetics requirement for many other medical schools.

3. Will there be any collaboration with other departments or universities to maximize resources? If there is collaboration, please include a memo of support from the applicable parties.

We will be including courses from the Chemistry and Biochemistry Department and the Ecology and Evolutionary Biology Department.

V. TARGET AUDIENCE(S)- describe the target audience(s) for this certificate and the specific audience needs this certificate aims to address. Address the relevant points below based on your target audience(s).

- i. Does this certificate meet the needs of an **industry or workforce partner**? Explain the industry needs this certificate is proposing to address. Provide a list of industry partners with whom you are working and confirmation of this support.

No

- ii. Does this certificate provide an **introductory pathway to an existing graduate degree**? Provide the name(s) of the degree(s).

The certificate provides upper-division biology courses that have recently become required for some medical schools. Access to these courses is particularly important for students who decided to apply to medical school several years after graduation. The courses in this certificate will be offered online and offered to both main campus and Arizona Online students.

- iii. Does this certificate serve as **professional development for the targeted audience**? Explain how this certificate will help the audience develop professionally.

No

VI. CERTIFICATE REQUIREMENTS - complete the table below to list the certificate requirements, including number of credit hours required and any special requirements for completion. Certificate requirements should include sufficient units to provide a substantive program and an appropriate level of academic rigor and in no case be less than 12 units of credit. Delete the **EXAMPLE** column before

submitting/uploading. **Note: future changes to the curriculum originally approved for the certificate must be approved by the Undergraduate Council.**

Minimum total units required <i>*minimum 12 units</i>	12
Minimum upper-division units required <i>*minimum 6 units of credit must be upper division UA coursework</i>	12
Total transfer units that may apply to the certificate.	6
List any special requirements to declare/admission to this certificate (completion of specific coursework, minimum GPA, interview, application, etc.)	MCB 181R, MCB 181L, ECOL 182R, and ECOL 182L or equivalent courses Students who are interested in the certificate and meet the requirements should contact the department to enroll.
Certificate requirements. List all required certificate requirements including core and electives. Courses listed must include course prefix, number, units, and title. Mark new coursework (New). Include any limits/restrictions needed (house number limit, etc.). Provide email(s)/letter(s) of support from home department head(s) for courses not owned by your department.	Core (6 units): MCB 410 Cell Biology (3 units) MCB 411 Molecular Biology (3 units) Elective (minimum 6 units): MCB 422: Problem Solving with Genetic Tools (4 units) MCB 404: Bioethics (3 units) BIOC 384: Foundations in Biochemistry (3 units) BIOC 385: Metabolic Biochemistry (3 units) ECOL 320 Genetics (4 units) ECOL 326 Genomics (3 units) ECOL 409 Evolution of Infectious Disease (3 units) ECOL 437 Vertebrate Physiology (4 units)
Internship, practicum, applied course requirements (Yes/No). If yes, provide description.	No
Additional requirements (provide description)	None

<p>Any <u>double-dipping restrictions</u> (Yes/No)? If yes, provide description. <i>*A maximum of 6 units may double-dip with a degree requirement (major, minor, General Education) or second certificate.</i></p>	<p>No more than 6 units may double dip with another major, minor, or certificate.</p>
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VII. CURRENT COURSES—using the table below, list all existing courses included in the proposed certificate. You can find information to complete the table using the [UA course catalog](#) or [UAnalytics](#) (Catalog and Schedule Dashboard> “Printable Course Descriptions by Department” On Demand Report; right side of screen). If the courses listed belong to a department that is not a signed party to this implementation request, upload the department head’s permission to include the courses in the proposed certificate and information regarding accessibility to and frequency of offerings for the course(s). Upload letters of support/emails from department heads to the “Letter(s) of Support” field on the UAccess workflow form. Add rows to the table, as needed.

