University of Hawai'i
Code Request Form for Academic Programs

NEW OR REPLACE PROGRAM CODE

☒ **New Program Code** ☐ **Replace Program Code** Date: 5/31/2021

REQUESTOR CONTACT INFORMATION

Name	Pheng Xiong	Campus	UH Manoa
Title	University Registrar	Email	pxiong@hawaii.edu
Office/Dept	Office of the Registrar	Phone	808.956.5322

NEW PROGRAM CODE TO CREATE

Institution	UH Manoa	Campus	UH Manoa
Level	UG	Effective Term	202210

	Code (Max. Characters)		Description	Check if requesting new code:
College	(2)	14	College of Natural Sciences	☐ See Banner form STVCOLL
Department	(4)	ICS	Information& Computer Sciences	☐ See Banner form STVDEPT
Degree/Certificate	(6)	UCERT	Undergraduate Certficate	☐ See Banner form STVDEGC
Major	(4)	CCM	Creative Computational Media	☑ See Banner form STVMAJR
Concentration	(4)			☐ See Banner form STVMAJR
Minor	(4)			☐ See Banner form STVMAJR

If a similar major/concentration code exists in Banner, please list the code:

Justification to warrant a new major/concentration code similar to an existing major/concentration code:

Is this major/concentration code being used the same way at the other UH campuses? ☐ Yes ☐ No

Should this program be available for applicants to select as their planned course of study on the online application? *If yes, student may select the code as their only program of study.* ☐ Yes ☐ No

RULES PERTAINING TO FINANCIAL AID AND 150% DIRECT SUBSIDIZED LOAN LIMIT LEGISLATION

Is 50% or greater of the classes in this program offered at a location other than the Home Campus? ☐ Yes ☐ No

Is this program/major/certificate financial aid eligible? ☐ Yes ☒ No

Does this certificate qualify as a Gainful Employment Program (Title IV-eligible certificate program)? ☐ Yes ☒ No

See http://www.ifap.ed.gov/GainfulEmploymentInfo/index.html

Program Length

In academic years; decimals are acceptable. The length of the program should match what is published by the campus in any online and/or written publication.

Special Program Designations ☐ A ☐ B ☐ N ☐ P ☐ T ☐ U

See Special Program Designations Code Definitions on IRAO Program Code Request webpage

Required Terms of Enrollment: ☐ Fall ☐ Spring ☐ Summer ☐ Extended

Form modified: Oct 20208

University of Hawai'i
Code Request Form for Academic Programs

NEW OR REPLACE PROGRAM CODE

EXISTING PROGRAM CODE TO REPLACE, IF APPLICABLE

Program Code		Program Description	
Institution		Campus	UH Manoa
College		Department	
Level			

Are current students "grandfathered" under the program code? ☐ Yes ☐ No

Should the old program code be available for use in Banner? ☐ Yes ☐ No

Effective _____ **, old program code will no longer be available to admit or recruit students.**
Term (ie. Fall 2020)

This will turn off the online application, recruitment (effects Banner forms SRASUMI and SRAQUIK) and admissions (effects Banner forms SAADCRV, SAAADMS, SAASUMI, SAAQUIK, and SAAQUAN) Banner modules.

Effective _____ **, old program code will no longer be available to award degree to students.**
Term (ie. Fall 2020)

This will turn off the general student (effects Banner form SGASTDN) and academic history (effects Banner form SHADEGR) Banner modules.

ATTACHMENTS

BOR Approved: Sole-credential Certificate, Associate, Bachelor and Graduate Degrees, and sole credential certificates

☐ BOR Meeting Minutes & Supporting Documents ☐ Curriculum

Chancellor Approved: Concentrations, Certificates and Associate in Technical Studies (ATS) Degree

☒ Memo from Chancellor to notify Vice President for Academic Planning and Policy regarding program action.

☒ Curriculum

CERTIFICATES ONLY: Please check one (1) statement. This certificate is a...

☐ BOR approved certificate. BOR Meeting/Approval Date: _____

☒ Chancellor approved within an authorized BOR program. BOR Program: _____

☐ Chancellor approved CO in accordance with UHCCP 5.203, Section IV.B.10.

