A THE UNIVERSITY OF ARIZONA.

UNDERGRADUATE EMPHASIS (SUB-PLAN) REQUEST FORM MAJORS WITHOUT EXISTING EMPHASES (SUB-PLANS)

Requests for the creation of a new emphasis requires approval from the school director/department head (managing administrator), college academic dean, Curricular Affairs, Undergraduate Council (UGC), and College Academic Administrators Council (CAAC). Complete this form (for each proposed emphasis) and submit to the <u>Office of Curricular Affairs</u>, no later than January 31, 2021 to be considered for inclusion in the 2021-2022 Academic Catalog.

- I. Requested by (College & School/Department): Social and Behavioral Sciences, School of Information
- II. Proposer's name, title, email and phone number: Dr. Catherine Brooks <u>cfbrooks@arizona.edu</u> 520-621-3565
- III. Degree, major and number of students currently enrolled in the major (include dual majors): Enrolled in term: 248; including not enrolled in term, 274
- **IV.** Total number of students that have completed the major in past 3 years: 214
- V. Minimum number of units required to complete the major (do not include foundation, general education, general electives or supporting coursework): 45
- VI. Name of the proposed emphasis: Interactive and Immersive Technologies
- VII. Campus and location offering-check the campus(es) and location(s) where this emphasis will be offered.

🗆 Main	□ UA	🗆 Phoenix	□ Distance (type in location(s) below):
	Online	Biomedical	

VIII. Provide a rationale for the proposed new emphasis. Survey your current majors to provide evidence of student interest in/demand for the proposed emphasis – attach the survey questions and results at the end of this proposal. Write a short summary of the findings of the survey. You may also include external data (Bureau of Labor Statistics, reports/letters of support from relevant bodies, etc.). Curricular Affairs can provide a job posting/demand report by skills obtained/outcomes of the proposed emphasis. Please contact <u>Office of Curricular Affairs</u> to request the report for your proposal.

Students in Information Sciences learn key introductory skills in data science, but they also study *information* beyond data, studying the ethics of information use, as well as programming foundations to apply their data science skills to real-world problems. Ultimately, as part of the College of Social and Behavioral Sciences, Information Science students learn how data is used and abused *by people* as well as the applications and intersections between information, people, and technology.

In the Interactive and Immersive Technologies sub-plan, students focus on the ways data and information can be presented and visualized, focusing on our coursework in Virtual Reality, Web Design and Development, and

Human Computer Interaction. While students in this sub plan will have the core programming and data science skills from the ISTA core curriculum, their major coursework will focus less on data science and analysis and more on how convey information to users with established and emerging technologies.

A growing field is the one of <u>User Interface/User Experience (UI/UX</u>); it's new enough that the Bureau of Labor Statistics does not yet report on it, but by looking at job statistics for software developers and web developers (the two overlapping areas UI/UX can be seen as falling into), one can see that median salaries are high and there is positive job growth. UI/UX requires a mix of skills in visual design, information architecture, and user research; crucially, UI "pertains to the design of 'interactive' elements in digital media". For jobs of the future, students will need a blend of technical, communication, and design skills and a keen understanding of how humans use and interact with technological environments.

Even more 'traditional' jobs involving conveying information are changing and require the skills in this subplan. In today's world, for example, librarians no longer make card catalogs but <u>rather Virtual Reality</u> <u>collections that patrons can physically immerse themselves in</u>. As the ALA or American Library Association (which provides accreditation for our MA program) notes: "Immersive storytelling or VR storytelling will become a more frequent tool for conveying information, especially as major media outlets invest in in-house virtual reality production."

Survey results are attached to this proposal; in summary, we found that 73% of students surveyed agreed or strongly agreed that they wished the program had a more specific career focus; 79% indicated they were interested in learning more about a career in Interactive or Immersive Technologies. 60% said they would have been more likely to declare the major if there had been sub-plans, with 32% neutral and less than 8% disagreeing.