Course prefix and number (include cross-listings)	Units	Title	Course Description	Pre-requisites	Modes of delivery (online, in-person, hybrid)	Typically Offered (F, W, Sp, Su)	Dept signed party to proposal? (Yes/No)
MCB 410	3	Cell Biology	The molecular basis of the structure and function of animal, plant and prokaryotic cells with emphasis on experimental analysis.	MCB 181R, MCB 181L, ECOL 182R, ECOL 182L	Online	Summer	Yes
MCB 411	3	Molecular Biology	Mechanisms of genome replication, genetic recombination, DNA repair, gene expression and regulation. Honors section available. Student with a prior failed attempt may only retake the course once.	MCB 181R, MCB 181L, ECOL 182R, ECOL 182L	Online	Summer	Yes
MCB 422	4	Problem Solving with Genetic Tools	Computer-simulated laboratory. Solving problems via genetic experiments in yeast and Mendelian genetic systems. Individual projects, assessed by regular written lab reports, require deduction and discovery of genotype, pathway, and genetic phenomena through crosses and phenotypic observation. In addition, a mutagenesis design assignment, oral presentation on a monogenic disease, and two literature reviews (on Cancer and Genome editing) will be assigned. Approximately 30-minute active lectures followed by solving of problems in class.	MCB 304, ECOL 320 or PLS 312	In-person and online	Fall, Spring, and Summer	Yes
MCB 404:	3	Bioethics	Advances in biomedical research will be reviewed and their ethical, social and legal implications discussed.	One year of college-level introductory biology	In-person, hybrid, online	Fall, Spring, Summer	Yes
BIOC 384	3	Foundations in Biochemistry	Structure and function of proteins, lipids, carbohydrates, and nucleic acids, with a focus on understanding the molecular function of essential biomolecules.	MCB 181R, and CHEM 142 or CHEM 152 or CHEM 105B or CHEM162, and CHEM 241A or CHEM 242A or CHEM 246A	In-person, online	Fall, Winter, Spring, Summer	Yes

BIOC 385	3	Metabolic Biochemistry	Fundamentals of metabolism and nucleic acid biochemistry at the cellular and organismal levels, with a focus on key pathways and regulatory mechanisms.	MCB 181R, and CHEM 142 or CHEM 152 or CHEM 105B or CHEM162, and CHEM 241A or CHEM 242A or CHEM 246A	In-person, online	Fall, Winter, Spring, Summer	Yes
ECOL 320	4	Genetics	The principles that govern the inheritance of all living organisms including molecular, chromosomal, organismal, population and evolutionary aspects of genetics. Extensive problem solving required.	MCB 181R, MCB 181L, ECOL 182R, ECOL 182L, CHEM 142 or CHEM 152 or CHEM 105B or CHEM162,	In-person, online	Fall, Summer	Yes
ECOL 326	3	Genomics	Introduction to the study of genomics and its relevance to molecular, cellular and organismal biology, human health and disease. This course integrates readings and discussions of current topics, and exercises that apply web-based computational tools for genome analysis.	ECOL 182R and ECOL 182L	In-person, online	Fall, Summer	Yes
ECOL 409	3	Evolution of Infectious Disease	Causes and consequences of evolutionary change in pathogens. Evolutionary principles, vertebrate immunity, molecular epidemiology, evolution of virulence, evolution of antimicrobial resistance, predicting epidemics, impacts of infectious disease on host evolution, HIV evolution.	MCB 181R, MCB 181L, ECOL 182R, ECOL 182L	Online	Spring, Summer, Winter	Yes
ECOL 437	4	Vertebrate Physiology	Basic principles of vertebrate physiology dealing particularly with physiological homeostasis maintained by interactions of complex organ systems.	MCB 181R, MCB 181L, ECOL 182R, ECOL 182L	Online	Summer	Yes

VIII. NEW COURSES NEEDED – using the table below, list any new courses that must be created for the proposed program. If the specific course number is undetermined, please provide level (i.e. CHEM 4**). Add rows as needed. Is a new prefix needed? If so, provide the subject description so Curricular Affairs can generate proposed prefix options.

No new courses are needed for this program.

IX. FACULTY INFORMATION- complete the table below. If UA Vitae link is not provided/available, attach a short CV (2-3 pages) to the end of the proposal or upload to the workflow form. UA Vitae profiles can be found in the [UA directory/phonebook](#). Add rows as needed. Delete the **EXAMPLE** rows before submitting/uploading. **NOTE: full proposals are distributed campus-wide, posted on committee agendas and should be considered “publicly visible”.** Contact [Office of Curricular Affairs](#) if you have concerns about CV information being “publicly visible”.