VERIFICATIONS

By signing below, I verify that I have reviewed and confirm the above information that is pertinent to my position.

Registrar (Print Name)	**Financial Aid Officer** (Print Name)	**For Community Colleges, verification of consultation with OVPCC Academic Affairs:**
Pheng Xiong	Jodie Kuba	Tammi Oyadomari-Chun
Pheng Xiong Digitally signed by Pheng Xiong Date: 2021.05.31 14:31:26 -10'00'	Jodie Kuba Digitally signed by Jodie Kuba Date: 2021.06.02 09:28:14 -10'00'	
Signature Date	Signature Date	Signature Date

ADDITIONAL COMMENTS

Create Undergraduate Certificate code.

Form modified: Oct 2020

Colleges of Arts and Sciences
College of Natural Sciences
Office of the Dean

UNIVERSITY of HAWAI'I® MĀNOA

MEMORANDUM

April 16, 2020

TO: David Lassner
President

VIA: Michael Bruno for Michael Bruno
Provost

VIA: Laura E. Lyons
Associate Vice Chancellor for Academic Affairs

FROM: Aloysius Helminck
Dean, College of Natural Sciences

Peter Arnade
Dean, College of Arts & Humanities

Brennon Morioka
Dean College of Engineering

SUBJECT: APPROVAL OF THE NEW *UNDERGRADUATE CERTIFICATE IN CREATIVE COMPUTATIONAL MEDIA*

SPECIFIC ACTION REQUESTED:

It is requested that the new *Undergraduate Certificate in Creative Computational Media* be approved.

RECOMMENDED EFFECTIVE DATE:

It is recommended that the effective date be Spring 2021.

ADDITIONAL COST:

There is no anticipated need for new resources at the outset. Reorganization of teaching loads for some ICS faculty will facilitate the increase in enrollment expected in the first few years of the certificate. If the program becomes extremely popular, there may be a need for additional

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Honolulu, Hawai'i 96822
Telephone: (808) 956-6451
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http://www.hawaii.edu/natsci/

sections of required courses that could result in the need for lecturer/instructor and/or TA positions in the ICS and ACM departments.

PURPOSE:

The purpose of the certificate is to provide students and/or professionals with the interdisciplinary training necessary to enter into job markets relating to but not limited to: video game and eSports design and development, digital film production and special effects, new media theatre and dance performance, movement-based media art installation, interactive public exhibit design such as for museums, theme parks, or marketing/advertising. The program is designed to either augment existing undergraduate students' expertise, or provide practical skills to unclassified students and professionals, giving them a more competitive advantage in the modern workforce.

BACKGROUND:

In order to provide interdisciplinary training, the Certificate Program for Creative Computational Media (CCM) will be a collaborative effort between 4 departments and 3 colleges: Academy for Creative Media (ACM) and Department of Theatre & Dance (College of Arts and Humanities), Department of Electrical Engineering (College of Engineering), and the Department of Information and Computer Sciences (College of Natural Sciences). No similar program exists with the UH system, and no single department has the expertise and resources to offer the certificate along, hence this is a collaborative effort between the departments/colleges mentioned above. The primary home of the certificate will be in the College of Natural Sciences, but the certificate will be shared between the three contributing colleges. Each of the four departments have started the process of cross-listing courses and updating their prerequisites to ensure that key courses are readily available for students from various disciplines.

ACTION RECOMMENDED:

It is recommended that the new *Undergraduate Certificate in Creative Computational Media* be approved.

President Lassner approved ATP on January 8, 2020.

APPROVED/DISAPPROVED:

David Lassner Digitally signed by David Lassner Date: 2021.04.16 12:57:05 -10'00'

David Lassner
President

Date

ACADEMIC SUBJECT CERTIFICATE PROPOSAL
Undergraduate Certificate Program in Creative Computational Media.

1. Purpose and objectives

Purpose and Objectives

The Certificate Program for Creative Computational Media (CCM) is a collaborative effort between 4 departments and 3 colleges: the Academy for Creative Media (ACM) and the Department of Theatre & Dance (Arts and Humanities), the Department of Electrical Engineering (College of Engineering), and the Department of Information and Computer Sciences(ICS) (College of Natural Sciences).