IX. At minimum, provide two unique learning outcomes for the proposed emphasis. Which courses in the emphasis will Introduce, Practice, and/or Assess the learning outcomes? Use the table below to provide the information. Add rows as needed.

Learning Outcome	Introduced	Practiced	Assessed
Create visualizations of	ISTA 116, ISTA 131	ISTA 320, 350, ISTA	ISTA 498
data and information		330, ISTA 403, ISTA	
		424, ISTA 425, ISTA 451	
Design immersive and	ISTA 100, 130	ISTA 416, ISTA 330,	ISTA 498
interactive technologies.		ISTA 424, ISTA 425,	
_		ISTA 451	
Design technology	ISTA 100, 116, 130,	ESOC 302, ISTA 320,	ISTA 498
experiences or	131, 161	ISTA 350, ISTA 330,	
information architecture		ISTA 416, ISTA 425	
based on analyses of			
user data.			

X. Requirements to meet 40% commonality across emphases. <u>ABOR Policy 2-221-c. Academic Degree Programs</u> <u>Subspecializations</u> requires all emphases within a major to share at least 40% curricular commonality across emphases (known as "major core"-courses counting towards major units and major GPA). List the required major core curriculum required of all emphases. Refer to your existing <u>advisement report(s)</u>, if needed. Include the prefix, course number, course title and number of units. Add rows as needed.

Requirement	<u>Courses (include prefix, number, title, units)</u>	Minimum units
Title/Description		<u>needed to satisfy</u> <u>requirement</u>
Major Core	 ISTA 100: Great ideas of the Information Age (3 units) ISTA 116: Statistical Foundations of the Information Age (3 units) ISTA 130: Computational Thinking and Doing (4 units) ISTA 131: Dealing with Data (4 units) ISTA 161: Ethics in a Digital World (3 units) 	15 (17 but transfer credit is accepted, minimum set at 15)
Required for all majors	1. ESOC 302: Quantitative Research methods	3 units
Required for all majors	 Choose one Society course: ESOC 313: Digital Discourse and Identity (3 Units) ESOC 314: Theories of New Media (3 Units) ESOC 315: Publishing – From Papyrus to e-Readers (3 Units) ESOC 316: Digital Commerce (3 Units) ESOC 317: Digital Crime and Social Media (3 Units) ESOC 318: Disruptive Technologies (3 Units) ESOC 319: Instructional Technologies (3 units) ESOC 330: Digital Dilemmas – Privacy, Property, and Access (3 Units) ESOC 477: Information Security (3 Units) ESOC 478: Science Information and its Presentation (3 units) ESOC 495: Special Topics (3 units) 	3 units
Required for all majors	 Choose one Computational Arts & Media (3 units total): ART/FA 432A: Interactivity (3 Units) ART/FA 437A: Foundation Digital 3D Modeling, Rendering and Rapid Protyping (3 Units) ESOC 300: Digital Storytelling and Culture (3 Units) ESOC 340: Information, Multimedia Design and the Moving Image (3 Units) ISTA 230: Introduction to Web Design and Development (3 Units) ISTA 251: Introduction to Game Design (3 Units) ISTA 301: Computing and the Arts (3 Units) ISTA 302: Technology of Sound (3 Units) ISTA 303: Introduction to Creative Coding (3 Units) LING 388: Language and Computers (3 Units) 	3 units
Required for all majors	ISTA 498: Senior Capstone (3 units)	3 units
Required for all majors	Engagement requirement (Choose one): ESOC 480: Digital Engagement (3 units) INFO 499: Independent study (3 units) INFO 493: Internships (3 units) INFO 492: Directed Research (3 units)	3 units

ISTA 491: Preceptorship (3 units)	
Total major core upper division units required	12
Total major core units required	30

XI. Requirements specific to the proposed emphasis. List the required emphasis core, electives, and any special conditions students must meet to complete the emphasis using the table below. Include the prefix, course number, course title, and units for each course. Provide email(s)/letter(s) of support from home department head(s) for courses not owned by your department. Highlight and label (NEW) any new courses that must be developed for the emphasis. Add rows as needed.