Faculty Member	Involvement	UA Vitae or Box link
Dr. Lisa Rezende	Director of Online Programs, Oversee and teach MCB 410 and 411, Program Assessment	https://profiles.arizona.edu/person/lrezende
Dr. Ryan Gutenkunst	Oversee Program Assessment	https://profiles.arizona.edu/person/rgutenk
Dr. Stephanie Capaldi	Teach MCB 422	https://arizona.box.com/s/jzuaz6zdqq1cj0lsq0vs0ny8yl55d2ui
Dr. Angel Pimentel	Teach MCB 404, MCB 410 and MCB 411	https://arizona.box.com/s/jzuaz6zdqq1cj0lsq0vs0ny8yl55d2ui

X. STUDENT LEARNING OUTCOMES AND CURRICULUM MAP – describe what students should know, understand, and/or be able to do after completing this certificate. Provided a detailed curricular map linking student outcomes to specific courses and class activities. Consider working with [Office of Instruction and Assessment](#) to create a curricular map using Taskstream.

Program Learning Outcomes:

Conceptual Outcome 1: Demonstrate understanding of the molecular and cellular mechanisms that apply to biomedicine, including how chemical principles govern the activity of life, how traits are inherited, and how phenotypes emerge from interactions among molecules and cells.

Conceptual Outcome 2: Apply understanding of molecular and cellular mechanism to novel scenarios in biomedicine.

Skill Outcome 1: Apply analytical thinking to biomedical problems involving cell and molecular biology data.

Skill Outcome 2: Communicate effectively about ideas and methods in cell and molecular biology as in a medical context.

Curriculum Map

Outcome	Conceptual Outcome 1: Demonstrate understanding of the molecular and cellular mechanisms that apply to biomedicine including how chemical principles govern the activity of life, how traits are inherited, and how phenotypes emerge from interactions among molecules and cells	Conceptual Outcome 2: Apply understanding of molecular and cellular mechanism to novel scenarios in biomedicine.	Skill Outcome 1: Apply analytical thinking to biomedical problems involving cell and molecular biology data	Skill Outcome 2: Communicate effectively about ideas and methods in cell and molecular biology as in a medical context.
Core Courses				
MCB 410: Cell Biology	Practiced	Practiced	Practiced	Practiced
MCB 411: Molecular Biology	Assessed	Assessed	Assessed	Assessed
Electives				
MCB 404 Bioethics			Practiced	
MCB 422 Problem Solving with Genetic Tools	Practiced	Practiced	Practiced	Practiced
BIOC 384 Fundamentals of Biochemistry	Practiced	Practiced		Practiced
BIOC 385 Metabolic Biochemistry	Practiced	Practiced		Practiced
ECOL 320 Genetics	Practiced	Practiced		Practiced

ECOL 326 Genomics	Practiced	Practiced	Practiced	Practiced
ECOL 409 Evolution of Infectious Disease	Practiced	Practiced		
ECOL 437 Vertebrate Physiology	Practiced	Practiced		

XI. ASSESSMENT PLAN FOR STUDENT LEARNING– identify factors that indicate that completion of the certificate enhances the undergraduate experience. Describe measures for programmatic assessment and provide a detailed plan for assessing certificate outcomes.

The program will be successful if students feel prepared for a career in health care or biomedical research, including application to graduate or professional schools, increased scores on standardized entrance exams, and help with deciding future career paths. Upon completing the certificate, students will complete an exit survey that will serve as an indirect assessment of program outcomes (see assessment plan below) and provide feedback on how the students’ undergraduate or non-degree seeking student experience has been enhanced by the completing the certificate. We will ask how well the certificate program helped them prepare for standardized entrance exams (e.g. MCAT), prepare for graduate or professional school, and prepare them for further careers. As we anticipate students to come from different majors, we will also ask how the certificate complemented and extended the coursework they completed for their major.

