

FORM TO REQUEST SUBSTANTIAL CHANGES TO AN EXISTING UNDERGRADUATE MINOR

A request for substantial changes to an existing program requires approval from the school director/department head (managing administrator), college academic dean, Curricular Affairs, Undergraduate Council (UGC), and College Academic Administrators Council (CAAC). Additional approvals may be required, depending on the requested changes.

I. Requested by (College & School/Department):

College of Science/Department of Planetary Sciences

II. Proposer's name, title, email and phone number:

Mark Marley, Head of Department of Planetary Sciences, (marley@lpl.arizona.edu), 621-8623

III. Minor name and number of students enrolled in the minor: Undergraduate Astrobiology Minor, 20**IV. Describe proposed changes to the minor. Provide a rationale and explanation for making changes to the minor and include any relevant supporting data. Are changes being made to the corresponding major (if applicable)?**

Since the 2017 update, a new course has been added: MCB 437- Life in Extreme Environments, taught by new a faculty member, Solange Duhamel, who specializes in astrobiology. The new course offers curriculum that falls in line with current astrobiology research and practice. This course will be added to the choices for minor core courses.

Additionally, ASTR 406- The Nature and Origins of Life has been removed from the curriculum as this inactive course is no longer taught at the University of Arizona.

We also propose introducing lower division coursework to the astrobiology curriculum. Adding a lower division GenEd course is a good gateway to beginning and establishing interest in a minor degree program.

- V. **Comparison Chart**—complete the chart below using your existing [academic advisement report](#). You may not need to complete all portions. Highlight row(s) indicating the proposed significant changes. You can find course information to help complete the chart below by using the [UA course catalog](#) or [UAnalytics](#) (Catalog and Schedule Dashboard> “Printable Course Descriptions by Department” On Demand Report; right side of screen). Proposed changes resulting in similar curriculum with other plans (within department, college, or university) may require completion of an additional comparison chart. **Delete Example columns before submitting.**

	Existing Minor Requirements	Proposed Minor Requirements
Minor name	Astrobiology	Astrobiology
CIP code—lookup here or contact the Office of Curricular Affairs for assistance, if needed	30.0101	30.0101
Total units required to complete the minor	18	18
Upper -division units required to complete the minor	18	15
Total transfer units that may apply to this minor	9	9
List any special requirements to declare or gain admission to this minor (completion of specific coursework, minimum GPA to declare, workshop attendance, application, etc.)	Interview with an astrobiology advisor.	Interview with an astrobiology advisor.
Minor requirements. List all minor requirements including core and electives. Courses listed must include prefix, number, units, and title. Mark new coursework (New). Include any limits/restrictions in place/needed (house number limit, etc.). Provide email(s)/letter(s) of support from home department head(s) for courses being added and are not owned by your department. Recommend ordering requirements in the same order as your advisement report.	<p>Complete 3 core courses:</p> <p>MCB 315 (3) <i>Key Concepts in Quantitative Biology</i></p> <p>ASTR 406 (3) <i>The Nature and Origins of Life</i></p> <p>ASTR 488 (3) <i>Astrochemistry</i></p> <p>ASTR 475 (3) <i>Planetary Astrobiology</i></p> <p>PTY5 450 (3) <i>Origin of the Solar System and Other Planetary Systems</i></p> <p>GEOS 484 (3) <i>The Coevolution of Earth and the Biosphere</i></p> <p>Need 9 units of the following, or seek approval from an astrobiology minor advisor.</p> <p>The Astrobiology Minor elective courses:</p>	<p>Complete 3 core courses:</p> <p>MCB 315 (3) <i>Key Concepts in Quantitative Biology</i></p> <p>MCB 437 (3) <i>Life in Extreme Environments (New)</i></p> <p>ASTR 488 (3) <i>Astrochemistry</i></p> <p>ASTR 475 (3) <i>Planetary Astrobiology</i></p> <p>PTY5 450 (3) <i>Origin of the Solar System and Other Planetary Systems</i></p> <p>GEOS 484 (3) <i>The Coevolution of Earth and the Biosphere</i></p> <p>Need 9 units of the following, or seek approval from an astrobiology minor advisor.</p> <p>The Astrobiology Minor elective courses:</p>