<u>Note: a proposed emphasis having similar curriculum with other plans (within department, college, or</u> <u>university) may require completion of a comparison chart.</u> Total units required for each emphasis must be <u>equal.</u>

Requirement Title/Description	<u>Courses (include prefix, number, title, units)</u>	<u>Minimum</u> <u>units</u> <u>needed to</u> <u>satisfy</u> <u>requirement</u>
Emphasis core	 Complete 5 courses (15 units minimum) ISTA 320: Data Visualization (3 units) ISTA 350: Programming for Informatics Applications (4 Units) ISTA 330: Advanced Web Design (3 Units) ISTA 403: Creative Coding (3 units) ISTA 416: Introduction to Human Computer Interaction (3 Units) ISTA 424: Virtual Reality (3 Units) ISTA 425: Algorithms for Games (3 Units) ISTA 451: Game Development (3 Units) ISTA 495: Special Topics (3 units) CSC 337: Web Programming (3 Units) LING 478: Speech Technology (3 units) 	
	Total emphasis upper division units required Total major emphasis units required*	15 15

*All emphases offered for this major must have the same minimum number of units required

XII. Emphasis course/faculty information for existing courses. Complete the table below for all emphasis coursework. You can find information to complete the table using the <u>UA course catalog</u> or <u>UAnalytics</u> (Catalog and Schedule Dashboard> "Printable Course Descriptions by Department" On Demand Report; right side of screen). Provide email(s)/letter(s) of support from home department head(s) for courses not owned by your department. Add rows as needed.

	tment. Add rows		Drea	Trueic	Home	Foundary
Course prefix and numbe r	Title	<u>Course Description</u>	Pre- requisites	Typic ally Offere d (F, Sp, Su, W) and Frequ ency (ever y year, odd years, etc.)	Home Depar tment	Faculty members available to teach the courses
ISTA 330	Advanced Web Design	Introduction to event-driven programming and prototype-oriented programming using JavaScript. Course topics include JavaScript language basics, Document Object Model (DOM) interaction and manipulation, DOM event management, and dynamic media creation.	ISTA 230	Typica lly offere d Spring , every year	School of Infor matio n	<u>Hamidreza</u> <u>Bahramian</u>
ISTA 350	Programming for Informatics Applications (4 Units)	This course will provide an introduction to informatics application programming using the python programming language and applying statistical concepts from a first semester statistics course. A key goal of this course is to prepare students for upper division ISTA courses by expanding on the skills gained in ISTA 116 and 130 but will be broadly applicable to any informatics discipline. Throughout the semester students will be faced with information application problems drawn from several different disciplines in order to expand their breadth of experience while simultaneously increasing their depth of knowledge of scientific and informatics programming methods. Students will practice problem decomposition and abstraction, gaining experience in identifying commonly occurring information processing issues and in applying well-known solutions. In addition, students will design their own algorithmic solutions to problems and will learn how to effectively compare different solutions, evaluating efficiency in order to choose the best solution for a given problem. Periodic code reviews will be held in order to expose students to a range of different solution methods, which will aid them in discovering weaknesses in their own work and will improve their ability to communicate with others on technical topics. The course will include an introduction to the python scientific computing libraries and other statistical	ISTA 116, 130, 131	Typica lly offere d Fall and Spring , every year	School of Infor matio n	Rich Thompson

