THE UNIVERSITY OF ARIZONA

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. General Information

a. Proposed Title of Certificate: Data Science and Visualization Certificate -- Undergraduate

b. CIP Code: 11.0101, Computer and Information Sciences, General

c. Anticipated first admission term: Spring, 2020

II. Requested by The School of Information, College of Social & Behavioral Sciences

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.

Undergraduate Major and Minor in Information Science and eSociety, Major in Information Science and Technology, and Major in Information Science and Arts

IV. Certificate Description The The 13-credit hour Data Science and Visualization Certificate will provide undergraduate students the confidence and training they need in data collection, exploration, manipulation and storage, analysis, and presentation in order to navigate data-rich workplace environments. The certificate will signal to employers that students have dedicated the time and energy necessary to develop the skills and confidence for tackling messy, real-world data problems using modern programming languages. The Certificate will service a diverse student population, training both 1) technically-minded students the nuances associated with successfully developing and scommunicating data methods and results, and 2) less technically-minded students the basic skills necessary for gathering insights from data. The Certificate will require students to

complete either an introductory data science or statistics course, a data mining course covering some of the more advanced algorithms used for gaining insight into and predicting from big data, and one elective course advancing their knowledge of how data science is conducted in research and business settings.

V. Purpose

The Data Science and Visualization Certificate is distinct in its accessability for students from across domains, fields, and disciplines at the University. It serves students who may or may not bring experience or prerequisites required of many data-oriented courses and programs on campus.

VI. Target Audience(s)

This program serves students from across the university, and specifically those without the math, information science, or computer science background some expect of data scientists. The required courses are designed to build skills and knowledge in these areas alongside the associated data skills.

i. This certificate meets the needs of many of our industry parterns, ranging from multi-billion dollar insurance companies to local tech startups.

ii. If a student chooses to do so, they might major in any of the three information science degrees housed in the School of Information at the University of Arizona – the certificate provides and introductory pathway into any of these three degrees:

Undergraduate Major and Minor in Information Science and eSociety

Major in Information Science and Technology

Major in Information Science and Arts

VII. 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.

Minimum total units required ***minimum 12 units***	13
Minimum upper-division units required ***minimum 6 units of credit must be upper division UA coursework***	6
Total transfer units that may apply to the certificate.	3
List any special requirements to declare/admission to this certificate	none
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:** **Complete 3 courses (10 units):** Either ESOC 214 Introduction to Data Science (3) OR ISTA 116 Statistical Foundations for the Information Age (3) and ISTA 321 Data Mining and Discovery (4) ISTA 322 Data Engineering (3) **Electives: Complete 3 units from the following:** ESOC 302 Quantitative Methods for the Digital Marketplace (3) ESOC 414 Computational Social Science (3) ISTA 130: Computational Thinking and Doing (Python) (4) ISTA 331: Principles and Practice of Data Science (3) ISTA 355: Introduction to Natural Language Processing (3) ISTA 429: Applied Cyberinfrastructure Concepts (3)

	ISTA 421 Introduction to Machine Learning (3) ISTA 457: Neural Networks (3)
Internship, practicum, applied course requirements (Yes/No). If yes, provide description.	none
Additional requirements (provide description)	none
Any double-dipping restrictions (Yes/No)? If yes, provide description. ***A maximum of 6 units may double-dip with a degree requirement (major, minor, General Education) or second certificate.***	None distinct or beyond the University max of 6 units.

VIII. **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.

IX.

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)

ESOC 214	3	Introduction to Data Science	As data continue to grow in volume and penetrate everything we do in contemporary work across many professions, employers are seeking data scientists to extract meanings and patterns from large quantities of data. This user-friendly course will provide an introduction to a variety of skills required for data analytics in organizations, education, health contexts, and the sciences. Specifically, this course examines information management in the context of massive sets of data, provides students proficiency with a variety of data analysis tools, and exposes learners to varied data platforms as well as skills and concepts related to data mining and statistical analysis. Particular attention will be given to toolkits imbedded in R and other platforms.		Online and in person	Fall and Spring	Proposed from dept. housing this course
ESOC 302	3	Quantitative Methods for the Digital Marketplace	This course will explore broad research paradigms and theoretical approaches that inform contemporary social research, varying study designs, as well as the systematic methods utilized in differing types of data analyses. Though this course will introduce research processes across the academic spectrum, quantitative analysis of both small and large data sets will be emphasized. Therefore, students will learn about basic statistical analyses and will be introduced to the emerging worlds of data science and social media	Junior or Senior ESOC and ISTA majors and minors only.	Online and in person	Fall and Spring	Proposed from dept. housing this course