	<p>ASTR 300A (3) <i>Astronomy & Astrophysics</i></p> <p>ASTR 403 (3) <i>Physics of the Solar System</i></p> <p>ASTR 442 (3) <i>Mars</i></p> <p>BIOC 462A (4-5) <i>Biochemistry</i></p> <p>BIOC 462B (4-5) <i>Biochemistry</i></p> <p>CHEM 400B (3) <i>Chemical Measurements Laboratory</i></p> <p>CHEM 480A (3) <i>Physical Chemistry I</i></p> <p>CHEM 480B (3) <i>Physical Chemistry II</i></p> <p>CHEM 481 (3) <i>Biophysical Chemistry</i></p> <p>CMM 479 (3) <i>Art of Scientific Discovery</i></p> <p>ECOL 380 (3) <i>Math Models in Biology</i></p> <p>ECOL 408L (2) <i>Genes, Biotechnology and the Environment</i></p> <p>ECOL 421 (3) <i>Philosophy of the Biological Sciences</i></p> <p>ECOL 426 (3) <i>Population Genetics</i></p> <p>ECOL 438 (3) <i>Biogeography</i></p> <p>ECOL 453 (3) <i>Functional and Evolutionary Genomics</i></p> <p>ECOL 465 (3) <i>Phylogenetic Biology</i></p> <p>ECOL 479 (3) <i>Art of Scientific Discovery</i></p> <p>ECOL 496N (2-4) <i>Non-Linear Dynamics of Biological Systems</i></p>	<p>PTYS 214 (3) <i>Astrobiology OR ASTR 202 (3) <i>Life in the Universe (New)</i></i></p> <p>ASTR 300A (3) <i>Astronomy & Astrophysics</i></p> <p>ASTR 403 (3) <i>Physics of the Solar System</i></p> <p>ASTR 442 (3) <i>Mars</i></p> <p>BIOC 462A (4-5) <i>Biochemistry</i></p> <p>BIOC 462B (4-5) <i>Biochemistry</i></p> <p>CHEM 400B (3) <i>Chemical Measurements Laboratory</i></p> <p>CHEM 480A (3) <i>Physical Chemistry I</i></p> <p>CHEM 480B (3) <i>Physical Chemistry II</i></p> <p>CHEM 481 (3) <i>Biophysical Chemistry</i></p> <p>CMM 479 (3) <i>Art of Scientific Discovery</i></p> <p>ECOL 380 (3) <i>Math Models in Biology</i></p> <p>ECOL 408L (2) <i>Genes, Biotechnology and the Environment</i></p> <p>ECOL 421 (3) <i>Philosophy of the Biological Sciences</i></p> <p>ECOL 426 (3) <i>Population Genetics</i></p> <p>ECOL 438 (3) <i>Biogeography</i></p> <p>ECOL 453 (3) <i>Functional and Evolutionary Genomics</i></p> <p>ECOL 465 (3) <i>Phylogenetic Biology</i></p>
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	ENVS 425 (3) <i>Environmental Microbiology</i>	ECOL 479 (3) <i>Art of Scientific Discovery</i>
	GEOG 438 (3) <i>Biogeography</i>	ECOL 496N (2-4) <i>Non-Linear Dynamics of Biological Systems</i>
	GEOS 302 (4) <i>Principles of Stratigraphy and Sedimentation</i>	ENVS 425 (3) <i>Environmental Microbiology</i>
	GEOS 403 (3) <i>Physics of the Solar System</i>	GEOG 438 (3) <i>Biogeography</i>
	GEOS 426A (6) <i>Research Methods in Aquatic Sciences</i>	GEOS 302 (4) <i>Principles of Stratigraphy and Sedimentation</i>
	GEOS 430 (3) <i>The Chemical Evolution of the Earth</i>	GEOS 403 (3) <i>Physics of the Solar System</i>
	GEOS 438 (3) <i>Biogeography</i>	GEOS 426A (6) <i>Research Methods in Aquatic Sciences</i>
	GEOS 442 (3) <i>Mars</i>	GEOS 430 (3) <i>The Chemical Evolution of the Earth</i>
	GEOS 466 (3) <i>Stable Isotope Geochemistry and Paleoclimate</i>	GEOS 438 (3) <i>Biogeography</i>
	GEOS 478 (3) <i>Global Climate</i>	GEOS 442 (3) <i>Mars</i>
	GEOS 497K (3) <i>Dendroecology</i>	GEOS 466 (3) <i>Stable Isotope Geochemistry and Paleoclimate</i>
	MCB 396I (2) <i>Career Exploration and Professional Development</i>	GEOS 478 (3) <i>Global Climate</i>
	MCB 414 (3) <i>Science and Theology</i>	GEOS 497K (3) <i>Dendroecology</i>
	MCB 479 (3) <i>Art of Scientific Discovery</i>	MCB 396I (2) <i>Career Exploration and Professional Development</i>
	MIC 425 (3) <i>Environmental Microbiology</i>	MCB 414 (3) <i>Science and Theology</i>
	PHIL 421 (3) <i>Philosophy of the Biological Sciences</i>	MCB 479 (3) <i>Art of Scientific Discovery</i>
	PHYS 403 (3) <i>Physics of the Solar System</i>	MIC 425 (3) <i>Environmental Microbiology</i>
	PTYS 403 (3) <i>Physics of the Solar System</i>	PHIL 421 (3) <i>Philosophy of the Biological Sciences</i>
	PTYS 407 (3) <i>Chemistry of the Solar System</i>	PHYS 403 (3) <i>Physics of the Solar System</i>
	PTYS 442(3) <i>Mars</i>	

