ARIZONA STATE UNIVERSITY

PROPOSAL TO ESTABLISH A NEW UNDERGRADUATE CERTIFICATE

The completed and signed proposal should be submitted by the Dean's Office to: curriculumplanning@asu.edu.

Before academic units can advertise undergraduate certificates or include them in their offerings as described in the university catalogs, they must be recommended for approval by the Senate Curriculum and Academic Programs Committee and the University Senate, and be approved by the Office of the University Provost.

Definition and minimum requirements:

These are the minimum requirements for approval. Individual undergraduate certificates may have additional requirements.

An undergraduate certificate is a programmatic or linked series of courses from a single field or one that crosses disciplinary boundaries and may be free-standing or affiliated with a degree program. The certificate provides a structured and focused set of courses that can be used to enhance a student's baccalaureate experience or professional development.

An undergraduate certificate program:

- Requires a minimum of 15 semester hours of which at least 12 semester hours must be upper division
- Requires a minimum grade of "C" or better for all upper division courses
- Consists of courses that must directly relate in whole or large part to the purpose of the certificate. Example: Geographic area certificates must include only courses specific to the title of the certificate, other than a non-English language
- Is cross disciplinary; or,
    - Certified by a professional or accredited organization/governmental agency; or,
    - Clearly leads to advanced specialization in a field; or,
    - Is granted to a program that does not currently have a major

College/School/Institute: College of Liberal Arts and Sciences

Department/Division/School: School of Geographical Sciences and Urban Planning

Proposed Certificate Name: Atmospheric Sciences

Requested effective Date: 2017-18

Delivery method: On-campus only (ground courses and/or iCourses)

Note: Once students elect a campus or On-line option, students will not be able to move back and forth between the on-campus and the ASU Online options. Approval from the Office of the Provost and Philip Regier (Executive Vice Provost and Dean) is required to offer programs through ASU Online.

Campus/Locations:
Indicate all locations where this program will be offered.

☐ Downtown Phoenix ☐ Polytechnic ☒ Tempe ☐ Thunderbird ☐ West Other:

Proposal Contact

Name:	Dr. Randall Cerveny	**Title:**	President's Professor
Phone number:	480-390-2646	**Email:**	cerveny@asu.edu

DEAN APPROVAL(S)

This proposal has been approved by all necessary unit and College/School levels of review. I recommend implementation of the proposed organizational change.

College/School/Division Dean name: PAUL LEPORE

Signature [signature] **Date:** APRIL 12, 2017 / /20

College/School/Division Dean name:
(if more than one college involved)

Signature _____ **Date:** / /20

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

PROPOSAL TO ESTABLISH A NEW UNDERGRADUATE CERTIFICATE

1. Overview

A. Provide a brief description of the new certificate.

This certificate represents coursework associated with the requirements for certification as a meteorologist by the National Weather Service (NWS). The certificate alone will not fulfill the NWS requirements for certification as a meteorologist; however, students will receive substantial instruction and practice in meteorology/climatology from the School of Geographical Sciences and Urban Planning. Completion of the program associated with the certificate gives our students acknowledgement of skill sets (GIS and meteorological instrumentation) beyond those existing at other programs around the country (e.g., University of Oklahoma, Pennsylvania State University) and makes our students more competitive for meteorology related positions.

B. This proposed certificate (check one):

- ☐ Is cross disciplinary; or
- ☐ Is certified by a professional or accredited organization/governmental agency; or,
- ☒ Clearly leads to advanced specialization in a field; or,
- ☐ Is granted to a program that does not currently have a major.

C. Why should this be a certificate rather than a concentration or a minor?

The proposed plan of study in Atmospheric Sciences is best offered as a certificate program rather than a minor or concentration due to the nature of the coursework comprising the curricular structure and the student populations that would be interested in pursuing the program. The primary source of students for the program would be majors in the Meteorology-Climatology concentration of the Geography BS degree. These students are already participating in a concentration, and therefore would be unable to complete the program if it were approved as a concentration. The proposed program is also unsuited to be offered as a minor because the primary student population (Geography BS [Meteorology-Climatology] majors) would be ineligible to complete the minor program because a single course (GPH 412) of the proposed program is also required by the Geography BS (Meteorology-Climitology) degree. Offering the proposed program as a certificate remedies this issue as courses within a certificate program are allowed to "share" with majors.