The objective is to provide students and/or professionals with training necessary to enter into job markets relating to but not limited to: video game and eSports design and development, digital film production and special effects, new media theatre and dance performance, movement based media art installation, interactive public exhibit design such as for museums, theme parks, or marketing/advertising.

These areas all require students who have a blend of expertise in computer science, creative media, electrical engineering and the performing arts. Three perfect examples of the kind of products CCM students can produce can be seen at the recently constructed TeamLab[1] interactive museum in Odaiba, Japan, the new Star Wars Galaxy's Edge theme park at Disney, and mesmerizing Cirque Du Soleil performances.

https://youtu.be/IExpZvkjqlI

https://youtu.be/4CesD6Hjs0k

[1] https://www.teamlab.art

The CCM program will take the form of selected required and elective courses from each of the collaborating departments.

Relationship to existing degree programs

There is no similar program in existence at UH System-wide. No department has the expertise and resources to support the certificate alone, hence the collaborative effort between ICS, ACM, EE and Theatre & Dance. Each department holds a key puzzle piece, necessary for the success of this concentration. For example, in order to successfully produce a Galaxy's Edge theme park, Electrical Engineers are needed to design the electronic systems that control the physical special effects, Computer Scientists develop the software to make the control of special effects programmable and have expertise in designing and evaluating user-interfaces for effectiveness. Theatre and Dance experts create choreographies that form the foundation of movements that are then digitized, and last but not least, Creative Media experts use their 3D design and animation skills to create the graphical imagery that accompanies the digitized actors and the special effects.

Therefore, in our shared desire to create a concentration that will enable students to be able to seek employment in such areas, the 4 departments have strategically begun cross-listing courses and updating pre-requisites to make key courses suitable and regularly available for the concentration (see below for more details).

2. Administration

The primary home of the certificate is the College of Natural Sciences, but the certificate is shared between the 3 Colleges. The administration of the program will rotate between 3 Departments every 3 – 5 years starting with the home Department (ICS) followed by the Theatre & Dance Department, and lastly ACM before returning to ICS. Chairs from the 4 Departments will select the chair and members of the CCM program committee (CCM-PC). The CCM-PC's responsibilities include but are not limited to:

- Setting certificate completion criteria.
- Reviewing applicants.
- Collecting data on the progress of the program through formative and summative evaluations with appropriate key performance indicators.
- Shared advising of students. Advisors will consist of the CCM-PC members and faculty and/or lecturers that teach the courses as part of the curriculum. Students may select 1st choice and 2nd choice of advisors from the participating departments.
- Soliciting suggestions and feedback from the local industry.
- Advertising the program.
- Evolving the program based on results of the feedback.
- Yearly assessment.

3. Units Involved, Planning and Implementation

The units and faculty involved in the planning and implementation of this concentration are from three Colleges:

- **College of Natural Sciences:**
  Department of Information and Computer Sciences
  Jason Leigh, Professor and Director- Laboratory for Advanced Visualization and Applications (LAVA)
  Guylaine Poisson, Associate Professor and Department Associate Chair

- **College of Arts and Humanities**
  Academy for Creative Media
  Christine Acham, Professor and Department Chair
  Brittany Biggs, Assistant Professor
  Department of Theatre & Dance
  Markus Wessendorf, Professor of Theatre and Department Chair
  Jhalak Kara Miller, Associate Professor of Dance

- **College of Engineering**
  Department of Electrical Engineering
  Darren Carlson, Assistant Professor of Computer Engineering

4. Targeted Population

We expect an enrollment of around 10-15 students the first two years and 20-30 students thereafter. The targeted audiences are i) undergraduate students enrolled in ICS, ACM, EE and Theatre & Dance, ii) unclassified students wanting to specialize in CCM, iii) professionals that would like to enroll in the certificate only.