		PTYS 403 (3) <i>Physics of the Solar System</i> PTYS 407 (3) <i>Chemistry of the Solar System</i> PTYS 442(3) <i>Mars</i>
Internship, practicum, applied course requirements. (Yes/No). If yes, provide description.	No	No
Senior thesis or senior project required (Yes/No). If yes, provide description.	No	No
Additional requirements (provide description)	n/a	n/a

VI. Peer institution comparison- describe how your modified minor requirements are similar and different from minor requirements of two peer institutions. Select peers from (in order of priority) [ABOR approved institutions](#), [AAU members](#), and/or other relevant institutions recognized in the field.

University of Kansas: <https://catalog.ku.edu/liberal-arts-sciences/physics-astronomy/minor-astrobiology/#requirementstext>

Penn State: <https://bulletins.psu.edu/undergraduate/colleges/intercollege/astrobiology-minor/#programrequirementstext>

Both University of Kansas and Penn State have similar programs with comparable numbers of units and core courses in three to four different departments. The University of Kansas requires 18 units of coursework, 12 of which must be upper division. They require a mix of Biology, Geology, Astronomy, and optional Chemistry coursework. Penn State requires 18-19 units of coursework, 6 of which must be upper division. They require a mix of Biology, Astronomy, Geoscience/ Earth Science, and optional Biochemistry coursework.

The University of Arizona will require 18 units of coursework, 15 of which must be upper division. Our core coursework comes from Molecular and Cellular Biology, Astronomy, Geosciences, and Planetary Sciences with electives chosen from those departments as well as options for coursework from Chemistry/Biochemistry and Ecology and Evolutionary Biology. Our program is unique in that a minimum GPA of 3.0 is required in the minor coursework.

VII. Faculty impact-indicate if new faculty hires will be required to deliver the proposed modified/new curriculum.

None. These courses are taught regularly in the College of Science.

VIII. Budgetary Impact- indicate new resources needed and source of funding to implement the proposed changes. If reallocating resources, indicate where resources will be taken from and the impact this will have on students/faculty/program/unit.

No new resources are needed.

Email approvals for ASTR 202 (Department of Astronomy) and MCB 437 (Department of Molecular and Cellular Biology) are included at the end of this submission.

IX. Required signatures

Managing unit administrator (print name and title): Mark Marley, Dept. Head PTYS

Managing administrator's signature:  Date: 10/14/21

Managing unit administrator (print name and title): _____

Managing administrator's signature: _____ Date: _____

Dean (print name): Rebecca L Gomez

Dean's signature:  Date: 10/14/21

Dean (print name): _____

Dean's signature: _____ Date: _____

Note: In some situations, signatures of more than one unit head and/or college dean may be required.