Assessment Plan

Outcome	Direct Assessment	Indirect Assessment
Conceptual Outcome 1: Demonstrate understanding of the molecular and cellular mechanisms that apply to biomedicine including how chemical principles govern the activity of life, how traits are inherited, and how phenotypes emerge from interactions among molecules and cells.	Assessment: Score on aligned questions from Gen-Bio Maps ¹ (GBM2, GBM 8, GBM 18, GBM 24, GBM 36, GBM 38, GBM 44, GBM 49) Target: 70% of students earn score of 70% or higher	Assessment: Student Exit Survey Target: 80% of students answered that the certificate program was “Very helpful” in preparing them to understand the molecular and cellular mechanisms that apply to biomedicine.
Conceptual Outcome 2: Apply understanding of molecular and cellular mechanism to novel scenarios in biomedicine.	Assessment: Score on aligned questions from Gen-Bio Maps ¹ (GMB 2, GBM 4, GBM 7, GBM 8, GMB 12, GBM 13, GBM 20, GBM 21, GBM 22, GBM 27,	Assessment: Student Exit Survey Target: 80% of students answered that the certificate program was “Very helpful” in

	GBM 32, GBM 33, GBM 37, GBM 40, GBM 54, GBM 61 Target: 70% of students earn score of 70% or higher	preparing them to apply molecular and cellular mechanism to novel scenarios in biomedicine.
Skill Outcome 1: Apply analytical thinking to biomedical problems involving cell and molecular biology data	Assessment: Score on aligned questions from Gen-Bio Maps ¹ (GBM 3, GBM 4, GBM 7, GBM 13, GBM 19, GBM 28, GBM 32, GBM 37, GBM 40, GBM 54, GBM 61) Target: 70% of students earn score of 70% or higher	Assessment: Student Exit Survey Target: 80% of students answered that the certificate program was “Very helpful” in preparing them to apply analytical thinking to biomedical problems involving cell and molecular biology data
Skill Outcome 2: Communicate effectively about ideas and methods in cell and molecular biology as in a medical context.	Direct Assessment: Score on MCB 411 capstone assignment which will be graded using the AACU Written Communication VALUE Rubric Target: 70% of students earn 70% or higher	Assessment: Student Exit Survey Target: 80% of students answered that the certificate program was “Very helpful” in preparing them to communicate effectively about ideas in cell and molecular biology in a medical context.

¹[GenBio-MAPS: A Programmatic Assessment to Measure Student Understanding of Vision and Change Core Concepts across General Biology Programs](#)

Brian A. Couch, Christian D. Wright, Scott Freeman, Jennifer K. Knight, Katharine Semsar, Michelle K. Smith, Mindi M. Summers, Yi Zheng, Alison J. Crowe, and Sara E. Brownell, CBE—Life Sciences Education 2019 18:1

XII. MARKETING AND RECRUITMENT - provide a detailed and robust marketing strategy for this certificate.

Main Campus Students: We plan to recruit main campus students by sending notices to students in MCB 181R and MCB 181L: Introduction to Biology I, a foundation course for life science majors. Approximately 2,000 students per year take this course. Recruiting fliers will also be sent to the pre-health advising center as well as academic advisors in relevant departments including. Chemistry and Biochemistry, Ecology and Evolutionary Biology, Physiology and Medical Science, Public Health, and Nutrition Sciences.

Arizona Online Students: This courses in the certificate are all offered online, making it ideal for Arizona Online students who wish to complete upper division biology courses. Arizona Online students will be recruited through our online asynchronous MCB 181R and MCB 181L: Introduction to Biology I, course.

XIII. CONTACTS AND ADMINISTRATION

- a. List the name and contact information for the primary point of contact for the certificate.

Dr. Lisa Rezende (lrezende@arizona.edu)

- b. List the name and contact information for the person or persons who will serve in the role of Director of Undergraduate Studies (DUS) for the certificate (this is not always the same as the DUS for affiliated programs or head of the managing academic unit.)