			analytics. Students will also consider related topics such as data visualization or research presentations.				
ESOC 414	3	Computational Social Science	This course will guide students through advanced applications of computational methods for social science research. Students will be encouraged to consider social problems from across sectors, like health science, education, environmental policy and business. Particular attention will be given to the collection and use of data to study social networks, online communities, electronic commerce and digital marketing. Students will consider the many research designs used in contemporary social research and will learn to think critically about claims of causality, mechanisms, and generalization in big data studies.	ESOC 214 or ISTA 116 or equivalent, or consent of instructor.	In person	Fall and Spring	Proposed from dept. housing this course
ISTA 116	3	Statistical Foundations for the Information Age	Understanding uncertainty and variation in modern data: data summarization and description, rules of counting and basic probability, data visualization, graphical data summaries, working with large data sets, prediction of stochastic outputs from quantitative inputs. Operations with statistical computer packages such as R.	PPL 60+ or SAT I MSS 640+ or ACT MATH 26+ or MATH 107, 112, 113, 116, 120, 120R, 122B, 124, 125, 129, or 223.	In person	Fall and Spring	Proposed from dept. housing this course
ISTA 130	4	Computational Thinking and Doing	An introduction to computational techniques and using a modern programming language to solve current problems drawn from science, technology, and the arts. Topics include control structures, elementary				

			data structures, and effective program design and implementation techniques. Weekly laboratory.				
ISTA 321	4	Data Mining and Discovery	This course will introduce students to the theory and practice of data mining for knowledge discovery. This includes methods developed in the fields of statistics, large-scale data analytics, machine learning and artificial intelligence for automatic or semi-automatic analysis of large quantities of data to extract previously unknown interesting patterns. Topics include understanding varieties of data, classification, association rule analysis, cluster analysis, and anomaly detection. We will use software packages for data mining, explaining the underlying algorithms and their use and limitations. The course include laboratory exercises, with data mining case studies using data from biological sequences and networks, social networks, linguistics, ecology, geo-spatial applications, marketing and psychology.	ISTA 116 or equivalent; or consent of instructor.	Online and in person	Fall and Spring	Proposed from dept. housing this course
ISTA 322	3	Data Engineering	This course will be inviting for a wide variety of students from across disciplines, and they will learn how to use industry standard tools and practices to make large data sets usable for scientists and other decision makers. From data collection and preparation, to the creation of big data stores, databases, or systems to make data flow, this course will focus on the practical work needed to	ISTA 130 or equivalent	In person	Spring	Proposed from dept. housing this course

			prepare big data for analyses across contexts. Students will be introduced to a variety of technical tools for data management, storage, use, and manipulation.				
ISTA 331	3	Principles and Practice of Data Science	ISTA 331 explores the ideas and techniques that businesspersons and scientists alike use to exploit data in order to create knowledge and make money. Topics and projects may include recommender systems (which powered Amazon's rise to global retail dominance), spam filters (the first machine learning application that affected our daily lives), topic extraction from documents, and an introduction to neural networks.	ISTA 116 and ISTA 131	In person	Fall and Spring	Proposed from dept. housing this course
ISTA 355	3	Introduction to Natural Language Processing	Natural language processing (NLP) is the study of how we can teach computers to use language by extracting knowledge from text, and then use that knowledge in some meaningful way. In this introductory course, we will examine the fundamental components on which natural language processing systems are built, including frequency distributions, part of speech tagging, syntactic parsing, semantics and analyzing meaning, search, introductory information and relation extraction, and structured knowledge resources. We will also examine pragmatic concerns in processing raw text from real-world sources.	Requires ISTA 350 or CSC 345. Must have not taken LING/CSC 439/539			