The program is designed to either augment existing undergraduate students' expertise, or provide practical skills to unclassified students and professionals, giving them a more competitive advantage in the modern workforce. Our program may also motivate unclassified students and professionals to consider pursuing full undergraduate degrees in one of the 4 home departments.

5. Organization

Students will be required to complete 18 credits (required courses and electives) with a minimum of 9 credits from upper division courses. On completion, students will need a cumulative GPA of 2.5 for the 6 courses selected for the certificate. As a residency requirement to earn the certificate, students must complete the 9 credits of required courses (ACM 215; EE/ICS 369; and ICS 486/ACM419) at UH Manoa.

Students will be encouraged to declare their intention to pursue the certificate early in the process by submitting an application form to the CCM-PC. At that time, the student will be assigned an advisor.

a. Foundation and Prerequisites

i. **Prerequisites** (3 credits)
ICS 110 (Alpha): Introduction to Computer Programming
or ICS 111: Introduction to Computer Science I
or EE 160: Programming for Engineers or equivalent

ii. Foundation
N/A

b. Field of Concentration

Creative Computational Media

c. Number of Credits

The certificate will require 18 credits.

d. Courses

The following courses are those identified by the collaborating departments as being most applicable to the concentration. Furthermore, in anticipation of creating our certificate, over a year ago we began cross-listing courses to ensure there would always be faculty available to teach them. We also updated prerequisites and curriculum to be able to accommodate the courses to be taken by unclassified students or professionals. Some courses still remain to be updated, however these are all electives and are already taken by non-majors, so we are confident we will be able to adjust them without sacrificing quality. Unclassified students and professionals who wish to take those classes in the interim are able to do so with a course override from the faculty teaching the course.

- **Required Courses (9 credits)**
  ACM 215: Introduction to 3D Computer Animation
  EE 369/ICS 369[2] Computational Media System
  ICS 486/ACM 419: Virtual and Augmented Reality Programming

- **Electives Courses (9 credits)**
  ACM 216 Fundamentals of Animation
  ACM 316B: 3D Character Animation
  ACM 317: 3D Cinematography and Dynamics
  ACM 321: Storyboarding & Animatics

2 cross-listing ICS 369 and change of prerequisites (EE 160 or ICS 111) requested.

ACM 325: Visual Effects
ACM 255: Cinema and Digital Media
ICS 462: Artificial Intelligence for Games
ICS 464: Human Computer Interaction I
ICS 484/ACM 484: Data Visualization
ICS 485/ACM 487: Video Game Design and Development
DNCE 362: Visual Media for Dance
DNCE 673: Adv. Dance, Technology, and Live Performance

Additional electives identified by students could be considered through a petitioning process, whose approval can be conducted in collaboration with the affected departments. Furthermore, other classes may be added over time. For example, there are 3 possible classes (ART 201, ART 301, MUS 400) that might be of interest to students of the certificate. We have already contacted the faculty and chairs of these departments, and all have expressed interest in participating once the certificate has been launched.

ART 201 Introduction to Electronic Arts
ART 301 Electronic Arts Studio
MUS 400 Adaptive Music Composition

e. Structure

The following table outlines when the courses are typically taught and example pathways for students to complete the courses depending on their career goals.

Bold: Required courses *Italic: Elective courses*

Fall	Spring	Summer
EE 369/ICS 369: Computational Media Systems. **ICS 486/ACM 419: Virtual & Augmented Reality Programming** *ICS 464: Human Computer Interaction I* *ICS/ACM 484: Data Visualization* *ICS 462: Artificial Intelligence for Games* *ACM 316B: 3D Character Animation* *ACM 321: Storyboarding & Animatics* *DNCE 362: Visual Media for Dance* *ACM 255: Cinema and Digital Media*	**ACM 215: Introduction to 3D Computer Animation** *ICS 485/ACM 487: Video Game Design* *ICS 464: Human Computer Interaction I* *ACM 216: Fundamentals of Animation* *ACM 317: 3D Cinematography and Dynamics* *ACM 325: Visual Effects* *ACM 255: Cinema and Digital Media*	*ACM 216: Fundamentals of Animation*