Dr. Lisa Nagy (lnagy@arizona.edu)

- c. If known, list the members of the certificate oversight committee for this certificate. *Note: undergraduate certificate oversight committees shall consist of a minimum of 3 members, 2 of which are faculty and at least one of the 2 is participating faculty in the certificate program. The oversight committee is responsible for 1) qualifications of participating faculty, 2) coordination of admissions recommendations with the Office of Admissions, and 3) curricular changes.*

The MCB Undergraduate Curriculum Committee will serve as the oversight committee for the Cell and Molecular Biology for Health Careers Certificate Program.

Dr. Lisa Nagy (chair)

Dr. Lisa Rezende (participating faculty in the certificate program)

Dr. Ryan Gutenkunst (participating faculty in the certificate program)

Dr. Daniela Zarnescu

Dr. Molly Bolger

Dr. Pascale Charest

Emily Dykstra

Justin Schneider (Advisor for certificate program)

Kara Dyson

Whitney DeGroot

Program Director/Main Proposer (print name and title): Dr. Lisa Rezende, Associate Professor of Practice (main proposer), Molecular and Cellular Biology

Main Proposer signature:

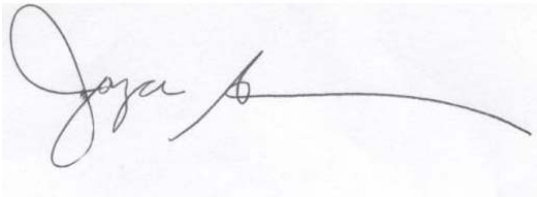
Date: 9/14/2021



Department Head (print name and title):

Department Head's signature: Dr. Joyce Schroeder, Professor and Head, Molecular and Cellular Biology

Date: 9-14-21



Associate/Assistant Dean (print name): Rebecca L. Gomez, Interim Associate Dean, College of Science

Associate/Assistant Dean's signature:

Date: 9/14/21



Dean (print name): Carmela Garziona, Dean, College of Science

Dean's signature: 9/14/21

Date:



For use by Curricular Affairs (Undergraduate):

Committee	Approval date
APS	
Undergraduate Council	
Undergraduate College Academic Administrators Council	

BUDGET PROJECTION FORM
Name of Proposed Program or Unit: Cell and Molecular Biology for Health Careers

Budget Contact Person: Barbara Johnson 520-621-7562 johnsonb@email.arizona.edu	Projected		
	1st Year 2021 - 2022	2nd Year 2022 - 2023	3rd Year 2024 - 2025
METRICS			
Net increase in annual college enrollment UG	30	60	100
Net increase in college SCH UG	360	720	1,200
Net increase in annual college enrollment Grad	-	-	-
Net increase in college SCH Grad	-	-	-
Number of enrollments being charged a Program Fee	-	-	-
New Sponsored Activity (MTDC)	-	-	-
Number of Faculty FTE	-	-	-
FUNDING SOURCES			
<u>Continuing Sources</u>			
UG RCM Revenue (net of cost allocation)	112,680	225,360	375,600
Grad RCM Revenue (net of cost allocation)	-	-	-
Program Fee RCM Revenue (net of cost allocation)	-	-	-
F and A Revenues (net of cost allocations)	-	-	-
UA Online Revenues	-	-	-
Distance Learning Revenues	-	-	-
Reallocation from existing College funds (attach description)	-	-	-
Other Items (attach description)	-	-	-
Total Continuing	\$ 112,680	\$ 225,360	\$ 375,600
<u>One-time Sources</u>			
College fund balances	-	-	-
Institutional Strategic Investment	-	-	-
Gift Funding	-	-	-
Other Items (attach description)	-	-	-
Total One-time	\$ -	\$ -	\$ -
TOTAL SOURCES	\$ 112,680	\$ 225,360	\$ 375,600
EXPENDITURE ITEMS			
<u>Continuing Expenditures</u>			
Faculty	-	-	-
Other Personnel (academic advisor)	6,018	9,026	15,044
Employee Related Expense	-	-	-
Graduate Assistantships	-	-	-
Other Graduate Aid	-	-	-
Operations (materials, supplies, phones, etc.)	-	-	-
Additional Space Cost	-	-	-
Other Items (attach description)	-	-	-
Total Continuing	\$ 6,018	\$ 9,026	\$ 15,044
<u>One-time Expenditures</u>			
Construction or Renovation	-	-	-
Start-up Equipment	-	-	-
Replace Equipment	-	-	-
Library Resources	-	-	-
Other Items (attach description)	-	-	-
Total One-time	\$ -	\$ -	\$ -
TOTAL EXPENDITURES	\$ 6,018	\$ 9,026	\$ 15,044
Net Projected Fiscal Effect	\$ 106,662	\$ 216,334	\$ 360,556