ISTA 429	3	Applied Cyberinfrastructure Concepts	Students will learn from experts from projects that have developed widely adopted foundational Cyberinfrastrcutrue resources, followed by hands-on laboratory exercises focused around those resources. Students will use these resources and gain practical experience from laboratory exercises for a final project using a data set and meeting requirements provided by domain scientists. Students will be provided access to computer resources at: UA campus clusters, iPlant Collaborative and at NSF XSEDE. Students will also learn to write a proposal for obtaining future allocation to large scale national resources through XSEDE.		In person	Fall and Spring	Proposed from dept. housing this course
ISTA 421	3	Introduction to Machine Learning	Machine learning describes algorithms which can modify their internal parameters (i.e., "learn") to recognize patterns and make decisions based on examples or through interaction with the environment. This course will introduce the fundamentals of machine learning, will describe how to implement several practical methods for pattern recognition, feature selection, clustering, and decision making for reward maximization, and will provide a foundation for the development of new machine learning algorithms.	ISTA 311, MATH 129, and MATH 313, or equivalent, or consent of instructor. ISTA 116 or comparable is recommended.	In person	Fall and Spring	Proposed from dept. housing this course
ISTA 457	3	Neural Networks	Neural networks are a branch of machine learning that combines a large number of simple computational	ISTA 350 or CSC 345 or	In person	Fall and Spring	Proposed from dept.

			units to allow computers to learn from and generalize over complex patterns in data. Students in this course will learn how to train and optimize feed forward, convolutional, and recurrent neural networks for tasks such as text classification, image recognition, and game playing.	NSCS 344, or ECE 275 or equivalent, or consent of instructor.			housing this course

X. 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 (ie 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.

None

Click or tap here to enter text.

XI. Faculty & Resources

a. **Current Faculty -** 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 Martin Marquez if you have concerns about CV information being "publicly visible".**

Steven Bethard, PhD	Information, Teaches ISTA 116, ISTA 457, and other courses	https://profiles.arizona.edu/person/bethard
Nick DiRienzo, PhD	Information, Teaches ESOC 214, ISTA 321, and other courses	https://ischool.arizona.edu/sites/ischool.arizona.edu/files/DiRienzo_CV_8_26_2019.pdf
Peter Jansen, PhD	Information, Teaches ISTA 355, Introduction to Natural Language Processing	https://profiles.arizona.edu/person/pajansen

Clayton Morrison, PhD	Information, Teaches introduction to machine learning	https://profiles.arizona.edu/person/claytonm
Yotam Shmargad, PhD	Political Science, Teaches Computational Social Science	https://sgpp.arizona.edu/sites/sgpp.arizona.edu/files/CV-Yotam-Shmargad.pdf
Rich Thompson, PhD	Information, teaches ISTA 130, ISTA 331 and also a wide a variety of courses in the School of Information	https://ischool.arizona.edu/sites/ischool.arizona.edu/files/RichThompsonCV%20%281%29.pdf

b. **Additional Faculty –** Describe the additional faculty needed during the next three years for the initiation of the program and lis the anticipated schedule for addition of these faculty members.

None

c. **Library Acquisitions Needed –** Describe additional library acquisitions needed during the next three years for the successful initiation of the program.

None

d. **Physical Facilities & Equipment -** Assess the adequacy of existing physical facilities and equipment available for the proposed certificate. Include special classrooms, laboratories, physical equipment, computer facilities, etc. Describe additional physical facilities and equipment that will be required or are anticipated during the next three years for the proposed program.

None

e. **Other Support -** Describe other support currently available for the proposed certificate. Include support staff, university and non-university assistance. List additional staff and other assistance needed for the next three years.

None

f. **Marketing & Recruitment** - Provide a detailed and robust marketing strategy for this certificate.

Girls Who Code (local high school girls bussed in by the iSchool for a Saturday coding event
free using an existing event, 20 new-to-UA students per year (maybe students who otherwise may not have chosen UA.
Undergraduate Major Fair
free, 30 students per year
Hack Arizona https://hackaz.io/
free, 30 students per year
UA libraries data science workshops with Jeff Oliver
free, 20 students per year
GE courses in data science across the campus – in class visits about the value of the undergrad certificate
free, 30 students per year

g. **Financial -** Provide a copy of the budget for the certificate including start-up costs and the anticipated costs for the first three years. Include some indication of how this fits with the overall department budget.

XII. Student Learning Outcomes and Assessment – describe what students should know, understand, and/or be able to do after completing this certificate, and how student outcomes will be assessed.

In completing the Certificate, students will

- Obtain practical experience using a variety of data science techniques and software applications.
- Gain hands-on experience working with real-world data sets drawn from science, social media, and business.
- Build on basic statistical and programming knowledge to become familiar with the tools utilized for advanced work in today's data-rich landscape.