Example Pathway for a Video Game Designer / Developer

Fall(6 credits)	Spring (9 credits)	Summer (3 credits)
EE 369/ICS 369	**ACM 215**	*ACM 216*
ICS 486/ACM 419	*ICS464*	
	ICS 485/ACM 487	

Example Pathway for a Virtual Reality / Mixed Reality Designer / Developer

Fall(9 credits)	Spring (9 credits)	Summer (3 credits)
EE 369/ICS 369	**ACM 215**	
ICS 486/ACM 419	*ACM 216*	
DNCE 362	*ACM317*	

Example Pathway for an Interactive Exhibit Designer / Developer

Fall(9 credits)	Spring (9 credits)	Summer (3 credits)
EE 369/ICS 369	**ACM 215**	
ICS 486/ACM 419	*ACM 216*	
ICS 464	*ACM 325*	

f. Practicum or Internship

All the certificate's classes are project-based and hence practicum-experience will be demonstrated by a portfolio of work consisting of completed assignments from the program classes they take. In addition to serving to assess whether students are able to meet Program Learning Objectives, the portfolio is the de facto standard by which media companies consider applicants for internships. The participating faculty of this certificate program have strong connections with industry that will help create opportunities for students seeking internships when the companies come to Hawaii during their recruitment drives. These companies are particularly interested in Hawaii because of its diverse student population, mirroring the diversity of the international customers that they wish to serve. Successful recruitment and retention of our student alumni by these companies will no doubt encourage them to continue to return each year, to recruit more students.

*Picture of Hironobu Sakaguchi, creator of the popular **Final Fantasy** video game guest speaking in Professor Leigh's video game design class.*

*Brian Singer, director of the **X-Men** series of films, learning about the future of virtual reality from the Laboratory for Advanced Visualization and Applications at UH.*

*Peter Ramsey (**Academy Award Winning Co-Director of SpiderMan: Into the Spider-Verse**) giving a guest lecture in ACM hosted event organized by ACM Assistant Professor Brittany Biggs.*

*Stevi Carter (Manager of Development, **Netflix Animation**) & Dave Hardin (Supervising Animator, **Disney**) giving a guest lecture in ACM hosted event organized by ACM Assistant Professor Brittany Biggs.*

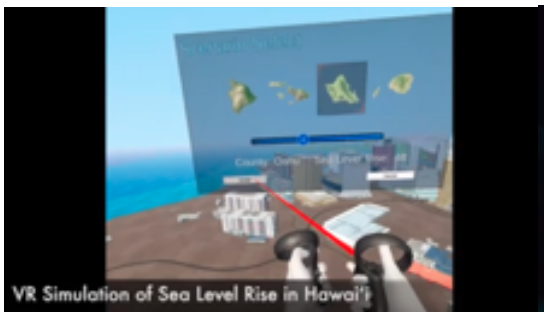
*Todd Jansen (Head of Layout, Trolls 2, **DreamWorks**) and Jeff Chasin (Production Manager, Zootopia, **Disney**) giving a guest lecture in ACM hosted event organized by ACM Assistant Professor Brittany Biggs.*

*Joanna Griebel (Animatic Editor) and Renae Radford (Lead Lighting/Compositing Artist) from **Blizzard Entertainment** giving a guest lecture in ACM hosted event organized by ACM Assistant Professor Brittany Biggs.*

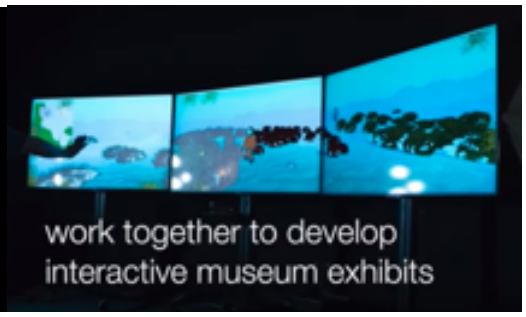
g. Integrative Experience

The classes are all integrative in nature. Faculty will guest present in each others classes. Students will develop projects that require the integration of skills representative of the 4 departments. The enrollments of the classes will also be managed to ensure there is a good balance between students from the 4 participating departments. Students will be asked to create a portfolio of projects they produced during their classes that will be used toward determining whether they qualify for certification, in addition to the courses they have completed.