Additionally, offering the program as a certificate would allow students to graduate from ASU with a Geography (Meteorology-Climatology) BS degree and subsequently return to complete the Atmospheric Sciences certificate and obtain the necessary coursework to qualify for employment with the National Weather Service. This statement also applies to meterorology-climatology students who have previously graduated from ASU and wish to return to complete coursework required by the National Weather Service for employment. Offering the program as a certificate gives this population the opportunity to complete the course of study without the necessity of also gaining admission to a bachelor's degree program for which there would be no purpose to completing.

D. Affiliation

If the certificate program is affiliated with a degree program, include a brief statement of how it will complement the program. If it is not affiliated with a degree program, incorporate a statement as to how it will provide an opportunity for a student to gain knowledge or skills not already available at ASU.

The proposed Atmospheric Sciences certificate program will be affiliated with the School of Geographical Sciences and Urban Planning (SGSUP) Bachelor of Science in Geography (Meteorology – Climatology concentration) degree program. Because of the current growing number of required classes associated with certification as a Meteorologist by the National Weather Service (e.g., a suite of meteorology classes in Dynamics and Synoptics as well as four semesters of calculus and two semesters of calculus-based physics), we designed this certificate program to provide a means for students to be able to take all of the required and the additional recommended classes specified by the National Weather Service needed for certification as an Operational Meteorologist.

E. Demand

Explain the need for the new certificate (e.g., market demand, interdisciplinary considerations).

The course load associated with the meteorologist certification for the National Weather Service (NWS) exceeds the limits of our normal ASU undergraduate Bachelor of Science major. Therefore, the creation of an "atmospheric sciences" certificate allows our students to graduate with an ASU Bachelor of Science degree, combined with this certificate, and thus be eligible to work as a meteorologist with the National Weather Service. Only a limited number of university programs around the country meet the certification requirements of the NWS and consequently this certificate combined

with our undergraduate Bachelor of Science degree allows us to be one of those programs.

F. Projected enrollment
What are enrollment projections for the first three years?

	1st Year	**2nd Year** (Yr. 1 continuing + new entering)	**3rd Year** (Yr. 1 & 2 continuing + new entering)
Number of Students (Headcount)	18	28	35

2. Support and Impact

A. Faculty governance
Provide a supporting letter from the chair of the academic unit verifying that the proposed certificate 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.

Please see attached letter of support from Dr. Trisalyn Nelson, Director of the School of Geographical Sciences and Urban Planning.

B. Other related programs
Identify other related ASU programs and outline how the new certificate will complement these existing ASU programs. (If applicable, statements of support from potentially-affected academic unit administrators need to be included with this proposal submission.)
- Cronkite Journalism/CLAS Geography BS (Meteorology - Climatology) Concurrent Major Program
A concurrent program between College of Liberal Arts and Sciences' School of Geographical Sciences and Urban Planning and Cronkite School of Journalism allows students to achieve a degree that will aid them in obtaining jobs in Broadcast Meteorology. This certificate program will add to their portfolios in order to compete successfully for such jobs.

- Geography BS
Many Bachelor of Science students in the School of Geographical Sciences and Urban Planning do not necessarily wish to become meteorologists but desire to have a background that will help them in competing successfully for meteorological-related fields. For example, BS students in the school have successfully been placed in Air Traffic Control positions, energy positions (e.g., Salt River Project Water/Power Utility and Arizona Public Service Power). This certificate will add to their resumes and to their skill sets in order to better compete successfully for such jobs.

- Urban Climate Research Center
The School of Geographical Sciences and Urban Planning's new program, the Urban Climate Research Center, is focused on research into major elements of climate and meteorology's impact on urban centers. This certificate will provide necessary skill sets for undergraduate students to be able to work with the new research professors at the UCRC and conduct important and critical investigation of urban climate.

C. Letter(s) of support
Provide a supporting letter from each college/school dean from which individual courses are taken.

3. Academic Curriculum and Requirements

A. Knowledge, competencies, and skills

List the knowledge, competencies, and skills (learning outcomes) students should have when they complete this proposed certificate. Examples of program learning outcomes can be found at (http://www.asu.edu/oue/assessment.html).

Learning Outcome #1: Students completing the Atmospheric Sciences certificate program will apply numerical calculation and conceptual understanding of meteorological (short-term weather) research skills, such as calculation of evaporation and wind advection.

- Measure #1: Research exercise in GPH 412 Physical Meteorology.

- Criterion: calculation of hydrometeorological transfer with a 70% comprehension is deemed as mastering the material.

- Measure #2: Final exam in GPH 412 Physical Meteorology for conceptual understanding of meteorological skills.

- Criterion #1: accurately calculating the potential and actual evaporation rates using an evaportranspiration equation with a 70% comprehension is deemed as mastering the material.