For use by Curricular Affairs:

Committee	Approval date
Academic Programs Subcommittee	
Undergraduate Council	
College Academic Administrators Council	

- Notify proposers of approval
- Upload proposal documents to relevant plan table values
- Notify ADVIP team, include proposers

If name change requested & approved:

- Create approval memo
- Send memo to college/dept and acad_org listserv
- Create new plan code
- Add last admit term to previous plan code
- Upload proposal documents to relevant plan table values
- Notify ADVIP team, include proposers

Brenton, Amy Pearl - (apbrenton)

Subject: FW: Astrobio meeting notes from 6/24

From: Schroeder, Joyce A - (joyces) <joyces@arizona.edu>

Sent: Thursday, August 26, 2021 8:06 AM

To: Duhamel, Solange - (duhamel) <duhamel@arizona.edu>; Marley, Mark S. - (marksmarley) <marksmarley@arizona.edu>

Cc: Brenton, Amy Pearl - (apbrenton) <apbrenton@arizona.edu>; Reiners, Peter W - (reiners) <reiners@arizona.edu>; Apai, Daniel - (apai) <apai@arizona.edu>; Aspinwall, Craig A - (aspinwal) <aspinwal@arizona.edu>; Carrapa, Barbara - (bcarrapa) <bcarrapa@arizona.edu>; Dante Lauretta <lauretta@lpl.arizona.edu>; Ferriere, Regis H J - (regisf) <regisf@arizona.edu>; Gomez, Rebecca L - (rgomez) <rgomez@arizona.edu>; Hamilton, Christopher W - (chamilton) <chamilton@arizona.edu>; Impey, Christopher D - (cimpey) <cimpey@arizona.edu>; Monti, Oliver L A - (monti) <monti@arizona.edu>; Quade, Jay - (quadej) <quadej@arizona.edu>; Worobey, Michael - (worobey) <worobey@arizona.edu>; Zega, Thomas J - (tzega) <tzega@arizona.edu>; Ziurys, Lucy M - (lziurys) <lziurys@arizona.edu>; lclose@as.arizona.edu

Subject: Re: Astrobio meeting notes from 6/24

Hi everyone,

I wanted to clarify what MCB can offer for the Astrobiology minor, either as a core course or as an elective:

MCB 445 will not be taught any longer, as we no longer have faculty available to teach it. I have asked the college for another astrobiology hire, and based on this discussion, the earliest this would result in a new astrobiology course being taught would be in 4 years, so we should remove it from our discussion for now.

Fortunately, we have MCB 437 (Solange's course on Life in Extreme Environments) which is taught every year and would be an excellent fit for the minor, either as a core or as an elective. She sent around the syllabus in her last email, please let us know if you agree. If other biology courses are needed for the astrobiology minor, let me know and we can discuss whether any of our other coursework would be appropriate.

Thanks

Joyce

Joyce Schroeder, PhD
Professor and Head, Molecular and Cellular Biology
University of Arizona

1007 E Lowell St 444
Tucson AZ 85721
520-626-1384
joyces@arizona.edu

From: Duhamel, Solange - (duhamel) <duhamel@arizona.edu>

Date: Wednesday, August 25, 2021 at 7:59 PM

Brenton, Amy Pearl - (apbrenton)

Subject: FW: ASTR 202 astrobiology minor concurrence needed

Begin forwarded message:

From: Xiaohui Fan <xfan@email.arizona.edu>
Subject: Re: ASTR 202 astrobiology minor concurrence needed
Date: October 8, 2021 at 10:49:49 AM MST
To: "Jannuzi, Buell Tomasson - (buelljannuzi)" <buelljannuzi@arizona.edu>
Cc: "Marley, Mark S. - (marksmarley)" <marksmarley@arizona.edu>

Hi Buell, Mark,

Sorry that it took a while for Laird et al. to look into this and discuss with Amy. We are all good from our side to list ASTR202 as an Astrobiology minor elective.

Thanks!