The following are 2 brief videos illustrating the sort of work that might be part of a student's portfolio of work generated during the course of the certificate program:



https://youtu.be/R1GIcCAKbP0



https://youtu.be/CyPZa-diU48

6. Resources

We do not anticipate a need for new resources at the outset. Reorganization of the teaching load for some ICS faculty will facilitate the increase in enrollment expected in the first few years. However, if the program becomes very popular, we expect the need for additional sections of courses required in the certificate. This could result in a need for lecturer, instructor and/or teaching-assistant positions in the ICS and ACM departments.

For the past 5 years all the equipment to enable the teaching of ICS 484/ACM 484, ICS 485/ACM 487 and ICS 486/ACM 419 have been funded by grants obtained by the Laboratory for Advanced Visualization & Applications (LAVA) from the National Science Foundation, and the Academy for Creative Media System. This past year and this semester (2019) the resources were also opened up to DNCE. Students also have access to other ACM System resources such as the Mele Sound Studio at Honolulu Community College, as well as the new Academy for Creative Media building at UH West Oahu (opening in Fall 2020). Should the Concentration become successful to the point financially justifiable, additional instructors and/or teaching assistants will need to be funded by the department(s), possibly on a joint appointment basis, to enable the program to grow to meet demand. There is already such precedent in the shared appointment of Darren Carlson in EE and ACM department. Furthermore as new faculty positions arise at the UH West Oahu campus, shared appointments between UHWO and UHM are also possible.

7. Measuring and Assessment

At the end of each year, we will review the formative (process and procedure) and summative (outcome and impact) evaluations, discuss, and make any necessary corrections. Key Performance Indicators (KPIs) listed below will be tracked to assess the health of the program. These metrics are an initial "strawman" that will also be refined as the program evolves.

Data collection will consist of a combination of tracking student class enrollment records and online surveys. Proposed KPIs include:

A. number of students enrolled in the classes that are identified as CCM students.
B. number of new applicants each year.
C. number of applicants remain in the program each year.
D. which classes tend to be more favored by students.
E. who hires the students of the program as interns.
F. who ends up employing the graduates of the program.
G. assessment of the learning outcomes (see below).

8. Justification

Program Learning Objectives

In addition to the individual learning objectives of each of the offered classes, the overarching learning objectives are:

1. Students will be able to work effectively in multi-disciplinary teams consisting of artists, performers and technologists.
2. Students will demonstrate mastery of the necessary workflows for transforming art, performance and technology into a coherent product.
3. Students will demonstrate ability to wield creative computational media tools – such as 3D modeling programs, projection mapping, virtual and augmented reality, Arduino-controlled electronic and robotic actuators, motion capture systems, etc.
4. Students will demonstrate understanding of how emerging technologies are being applied to the production of computational media applications.
5. Students will develop numerous interdisciplinary projects that will form their portfolios, allowing them to become more competitive in the job market (such as the following produced by LAVA alum Noel Kawano: https://www.noelkawano.com).

Assessment of Program Learning Objectives

To assess how well students have met the program learning objectives, the certificate granting process will include a review of their final portfolios by affiliated faculty of the program. Students may also include work they conducted at internships as part of their portfolios. Should they choose to do so, we will ask their employer to complete an evaluation form to determine how well the student was able to demonstrate mastery of the various aspects of the program learning objectives, while on their internship.

Relationship to University and Campus Mission

Our program is aligned with UH system principles and priorities [3] in the following ways:

Support and Rewarding of Collaboration Across All Programs and Activities, Including Articulation Across UH Campuses
ACM is already well articulated system-wide, and we will use this model to expand articulation to include this Certificate.

Minimizing the Duplication of Programs
Our collaboration between ACM, ICS, EE, Theatre & Dance ensures minimization of duplicated classes / programs. Already in planning for this, a number of ICS classes have been cross-listed to ACM. The same will occur for EE, ACM and Theatre & Dance classes.