Undergraduate Certificate Peer Comparison Chart- Select two peers for completing the comparison chart from (in order of priority) [ABOR-approved institutions](#), [AAU members](#), and/or other relevant institutions recognized in the field. The comparison chart will be used to identify typically required coursework, themes, and experiences for certificate programs within the discipline. The comparison programs are not required to have the same certificate name as the proposed UA program. Information for the proposed UA program must be consistent throughout the proposal documents. Delete **EXAMPLE columns** once ready to submit/upload.

Certificate name, institution	Proposed UA Program: Cell and Molecular Biology for Health Careers	Peer 1: Georgia Tech Biological Science Certificate Program in Biomedical Sciences	Peer 2: Indiana University Certificate in Human Biology
Current# of enrolled students			
Certificate program description	<p>Cell and Molecular Biology for Biomedical Careers: This undergraduate certificate program is designed for students who want to supplement their major course work with additional courses in molecular biology, cell biology, biochemistry, and genetics. Courses in the certificate program meet the requirements for upper-division biology electives needed for some</p>	<p>From: https://biosciences.gatech.edu/undergrad/biological-sciences-certificates</p> <p>Certificate programs in Biology and Physiology are available to students from any major. For Biology majors, the Certificate program is a way of customizing your Biology Electives to focus on a particular concentration in biology. For other majors, a Biology or Physiology certificate is a way of enhancing your degree to include an emphasis in biological concepts.</p>	<p>From: https://humanbio.indiana.edu/student-portal/certificate.html</p> <p>The Certificate in Human Biology is a 28-29 credit hour interdisciplinary program within the College of Arts and Sciences. The objectives are to provide students an introduction to the biological sciences relevant to the understanding of human biology, and consider ethical issues related to human biology.</p>

	professional and graduate schools. Students completing the certificate will have a strong foundation in the basic science needed to pursue a career in biomedicine or health care.		
Target careers	- Health careers - Biomedical Sciences	-Biomedical sciences	-Health science -Business -Law -Life science research
Minimum total units required	12	12	28
Minimum upper-division units required	12	9	10
Total transfer units that may apply to certificate	6	Major electives can be counted toward certificates, but courses required by name and number in a student's major program of study will not be counted toward certificates."	3
List any special requirements to declare/admission to this certificate (completion of specific coursework, minimum GPA, interview, application, etc.)	<ol style="list-style-type: none"> 1. MCB 181R, MCB 181L, ECOL 182R, ECOL 182L or equivalent courses 2. Consent of department 	<p>"To declare a certificate in Biology, select 12 credits that correspond to the desired certificate. Approved courses are listed below by certificate title. Students must also complete and submit a certificate application two weeks prior to the end of their last term."</p>	<ol style="list-style-type: none"> 1. Minimum cumulative GPA of 2.7 2. Minimum cumulative GPA of 3.0 in the certificate program
Certificate requirements. List all	Core:	For the biomedical certificate, any 12 units from: BIOS 3753 Human Anatomy	Required:

<p>certificate requirements including core and electives. Courses listed must include course prefix, number, units, and title. Mark new coursework (New). Include any limits/restrictions needed (house number limit, etc.).</p>	<p>MCB 410 Cell Biology (3 units) MCB 411 Molecular Biology (3 units)</p> <p>Elective: MCB 422: Problem Solving with Genetic Tools (4 units) MCB 404: Bioethics (3 units) BIOC 384: Foundations in Biochemistry (3 units) BIOC 385: Metabolic Biochemistry (3 units) ECOL 320 Genetics (4 units) ECOL 326 Genomics (3 units) ECOL 409 Evolution of Infectious Disease (3 units) ECOL 437 Vertebrate Physiology (4 units)</p>	<p>BIOS 3754 Anatomy Lab BIOS 3755 Human Physiology BIOS 3756 Physiology Lab BIOS 4150 Genomics and Applied Bioinformatics BIOS 4400 Human Neuroanatomy BIOS 4340 Medical Microbiology BIOS 4464 Developmental Biology BIOS 4401 Experimental Design and Statistical Methods BIOS 4464 Developmental Biology BIOS 4570 Immunology BIOS 4607 Molecular Microbiology BIOS 4651 Bioethics BIOS 4668 Eukaryotic Molecular Genetics BIOS 4520 Health, Genes, and Society BMED 3100 Systems Physiology BMED 3110 Quantitative Engineering Physiology Laboratory BMED 4400 Neuroengineering Fundamentals BMED 4500 Cell and Tissue Engineering Laboratory. PSYC 3020 Biopsychology</p>	<p>BIOL L112 (3) Introduction to Biology; Biological Mechanisms BIOL L211 (3) Molecular Biology MSCI M131 (3) Human Body and Disease ANAT A215 (5) Basic Human Anatomy REL R373 (3) Religion, Ethics, and Medicine HUBI B480 (1) E-portfolio Capstone Course</p> <p>Options: PHSL P215 (5) Basic Human Physiology or BIOL P451 (4) Integrative Human Physiology BIOL L350 (3) Environmental Biology or ANTH B370 (3) Human Variation PSY P201 (3) An Introduction to Neuroscience or PSY P315 (3) Developmental Psychology or PSY P326 (3) Behavioral Neuroscience</p>
<p>Internship, practicum, applied course requirements (Yes/No). If yes, provide description.</p>	<p>No</p>	<p>No</p>	<p>No</p>
<p>Additional requirements (provide description)</p>	<p>None</p>		<p>Program Retrospective</p> <p>From: https://humanbio.indiana.edu/career-</p>

			<p>preparation/program-retrospective.html</p> <p>“All students majoring in Human Biology or earning a Human Biology Certificate complete a Program Retrospective in HUBI B400 in their senior year. We also encourage them to create a LinkedIn professional profile, highlighting the skills they have accrued in the Human Biology Program.</p> <p>The Program Retrospective is a 5-7 page narrative that demonstrates your intellectual, personal, and professional growth during your time as a HUBI major at Indiana University. Your narrative should showcase evidence of your competency in relation to the Learning Goals of the Human Biology Program”</p>
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*Note: comparison of additional relevant programs may be requested.

January 22, 2021

Dear Members of Curricular Affairs, Undergraduate Council (UGC), and College Academic Administrators Council (CAAC):

The Department of Ecology and Evolutionary Biology supports the proposal for the *Cell and Molecular Biology for Pre-Health Careers Undergraduate Certificate Program*. We agree to have the following courses included as electives for the certificate:

- ECOL 320 Genetics (4 units)
- ECOL 326 Genomics (3 units)
- ECOL 409 Evolution of Infectious Disease (3 units)
- ECOL 437 Vertebrate Physiology (4 units)

These courses are offered throughout the year and have the capacity to enroll any additional students in the certificate program who wish to take them.

Sincerely,



Dr. Michael Worobey
Department Head, Ecology and Evolutionary Biology
Louise Foucar Marshall Science Research Professor
College of Science
(520) 626-3456
worobey@email.arizona.edu





THE UNIVERSITY OF ARIZONA
COLLEGE OF SCIENCE
COLLEGE OF MEDICINE TUCSON
**Chemistry
& Biochemistry**

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January 27, 2021

Dear Members of Curricular Affairs, Undergraduate Council (UGC), and College Academic Administrators Council (CAAC)

The Department of Chemistry and Biochemistry supports the proposal for the Cell and Molecular Biology for Pre-Health Careers Undergraduate Certificate Program. We agree to have the following courses included as electives for the certificate:

- BIOC 384: Foundations in Biochemistry (3 units)
- BIOC 385: Metabolic Biochemistry (3 units)

Both courses are offered throughout the year and have the capacity to enroll any additional students in the certificate program who wish to take the course(s).

Sincerely,

Craig Aspinwall, Ph.D.
Interim Department Head