Xiaohui

On Sep 24, 2021, at 9:52 AM, Jannuzi, Buell Tomasson - (buelljannuzi) <buelljannuzi@arizona.edu> wrote:

Hi Mark,
I need Xiaohui (Associate Head) to check that this is ok — I expect it is, but I am not up on the current details from the faculty proving the program. Xiaohui, are you current or can check with Laird, Lucy, Daniel et al.?
Thanks,
Buell

Begin forwarded message:

From: "Marley, Mark S. - (marksmarley)" <marksmarley@arizona.edu>
Date: September 24, 2021 at 12:43:05 PM EDT
To: "Jannuzi, Buell Tomasson - (buelljannuzi)" <buelljannuzi@arizona.edu>
Cc: "Brenton, Amy Pearl - (apbrenton)" <apbrenton@arizona.edu>
Subject: ASTR 202 astrobiology minor concurrence needed

Buell, We would need a short email from you agreeing to listing ASTR202 as an Astrobiology minor course. See below for details.

Begin forwarded message:

From: "Brenton, Amy Pearl - (apbrenton)"
<apbrenton@arizona.edu>
Subject: astrobiology minor update
Date: September 21, 2021 at 12:36:27 PM EDT
To: "Marley, Mark S. - (marksmarley)"
<marksmarley@arizona.edu>

Hi Mark,

I am working on getting the paperwork to get MCB 437 put into the Astrobiology minor core coursework. There was also some discussion about adding PTYS 214 or ASTR 202 as elective courses. I wasn't sure what the consensus ended up being. It is easy to add them to the paperwork if we are adding them. I can make sure they are added as PTYS 214 **or** ASTR 202 so that students can only get credit for taking one since the courses have a lot of similarities.

We do have to provide a letter or email of support for any courses we are adding that are not owned by our department.

I'm attaching the form as I have it filled out so far. Please let me know what you would like changed.

Thanks,
Amy

Amy Brenton, MA

Academic Advisor
Lunar and Planetary Laboratory
THE UNIVERSITY OF ARIZONA
[Schedule an Appointment](#)

Gerard P. Kuiper Space Sci., 321
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Pronouns: she/her
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[facebook](#) | [twitter](#) | [instagram](#) |

<image002.png><image004.png><Astrobiology Request for Curricular Changes Form - Minors_for 2021.docx>

Xiaohui Fan
Regents' Professor of Astronomy
Associate Department Head
Department of Astronomy/Steward Observatory
University of Arizona
Tucson, AZ 85721 - 0065

Email: fan@as.arizona.edu
URL: <http://sancerre.as.arizona.edu/~fan>
Tel: 520-626-7558
Twitter: @xfan_astro
Pronouns: he/him/his

To: Marley, Mark S. - (marksmarley) <marksmarley@arizona.edu>

Cc: Brenton, Amy Pearl - (apbrenton) <apbrenton@arizona.edu>, Reiners, Peter W - (reiners) <reiners@arizona.edu>, Apai, Daniel - (apai) <apai@arizona.edu>, Aspinwall, Craig A - (aspinwal) <aspinwal@arizona.edu>, Carrapa, Barbara - (bcarrapa) <bcarrapa@arizona.edu>, Dante Laurretta <laurretta@lpl.arizona.edu>, Ferriere, Regis H J - (regisf) <regisf@arizona.edu>, Gomez, Rebecca L - (rgomez) <rgomez@arizona.edu>, Hamilton, Christopher W - (chamilton) <chamilton@arizona.edu>, Impey, Christopher D - (cimpey) <cimpey@arizona.edu>, Monti, Oliver L A - (monti) <monti@arizona.edu>, Quade, Jay - (quadej) <quadej@arizona.edu>, Schroeder, Joyce A - (joyces) <joyces@arizona.edu>, Worobey, Michael - (worobey) <worobey@arizona.edu>, Zega, Thomas J - (tzega) <tzega@arizona.edu>, Ziurys, Lucy M - (lziurys) <lziurys@arizona.edu>, lclose@as.arizona.edu <lclose@as.arizona.edu>

Subject: Re: Astrobio meeting notes from 6/24

Hi Mark,

I have been discussing with Joyce and Amy the idea of making my MCB 437 "Life in extreme environments" the core course replacing Betul's MCB 445 for the Astrobiology Undergraduate Minor Program. Indeed I think it makes the most sense to replace a MCB class by another one so that we keep a core "biology" component in the Astrobiology curriculum. Both agree this would be a good idea so I am now passing to the rest of the group to get your opinion. I attached the syllabus for your reference.

Please let me know if you have questions.

Thank you,
Solange