- Criterion #2: sufficiently explaining a given optics situation (halo or rainbox) in terms of the hydrologic/solar processes creating them with a 70% comprehension is deemed as mastering the material.

Learning Outcome #2: Students completing the Atmospheric Sciences certificate program will apply numerical calculation and conceptual understanding of climatological (long-term weather) research skills, such as calculation of solar/terrestrial fluxes.

- Measure #1: Research exercise in GPH 412 Physical Meteorology.

- Criterion: completion of specific exercise (calculation of the Solar/Terrestrial radiative fluxes) with a 70% comprehension is deemed as mastering the material.

- Measure #2: Final exam in GPH 412 Physical Meteorology for conceptual understanding of climatological skills.

- Criterion #1: accurately describing the basic underlying configuration of a global climate model with a 70% comprehension is deemed as mastering the material.

- Criterion #2: accurately calculating all energy balance terms for a given location/time sequence with a 70% comprehension is deemed as mastering the material.

B. Admissions criteria

List the admissions criteria for the proposed certificate. If they are identical to the admission criteria for the existing major and degree program under which this certificate will be established, please note that here.

Applicants must be admitted to an undergraduate degree program or already have a bachelor's degree from ASU or another institution in order to enroll in the certificate. Applicants who have completed GPH 111 Introduction to Physical Geography, MAT 271 Calculus with Analytic Geometry II, and PHY 121 University Physics I: Mechanics with a grade of "C" (2.00 on a 4.00 scale) or better may complete this certificate.

C. Curricular structure

Provide the curricular structure for this certificate. Be specific in listing required courses and specify the total minimum number of hours required for the certificate.

Required certificate courses

Prefix	Number	Title	Is this a new Course?	Credit Hours
GPH	212	Introduction to Meteorology	No	3
GPH	213	Climate and Weather	No	3
GPH	412	Physical Meteorology	No	3
GPH	413	Meteorological Instruments and Measurement	No	3
GPH	414	Climate Change	No	3

MAT	275	Modern Differential Equations	No	3
			Section sub-total:	18

Elective certificate courses

Prefix	Number	Title	Is this a new Course?	Credit Hours
GIS	311	Geographic Information Science II	No	4
GIS	341	Introduction to Cartography and Georepresentation	No	3
GIS	351	Air Photo Interpretation	No	3
			Section sub-total:	3-4

Other certificate requirements

E.g. – Capstone experience, internship, clinical requirements, field studies, foreign language skills as applicable	Credit Hours
N/A	0
Section sub-total:	0
Total minimum credit hours required for certificate	**21**

D. Minimum residency requirement
How many hours of the certificate must be ASU credit?
6

E. New Courses
Provide a brief course description for each new course.
N/A

Note: All new required courses should be submitted in Curriculum Changemaker and ready for Provost's Office approval before this certificate is put on Curriculum and Academic Programs Committee (CAPC) agenda.

4. Administration and Resources

A. Administration

How will the proposed certificate be administered (including admissions, student advisement, retention, etc.)?

The proposed Atmospheric Sciences certificate will be administered via the School of Geographical Sciences & Urban Planning undergraduate advising office. The undergraduate advisors will be responsible for: 1) verifying student admissions eligibility to the proposed certificate program; 2) advising students regarding academic requirements of the proposed certificate program; and 3) general retention/persistence/graduation of students from the proposed certificate program.

B. Resources

What are the resource implications for the proposed certificate, including any projected budget needs? Will new books, library holdings, equipment, laboratory space and/or personnel be required now or in the future? If multiple units/programs will collaborate in offering this certificate please discuss the resource contribution of each participating program. Letters of support must be included from all academic units that will commit resources to this certificate.

No new or additional resources are necessary for the proposed certificate.

C. Primary Faculty

List the primary faculty participants regarding this proposed certificate. For interdisciplinary certificates, please include the relevant names of faculty members from across the University.

Name	**Title**	**Area(s) of Specialization as they relate to proposed certificate**
Randall Cerveny	President's Professor	Climate Change (GPH414), meteorology (GPH212/412), Climatology (GPH213)
Robert Balling	Professor	Climate Change, Energy Balance (GPH412), GIS
David Sailor	Professor	Climate Change (GPH414), Energy Balance (GPH412)
Matei Georgescu	Associate Professor	Meteorology (GPH212, GPH 412), Climatology (GPH213, GPH414)
David Hondula	Assistant Professor	Climate Change (GPH414), Meteorology (GPH412/412), Climatology (GPH213)
Nancy Selover	Research Professor, State Climatologist	Meteorological Instrumentation (GPH413)

5. Additional Materials

A. Complete and attach the Appendix document.

B. Provide one or more model programs of study (if appropriate).

C. Attach other information that will be useful to the review committees and the Office of the Provost.

PROVOST OFFICE APPROVAL(S)

This proposal has been approved by all necessary Provost office levels of review. I recommend implementation of the proposed organizational change.