Topics covered:
Dealing with Data
- Types of Data
- Data Quality and Preprocessing
- Measures of Similarity and Dissimilarity

Exploring Data
- Summary Statistics
- Visualization

Core Algorithms and Techniques
- Classification
- Regression

- Cluster Analysis
- Anomaly Detection
- Parametric and non-parametric methods
- Cross-validation

Assessment Plan
Student Learning Outcomes will be assessed annually through
- Data-related projects, presentations, and visualizations produced relative to students' coursework.
- Regular survey of skills, abilities, and responsibilities of program graduates and employers of the graduates.

XIII. Certificate Outcomes and Assessment– 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.

Certificate Outcomes
Factors indicating that the Certificate leads to gainful employment and/or advancement include:
- offers of employment to interns at their place of internship,

employment at a desirable position (as articulated by the student) within one year of earning the certificate,
promotion in professional settings within two years of earning the certificate, and
long-term satisfaction with working conditions (2, 5, and 10 years out from earning the certificate).
Indication from annual surveys of our former students that the certificate was a factor in their employment success.

Assessment Plan
Certificate Outcomes will be assessed
annually through an outgoing survey of Certificate Students regarding the above factors.
annually through a survey of employers as identified by those who earned the certificate.

XIV. Certificate Demand

a. Anticipated Enrollment and General Demand:

Generally, a 112% increase in career placement opportunities is expected for data science degrees generally from now until 2023 (Looking Glass data). Data visualization in particular is projected to bring an increase in job placement of more than 72% over time. These numbers represent national trends, but also hold true when examining Arizona employment opportunites in particular.

This certificate program will target:

- returning students already working wanting to improve their skills and/or increase their eligibility for promotion,
- students interested in augmenting their current degree program with this particular skill set (e.g., this is a great certificate to add to a major like Sociology, Geography, or Retail).

Initially, we will target students in our own programs (e.g., BA in Info. Sci./eSoc, BA in Info. Sci./Arts, BS in Info. Sci./Tech) that have already one of the required certificate courses, since they will only need to take two more courses to complete the certificate.

3-Year Projected Annual Enrollment:

- 1st Year, 5 Certificates Awarded
- 2nd Year, 10 Certificates Awarded
- 3rd Year, 20 Certificates Awarded

General Demand

Students, generally, are living amid a massive shift in the amount of data we can save, use, analyze, and visualize – the Arizona region and students nationally thus need to be prepared for life and work in this data-driven economy:

- The data volumes are exploding, more data has been created in the past two years than in the entire previous history of the human race.
- Data is growing faster than ever before and by the year 2020, about 1.7 megabytes of new information will be created every second for every human being on the planet.
- By then, our accumulated digital universe of data will grow from 4.4 zettabyets today to around 44 zettabytes, or 44 *trillion* gigabytes.
- Every second we create new data. For example, we perform 40,000 search queries every second (on Google alone), which makes it 3.5 searches per day and 1.2 trillion searches per year.
- In Aug 2015, over 1 billion people used Facebook **FB +1.31%** in a single day.
- Facebook users send on average 31.25 million messages and view 2.77 million videos every minute.
- We are seeing a massive growth in video and photo data, where every minute up to 300 hours of video are uploaded to YouTube alone.
- In 2015, a staggering 1 trillion photos will be taken and billions of them will be shared online. By 2017, nearly 80% of photos will be taken on smart phones.

Source: http://www.forbes.com/sites/bernardmarr/2015/09/30/big-data-20-mind-boggling-facts-everyone-must-read/#22f2f71c6c1d

b. Needs Served by the Certificate

From a recent paper US Bureau of Labor Statistics called "working with big data": *The growth in big data will continue to expand the kinds of work that use this information. As mentioned previously, BLS does not collect data specifically about data 8 Occupational Outlook Quarterly • Fall 2013 scientists. Instead, BLS classifies these workers as statisticians or computer programmers or in other occupations. In May 2012, BLS data for wage and salary workers show that there were 25,570 statisticians and 316,790 computer programmers. These occupations had median annual wages of $75,560 and $74,280, respectively— more than double the median annual wage of $34,750 for all workers in May 2012. In fact, wages in mathematics- and computer-related occupations continue to outpace wages in other occupations. According to BLS Occupational Employment Statistics data, median annual wages in these occupations were $76,270 in May 2012, more than double the median wage for all occupations. BLS projects both statisticians and computer programmers to have average employment growth between 2010 and 2020. Statistician, a relatively small occupation, is projected to add about 3,500 new jobs over the decade. The larger occupation of computer programmer is projected to add about 43,700 new jobs during the same period. Workers who use big data are employed by many kinds of institutions and in many different industries: government, businesses, financial institutions, healthcare, scientific research facilities, colleges and universities, and others. The collection and use of big data continues to expand in all of these.*