Increasing the Diversity of Enrollment
While most students who enroll in the Certificate will likely come from the collaborating departments, we will design the program to be easily accessible to students that are not in EE, ICS, ACM, Theatre & Dance, as well as unclassified students and professionals, without the need for extensive prerequisites. This work already began over a year ago in anticipation of creating this certificate – many courses have been cross-listed and their prerequisites updated.

3 https://www.hawaii.edu/offices/aa/IAFP_BOR_Approved_April17.pdf

Ensure Well-Maintained Facilities in Support of Education and Research
The program will leverage the resources at the Laboratory for Advanced Visualization and Applications, the iLab, the ACM animation lab, ICS computer labs, the new ACM building in West Oahu, and the Mele Sound Studio at Honolulu Community College, which are fully equipped with the technologies needed to support the classes.

Demand for the Program

We conducted a survey in May 2019 of students in ACM, Computer Science, Electrical Engineering, and Theatre & Dance. Of the 44 students that answered the survey, 91% indicated their interest in obtaining the certificate. Below is a sampling of the reasons students cited:

> *"A certificate like this would give me the skills necessary to be proficient in video game production as well as cinematic production. Video games offer all sorts of unique environments for storytelling that classic courses in cinematic production simply are unable to guide us through. The courses involved in obtaining a certificate like this would allow me to become a true cross-platform storyteller."*
>
> *"I've always wanted a course pathway that allows you to have an equal blend of computer science and art/visualization."*
>
> *"After graduation, I hope to find a job that allows me to both use creative media and my EE knowledge. Being able to take digital media classes would really help me obtain my professional goals and would be a cool opportunity to incorporate art in STEM."*
>
> *"I'm about to change my major, and these classes would help gear me towards my actual career goal working somewhere within the animation / video game production area."*
>
> *"I believe there is interest for these programs to work together and bring together a lot of skills needed for projects such as games, virtual reality and creative media. The departments being separated before made it much harder for Students in each department to meet each other (in my experience as an ACM Major) and I think this major will encourage more collaboration and more potential projects if created. I wish I had the opportunity to be here for this major! I've been waiting such a long time for something like this to be suggested.*"

Continuing Need for the Program

The general public has an insatiable appetite for entertainment in the form of movies, video games, and concerts, theatre and dance productions, as evidenced by the massive investments and profits made by companies such as Disney, Netflix, Amazon, Google, Microsoft, Electronic Arts, Activision. All this translates to expansive job opportunities for UH students if they are adequately trained in the interdisciplinary manner expected by these companies.

For example:
The global film industry shows healthy projections for the coming years, as the global box office revenue[4] is forecast to increase from about 38 billion U.S. dollars in 2016 to nearly 50 billion U.S. dollars in 2020. The U.S. is the third largest film market in the world[5] in terms of tickets sold per year, ranking ***behind*** China and India[6].

Feature films based on gaming content (i.e. *Detective Pikachu*) have record breaking $700M opening weekends.

As large as the film industry is, perhaps more surprising to many is the fact that the global gaming market reached $138 billion in 2018, with 50% from mobile gaming revenue, with the Asia Pacific region being the largest gaming market[7].

Video games now have production budgets and profits in the hundreds of millions. For example, a typical top-end video game title such as *Call of Duty Black Ops 4*, costs approximately $200M to produce and made $500M at its launch. *Grand Theft Auto 5* has made $6B since its release in 2013. Just as in the film industry, these projects are typically completed by teams of artists, computer scientists, electrical engineers, theatrical performers with over 150 members.

The new trend in gaming is for previously digital movie/tv companies to stream interactive video games to consumers. For example, Apple, Amazon, Microsoft are following the lead of Sony in attempting to create the "Netflix" of gaming. Netflix also announced at the recent E3 conference they are also entering the gaming market[8].

Entertainment aside, the skills students gain from this certificate also makes them employable to companies that routinely do data visualization- e.g. Bloomberg, Raytheon, Aerospace Corporation, Ford, GM, BMW, Monsanto, Caterpillar, Johnson & Johnson.