Office of the University Provost

Signature **Date:** / /20

Note: An electronic signature, email, or a PDF of the signed signature page is acceptable.

APPENDIX

OPERATIONAL INFORMATION FOR UNDERGRADUATE CERTIFICATES

(This information is used to populate the Degree Search/catalog website.

Please consider the student audience in creating your text.)

A. **Proposed Certificate Name:**
Atmospheric Sciences

B. Description (150 words maximum)
The certificate program coursework is associated with the requirements for certification as a meteorologist by the National Weather Service. Students will achieve skill sets in GIS and meteorological instrumentation, which is beyond the scope of study in the undergraduate program in meteorology-climatology at the School of Geographical Science and Urban Planning. Additional work will be required for national-level certification with the National Weather Service.

Marketing Text**:** (50 words maximum)
The atmospheric sciences certificate program is designed to provide our students with extensive knowledge of the study and practice of meteorology and climatology and advanced skills, making them competitive for meteorological-related positions in their primary field of study.

C. **Contact and Support Information**

Building Name, code and room number: *(Search ASU map)*	COOR 5671
Program office telephone number: (*i.e. 480/965-2100*)	480/965-7533
Program Email Address:	geoplan@asu.edu
Program Website Address:	https://geoplan.asu.edu

D. **Program Requirements:** Provide applicable information regarding the program such as curricular restrictions or requirements, specific course lists, or academic retention requirements.

The certificate requires a minimum of 21 credit hours with a grade of "C" (2.00 on a 4.00 scale) or higher. At least 12 of the 21 credit hours must be upper-division courses.

Required Courses: (18 credit hours)
GPH 212 Introduction to Meteorology, SQ (3)
GPH 213 Climate and Weather, SQ (3)
GPH 412 Physical Meteorology (3)
GPH 413 Meteorological Instruments and Measurement (3)
GPH 414 Climate Change, G (3)
MAT 275 Modern Differential Equations, MA (3)

Electives: (3-4 credit hours; select one course)
GIS 311 Geographic Information Science II, CS (4)
GIS 341 Introduction to Cartography and Georepresentation, CS (3)
GIS 351 Air Photo Interpretation (3)

Depending on a student's undergraduate program of study, prerequisite courses may be needed in order to complete the requirements of this certificate.

E. **Additional Admission Requirements** If applicable list any admission requirements (freshman and/or transfer) that are higher than and/or in addition to the university minimum undergraduate admission requirements.)
Applicants must have completed GPH 111 Introduction to Physical Geography, MAT 271 Calculus with Analytic Geometry II, and PHY 121 University Physics I: Mechanics with a grade of "C" or better (2.00 on a 4.00 scale).

A student pursuing an undergraduate certificate must be enrolled as a degree-seeking student at ASU. Undergraduate certificates are not awarded prior to the award of an undergraduate degree. A student already holding an undergraduate degree may pursue an undergraduate certificate as a nondegree-seeking graduate student.

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

*Note**:** Once students elect a campus or On-line option, students will not be able to move back and forth between the on-*

campus and the ASU Online options. Approval from the Office of the Provost and Philip Regier (Executive Vice Provost and Dean) is required to offer programs through ASU Online.

G. **Campus/Locations:**

Indicate **all** locations where this program will be offered.

☐ Downtown Phoenix ☐ Polytechnic ☒ Tempe ☐ Thunderbird ☐ West Other:

School of Geographical Sciences and Urban Planning
Arizona State University

March 22, 2017

RE: Proposal to Establish an Undergraduate Certificate in Atmospheric Sciences

To the College of Liberal Arts and Sciences Curriculum Committee:

This letter is written in support of the submitted petition to establish an Undergraduate Certificate in Atmospheric Sciences. The School of Geographical Sciences and Urban Planning has the necessary resources to support the certificate as presented in the proposal without impacting core program resources.

The proposal has been fully approved according to the policy of the School of Geographical Sciences and Urban Planning. The faculty of the School of Geographical Sciences and Urban Planning approved the proposal and the curriculum for the certificate during the March 21st faculty meeting.

Respectfully,

Dr. Trisalyn Nelson
Director, School of Geographical Sciences and Urban Planning
University Foundation Professor
Arizona State University

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