		packages. Additional course topics will include the use of version control systems,				
		software profiling, general software engineering practices and basic shell scripting.				
ISTA	Advanced		ISTA 303 or	Typica	School	Peter
403	Creative Coding (3 units)	This course continues the exploration of creative coding that began in ISTA 303. Students will develop experimental and creative works based, in part, on techniques from the fields of human-computer interaction, computer vision, virtual reality, machine learning, and other disciplines that have the potential to impact our culture through the introduction of new technologies. Aside from gaining technical proficiencies needed to engage with these topics (e.g., software engineering, physical computing techniques, familiarity with multimedia packages and libraries), students will have the opportunity to explore the use of novel interaction devices (e.g., Kinect, Wii, LeapMotion, Glasses, and Oculus Rift) as well as to experiment with a range of digital media environments (e.g., projection mapping, live coding, sonification, mobile devices, physical sensors, augmented reality, immersive systems). Moreover, students will become more familiar with the history and current state of the fields of new media art and creative coding. Students will read widely from journal articles and from media arts conference and festival proceedings, and will be expected to document their own work in a clear, professional manner, both through writing assignments and the creation of an online portfolio of creative projects. By the end of this course students will have the ability to participate meaningfully (through the implementation and documentation of creative projects) in contemporary discourse regarding art and technology.	consent of instructor	lly offere d Fall, Spring Main campu s Not offere d since Fall 2014	of Infor matio n	Jansen
ISTA 416	Introduction to Human- Computer Interaction (3 units)	The field of Human-Computer Interaction (HCI) encompasses the design, implementation, and evaluation of interactive computing systems. This course will provide a survey of HCI theory and practice. The course will address the presentation of information and the design of interaction from a human-centered perspective, looking at relevant perceptive, cognitive, and social factors influencing in the design process. It will motivate practical design guidelines for information presentation through Gestalt theory and studies of consistency, memory, and interpretation. Technological concerns will be examined that include interaction styles, devices, constraints, affordances, and metaphors. Theories, principles and design guidelines will be surveyed for both classical and emerging interaction paradigms, with case studies from practical application scenarios. As a central theme, the course will promote the processes of usability engineering, introducing the concepts of participatory design, requirements analysis, rapid prototyping, iterative development, and user evaluation. Both quantitative and qualitative evaluation strategies will be discussed. This course is co-convened: Upper-level undergraduates and graduate students are encouraged to enroll. Graduate students will be expected to complete more substantial projects and will be given more in-depth reading assignments.		Typica lly offere d Spring , Main campu s	School of Infor matio n	Ren Bozgiyikli, Lila Bozgiyikli

ISTA 424	Virtual Reality (3 units)	Virtual reality is an emerging technology that has been widely used in recent years in various areas, such as education, training, well-being, and entertainment. Virtual reality offers a highly immersive experience as the head mounted displays replace the vision of the users with digital imagery. It encompasses many disciplines, such as computer science, human computer interaction, game design and development, information science, and psychology. This course merges a theoretical and practical approach to give students the necessary knowledge to design, develop, and critique virtual reality games and applications.	ISTA 350 or CSC 210	Typica lly offere d Fall, Spring Main Camp us		Ren Bozgiyikli, Lila Bozgiyikli
ISTA 425	Algorithms for Games	Algorithms are a crucial component of game development. This course will provide students with an in-depth introduction to algorithm concepts for game development. The course will cover basic algorithm and data structures concepts, basic math concepts related to game algorithms, physics and artificial intelligence based game algorithms that are supplemented with modern examples. Unity Game Engine along with C# programming language will be used throughout the class.	ISTA 350 or CSC 210	Typica lly offere d Fall, Spring Main Camp us	School of Infor matio n?	Ren Bozgiyikli, Lila Bozgiyikli
ISTA 451	Game Development	This course provides an introduction to video game development. We will explore game design (not just computer games, but all games) and continue with an examination of game prototyping. Once we have working prototypes, we will continue with the development of a complete 2D computer game. The remaining course topics include: designing the game engine, rendering the graphics to the screen, and artificial intelligence. Students will be given periodic homework that reinforces what was learned in class. Homework will include developing a game prototype, game design documentation, some programming tasks. Students will work in small teams to develop a working game as a term project. Grades will be primarily based on the term project with some small amount of weight to homework. The examples provided in class will be programmed in Java and available for execution on any operating system. Programming homework assignments will be done in either Java or the language chosen by the instructor. The term project can be written in any programming language with instructor permission.	ISTA 350 or CSC 210	Typica lly offere d Fall, Spring Main Camp us	School of Infor matio n	Drew Castalia, Ren Bozgiyikli, Lila Bozgiyikli
CSC 337	Web Development	Introduction to the techniques and technologies for developing dynamic web sites. Topics include a web server, PHP as the server-side scripting language, the MySQL database, JavaScript and AJAX for enriching web services, and page layout with HTML and CSS. Security concerns will be considered with details for prevention of	ISTA 130 or CSC 110	Typica lly offere d Fall, Spring ,	Comput er Science	See email from CSC