- Arizona predictions show that computing and math-related position numbers are on the rise, data analytics and visualization are computational and mathematical processes, statistics in a big-data world:
- 2014 - 2024 Estimated Increase for Arizona:

- Computer and Mathematical 0.22%, 26,009 jobs
- Business and Financial Operations 0.17%, 34,773 jobs https://laborstats.az.gov/employment-forecasts
- Data scientists will enjoy one of the brightest job outlooks of all IT occupations through 2020. Data science and analytics is home to a substantial – and fast-growing – talent gap in the IT workforce, meaning there are more job openings than qualified data scientists to fill them.
- 63% of IT executives polled in a 2011 study by leading IT service firm EMC, suggests the demand for data scientists will significantly outpace (31%) or outpace (32%) the supply of talent through 2018. Another comprehensive report from the McKinsey Global Institute forecasts a shortage of up to 190,000 data scientists in the U.S. by 2018.
- Data- and big-data scientists are sought-after at today's top high-tech and social media giants. Search your favorite job boards for "data analyst" or "big data" and you're likely to see companies such as Facebook, LinkedIn, Groupon, Spotify & Amazon seeking fresh talent. These businesses amass incredible amounts of raw data, and understand well the game-changing advantages that await the first-movers to capitalize on the big data explosion.
- Health care is another hot area for data scientist hiring; with its widespread and ongoing migration to electronic patient records, the medical industry is building data sets to rival the largest enterprises. Other industries aggressively hiring big data scientists include government agencies, social networking hubs, big-box retailers and the U.S. military.

Sources:
EMC Data Scientist Study, 2011
McKinsey Global Institute Big Data Report, 2011

Related Positions:
Data Associate
Data Analyst
Data Scientist
Business Analyst
Business Data Analyst
Market Research Analyst
Predictive Analytics Professional
Data Architect
Data Analyst
Big Data Scientist
BI Analyst
BI Engineer
Data Engineer

Data Mining Engineer

Local worksites for data-trained students include:
IBM Research
Rosetta Stone
Apple Computer
Adobe
Air Force Research Labs (Mesa AZ)
State Farm
American Express

Similar programs:

- ASU Applied Business Data Analytics Certificate: https://wpcarey.asu.edu/undergraduate-degrees/business-analytics-certificate
- See: Arizona State University will now certify you in big data analytics, http://www.techrepublic.com/article/arizona-state-university-will-now-certify-you-in-big-data-analytics/
- Also, see: Data Analysis Online Courses for Pima Community College- Northwest Students, http://college.usatoday.com/pccn/online-courses-data-analysis

C. Collaborations
There will be no collaborations with other departments or universities for this certificate program other than donated courses toward this program if depts. choose to do so.

XV. Contacts and Administration

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

Catherine Brooks, Director, iSchool, cfbrooks@email.arizona.edu

Amy C. Kimme Hea
Associate Dean, Academic Affairs and Student Success

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.) Diana Daly, Director of Undergraduate Studies, didaly@email.arizona.edu

THE UNIVERSITY OF ARIZONA

BUDGET PROJECTION FORM

Name of Proposed Program or Unit:

	Projected		
Budget Contact Person:	**1st Year** 2020 - 2021	**2nd Year** 2021- 2022	**3rd Year** 2022- 2023
METRICS			
Net increase in annual college enrollment UG	5	10	20
Net increase in college SCH UG	45	90	180
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			
Continuing Sources			
UG RCM Revenue (net of cost allocation)			
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	**$ -**	**$ -**	**$ -**
One-time Sources			
College fund balances	500	250	250
Institutional Strategic Investment			
Gift Funding			
Other Items (attach description)			
Total One-time	**$ 500**	**$ 250**	**$ 250**
TOTAL SOURCES	**$ 500**	**$ 250**	**$ 250**
EXPENDITURE ITEMS			
Continuing Expenditures			
Faculty			
Other Personnel			
Employee Related Expense			
Graduate Assistantships			
Other Graduate Aid			
Operations (materials, supplies, phones, etc.)			
Additional Space Cost			
Other Items (attach description)			
Total Continuing	**$ -**	**$ -**	**$ -**
One-time Expenditures			
Construction or Renovation			
Start-up Equipment			
Replace Equipment			
Library Resources			
Other Items (attach description)	500	250	250
Total One-time	**$ 500**	**$ 250**	**$ 250**
TOTAL EXPENDITURES	**$ 500**	**$ 250**	**$ 250**
Net Projected Fiscal Effect	**$ -**	**$ -**	**$ -**

From: Florian, Jim - (florianj)
To: Marquez, Martin - (martinmarquez)
Subject: Re: Feedback: Undergraduate Certificate in Data Science and Visualization
Date: Tuesday, January 21, 2020 3:51:21 PM
Attachments: image001.png

Hi Martin,
Good to go.
Jim

On Jan 21, 2020, at 3:19 PM, Marquez, Martin - (martinmarquez) <martinmarquez@email.arizona.edu> wrote:

> Hi Jim,
>
> Could you confirm that the budget pieces are all good to go? Normally we would have certificates go through UAccess (like majors and minors). However, these were stalled due to the moratorium and the committees wanted to expedite them.
>
> Please let me know!
>
> Best,
> Martin
>
> **From:** Marquez, Martin - (martinmarquez)
> **Sent:** Tuesday, January 21, 2020 3:03 PM
> **To:** Brooks, Catherine F - (cfbrooks) <cfbrooks@email.arizona.edu>; Carlson, Stephanie L - (scarlson) <scarlson@email.arizona.edu>
> **Cc:** Florian, Jim - (florianj) <florianj@arizona.edu>; Kimme Hea, Amy C - (kimmehea) <kimmehea@email.arizona.edu>; Chavez, Kathryn - (kathrync) <kathrync@email.arizona.edu>; Burleson, Win - (win) <win@email.arizona.edu>
> **Subject:** RE: Feedback: Undergraduate Certificate in Data Science and Visualization
> **Importance:** High
>
> Hi Catherine,
>
> Thanks for sending us the two updated certificate proposals. I am including the proposals merged with the budget projection forms to this email. I made a couple of small edits for the certificate in data science and visualization. The ISTA 321 course is 4 units (I removed my comment that was left on the final draft), bringing the total minimum for the certificate to 13. I changed the impacted fields to reflect that minimum (page 3 and 7).
>
> I have added the proposals to the Academic Programs Subcommittee January 28 meeting agenda. The certificates would be the fifth and sixth action items on the agenda. I estimate the presentation time to be 4:10 pm. This is an estimated time and the actual time could be a bit earlier or later, depending on the discussion taking place

From: Kimme Hea, Amy C - (kimmehea)
To: Marquez, Martin - (martinmarquez)
Cc: Salazar, Ricky M - (ricar22)
Subject: RE: Feedback: Undergraduate Certificate in Data Science and Visualization
Date: Tuesday, January 21, 2020 3:57:59 PM
Attachments: image002.png

Dear Martin,

Yes, you have our approval for these certificates.

All best,

Amy

Amy C. Kimme Hea, PhD
Associate Dean, Academic Affairs & Student Success
College of Social and Behavioral Sciences
Douglass Building, Room 200W
PO Box 210028
University of Arizona
Tucson, AZ 85721.0028
520.621.1112

From: Marquez, Martin - (martinmarquez) <martinmarquez@email.arizona.edu>
Sent: Tuesday, January 21, 2020 3:07 PM
To: Kimme Hea, Amy C - (kimmehea) <kimmehea@email.arizona.edu>
Cc: Salazar, Ricky M - (ricar22) <ricar22@email.arizona.edu>
Subject: FW: Feedback: Undergraduate Certificate in Data Science and Visualization
Importance: High

Hi Amy,

Hope you had a nice weekend.

Just want to confirm that the college approves the two certificates. We have your original signature from the original requests, but changes have been made to the proposals since, so we just want to reaffirm (and document college approval). Your confirmation through email works.

Thanks!

Best,
Martin

From: Marquez, Martin - (martinmarquez)