		such vulnerabilities in web applications. This course includes a team project to deploy a dynamic website. Weekly laboratory.		Summ er Main Camp us		
LING 478	Speech Technology	Topics include speech synthesis, speech recognition, and other speech technologies. This course gives students background for a career in the speech technology industry.	Coursework in phonetics (LING 314 or LING 515 or SPH 267 or SLHS 267) or a background in programmin g (such as a 100 or 200 level course from the Computer Science Department).	Typical ly offered Spring, Main Campu s	Linguist	i See email from Lingu istics
ISTA 495	Special Topics	Special topics courses are offered to allow students to explore specialized topics not covered in the program curriculum. Multiple topics might be offered in any given year, and specialized topic descriptions will be advertised by the School for students interested in enrolling in the course. A specific course syllabus will be published prior to the offer of a special topic course.		Typica lly offere d Fall and Spring	School of Infor matio n	Various
ISTA 320	Data Visualization	This course will introduce students to the fundamental concepts and tools used to convey the information contained within large, complex data sets through a variety of visualization techniques. Students will learn the fundamentals of data exploration data via visualizations, how to manipulate and reshape data to make it suitable for visualization, and how to prepare everything from simple single-variable visualizations to large multi-tiered and interactive visualizations. Visualization theory will be presented alongside the technical aspect of the course to develop a holistic understanding of the topic.	ISTA 116 or ESOC 214	Typica lly offere d Fall and Spring	School of Infor matio n	Adriana Picoral, Megan Wetherell, Nick DiRienzo

XIII. Emphasis course/faculty information for NEW courses. Complete the table below. Provide email(s)/letter(s) of support from home department head(s) for courses not owned by your department. Add rows as needed. Add rows as needed.

Course	Title	Course Description	Pre-	Status*		Typically Offered (F,	Home	Faculty
prefix and number		F	requisites		first term offered	Sp, Su, W) and Frequency (every year, odd years, etc.)	Dept.	members available to teach the courses

*In development (D); submitted for approval (S); approved (A) No new courses; all courses approved and offered.

Emails from CSC and Linguistics below:

Sent: Friday, October 23, 2020 12:17 AM
To: Owen, Laura Catherine Joan - (lauraowen) <<u>lauraowen@arizona.edu</u>>
Cc: Michelle Strout <<u>mstrout@cs.arizona.edu</u>>
Subject: Re: CS classes, ISTA BS sub-plans

Hi Laura,

I am writing on behalf of Dr. Strout, Interim Department Head, Department of Computer Science. Dr. Strout is included in this email.

This email serves as confirmation that the iSchool may continue to use CSC 110, Introduction to Computer Programming I, as a substitute for ISTA 130 as part of the ISTBS major core.

This email serves as confirmation that the iSchool may include CSC 337, Web Programming, as an option in the proposed "Interactive and Immersive Technologies" emphasis. Please note, our department prioritizes enrollment in CSC 337 for CS majors and minors.

Best, Martin

-----Martin Marquez II Director, Academic and Support Services <u>Department of Computer Science</u> University of Arizona

From: Warner, Natasha - (nwarner) <<u>nwarner@arizona.edu</u>>
Sent: Tuesday, October 20, 2020 12:06 PM
To: Owen, Laura Catherine Joan - (lauraowen) <<u>lauraowen@arizona.edu</u>>; Ohala, Diane K - (ohalad) <<u>ohalad@arizona.edu</u>>; Kelly, Lauren Duley - (laurenduleykelly) <<u>laurenduleykelly@arizona.edu</u>>;
Subject: Re: Linguistics classes and ISTA sub-plans

Hi,

yes, I confirm that Linguistics is still happy to have iSchool students in all of those classes, and to have those classes appear in your sub-plans as you mention.

Thanks, Natasha

Natasha Warner, Professor and Head Dept. of Linguistics, Box 210025 University of Arizona Tucson, AZ 85721-0025 USA 520-626-5591 Pronouns: she/her/hers **XIV.** Using the table below, list each faculty member who will contribute to the teaching of courses in this emphasis and the teaching FTE they will contribute. Add rows as needed.

Course(s)	Name	Department	Rank	Degree	Faculty/%
					effort
ISTA 350	Rich	0418-School of	Lecturer	PhD	.4
	Thompson	Information			
ISTA 330		0418-School of	Lecturer	Two MS	.4
	Hamidreza	Information		degrees, one in	
	Bahramian			CS and one in	
				Data Science	
ISTA 416	Ren Bozgiyikli	0418-School of	Assistant	PhD	.3
		Information	Professor		
ISTA 416	Leonard	0418-School of	Adjunct	PhD	.2
	Brown	Information	Professor		
ISTA 424	Lila Bozgiyikli	0418-School of	Assistant	PhD	.2
		Information	Professor		
ISTA 425	Ren Bozgiyikli	0418-School of	Assistant	PhD	Last academic
	0,	Information	Professor		year, .1
ISTA 451	Drew Castalia	0418-School of	Lecturer	Masters	.4
		Information			
ISTA 403	Peter Jansen	0418-School of	Assistant	PhD	Course not
	,	Information	Professor		currently
					offered
ISTA 495	Various	0418-School of			
		Information			
ISTA 320	Adriana Picoral	0418-School of	Assistant	PhD	.2
		Information	Professor,		
			Career Track		

XV. Special conditions for admission to/declaration of this emphasis – explain in detail the criteria to declare this emphasis, including GPA requirements, completion of courses prior to declaration, application process, interviews, etc. These conditions must be approved by faculty governance to be enforced.

None, other than being in good standing academically (minimum 2.0 GPA).

XVI. **Emphasis productivity** – provide a detailed plan in the case the emphasis does not attract the number of anticipated students and/or the new courses have low enrollments. Will emphasis courses continue to be offered as described in Section XIII and XIV or will students be offered alternative courses from outside the emphasis as substitutions? Is the department/school/college committed to offering the courses regardless of the emphasis productivity?

The iSchool and ISTA programs have experienced growth in recent years.

Below is a head count for the current degree for Spring 2016, 2017, 2018, 2019, and 2020:

Headcount								
	Bachelor of Science							
	Spring 2016	Spring 2017	Spring 2018	Spring 2019	Spring 2020			
I	Active in Plan	Active in Plan	Active in Plan	Active in Plan	Active in Plan			
Þ			1					
	122	160	209	207	228			
	122	160	210	207	228			

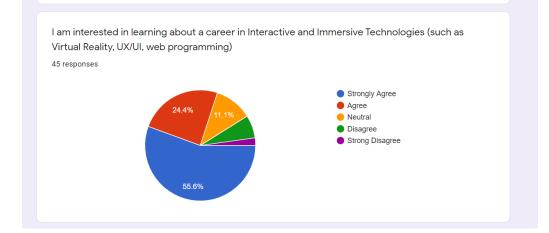
ience & Tech 2:

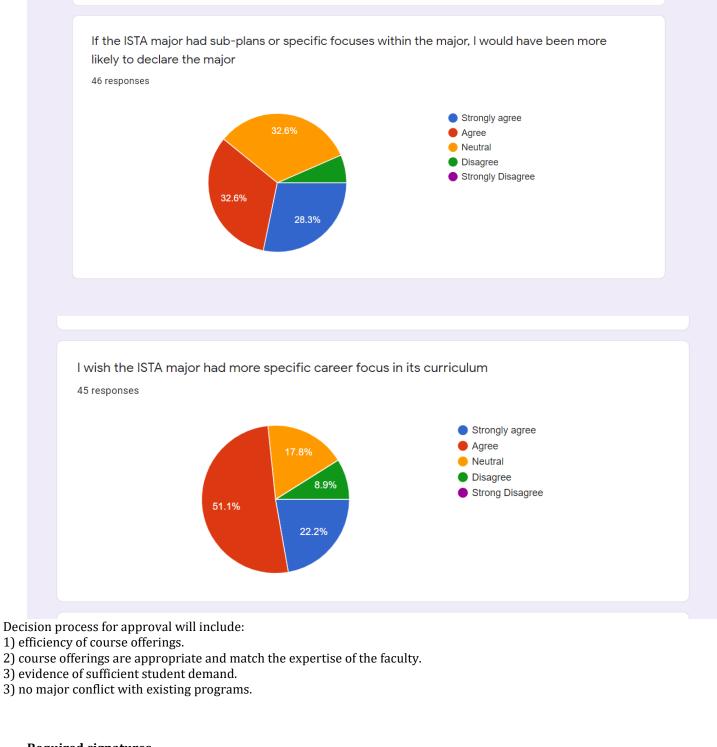
We propose the sub plans not to just attract new majors, but also to provide a focus in learning outcomes for our increasing number of majors. As the major expands and our program is able to offer more coursework, it makes sense that what was conceived of as a very broad, interdisciplinary major develops distinct focuses.

The proposed sub plan is also flexible (a choice of 5 out of 10 classes) meaning that even if a few classes are not available or not popular, students are still able to complete it. We are also committed to flexibility if a student truly needs an exception or substitution in order to graduate.

- XVII. Do you want the emphasis name to appear on the transcript? \boxtimes Yes \Box No
- XVIII. Do you want the emphasis name to appear on the diploma? oxtimes Yes \Box No
 - XIX. Anticipated semester and year to launch the proposed emphasis: Fall 2021
 - XX. Number of new faculty hires required to deliver the emphasis: None
 - XXI. Budgetary impact- indicate new resources needed and source of funding to implement the proposed emphasis. If reallocating resources, indicate where resources will be taken from and the impact this will have on the students/faculty/program/unit. None indicated

Survey results in graph form below and linked: https://docs.google.com/spreadsheets/d/1IjPpqwchMjuKRutKADy0qvFRtPfhDPThRuEcV6Ykzbk/edit#gid=7 24816773





XXII. Required signatures

Managing Unit Administrator (print name and title): _____

Managing Administrator's Signature: _____

Managing Unit Administrator (print name and title): _____

Managing Administrator's Signature:	Date:		
Dean (print name and title):		-	
Dean's Signature:	Date:		
Dean (printed name and title):		_	
Dean's Signature:	Date:		

All programs that will be offered through distance learning and/or fully online must include the following signature. The signature of approval does not indicate a commitment to invest in this program. Any potential investment agreement is a separate process.

Joel Hauff, Associate Vice President Academic Initiatives and Student Success and Executive Director for Online and Distance Education Administration

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					

□ Create approval memo

□ Send memo to college/dept and acad_org listserv

Create emphasis code in UAccess, including secondary major emphasis code

Upload approval memo and proposal documents to UAccess

□ Notify acad_org of the plan code creation

□ Notify ADVIP team, include proposers