Need for the state of Hawai'i
COVID-19 has made it much more evident to Hawai'i's legislators that Hawai'i needs to grow alternative industries rather than rely solely on tourism and the military. Creative Computational Media is something that is COVID-proof in that it can be done on a computer at home and does not require shipping of large quantities of physical resources. Students can therefore obtain jobs both in Hawai'i and in the mainland while remaining in Hawai'i.

Furthermore, according to the US Dept of Labor and Statistics, computer-related fields are expected to grow 11% from 2019-2029, as compared to all other occupations which are expected to grow at only 4%. The median wage in those jobs currently are at $88,240, with multimedia artists and animators at $75,270. The median wage of all other occupations is $39,810.

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[4] https://www.statista.com/statistics/259987/global-box-office-revenue/

[5] https://www.statista.com/statistics/252729/leading-film-markets-worldwide-by-number-of-tickets-sold/

[6] https://www.statista.com/topics/964/film/

[7] https://newzoo.com/insights/articles/global-games-market-reaches-137-9-billion-in-2018-mobile-games-take-half/

[8] https://www.gamesradar.com/netflix-is-coming-to-e3-to-talk-about-turning-their-shows-into-games/

As an example of other related certification efforts, Rochester Institute of Technology offers a certification in the Unreal Engine- a widely used video game and film production, tool. Another tool of equal importance is the Unity Engine- which also offers certifications. The CCM program already teaches courses covering similar materials, and so a CCM certificate can be considered a super-certification. The CCM certification will boost Hawai'i's students' credentials to enable them to get into those creative industries more easily.

In 2017 Creative Sectors represented $3.6 billion of State GDP (4.2% of the State Total GDP). Creative sector job growth between 2007-2017 was 9.7%, and represents 6.2% of civilian jobs in Hawai'i. 2018 show record Direct Production Spend for Movies and TV ($480 million)[9].

Servco is a $1.8+ billion business spanning the Pacific. In 2020 Peter Dames, who leads Servco's IT function, process improvement team, and innovation incubator, announced that key areas of importance to the company's future growth are **User Experience Designer, Social Media, Videographer, Mobile Apps, App Development**, Agile, Data Scientist, Oracle, and Product Management. 5 of these 9 areas require skills at the intersection of computation and creative media.

[9] https://files.hawaii.gov/dbedt/economic/data_reports/hawaii-creative-report/HI_Creative_Ind_December_2017.pdf

Presented to the Mānoa Faculty Senate by the Committee on Academic Policy and Planning (CAPP) for a vote of the full Senate on February 17, 2021, a resolution supporting the proposal for an Undergraduate Certificate in Creative Computational Media. Approved by the Mānoa Faculty Senate on February 17, 2021 unanimously with 60 votes (100%); 0 opposed; and 3 abstentions.

RESOLUTION SUPPORTING THE PROPOSAL FOR AN UNDERGRADUATE CERTIFICATE IN CREATIVE COMPUTATIONAL MEDIA

WHEREAS, the general public has an insatiable appetite for entertainment in the form of movies, video games, and concerts, theatre and dance productions, which translates to expansive job opportunities for suitably trained UH students in industries other than tourism in Hawai'i; and

WHEREAS, the program objective is to provide students and/or professionals with training necessary to enter into job markets relating to this blend of computer science, creative media, electrical engineering, and the performing arts; and

WHEREAS, the program represents a collaborative effort between the Department of Information and Computer Sciences, the Academy for Creative Media, the Department of Electrical Engineering, and the Department of Theatre & Dance; and

WHEREAS, the four departments have strategically begun cross-listing courses and updating pre-requisites to make key courses suitable and regularly available for the certificate; and

WHEREAS, the participating faculty of this certificate program have strong connections with industry that will help create opportunities for students seeking internships when the companies come to Hawai'i during their recruitment drives; and

WHEREAS, 91% of surveyed target students indicated their interest in obtaining the certificate; and

WHEREAS, initiating this certificate will utilize only existing resources present at the University of Hawai'i at Mānoa, although success may later require additional resource acquisition; and

WHEREAS, the proposed certificate will provide enhanced, integrative training not currently provided in the University of Hawai'i System; therefore,

BE IT RESOLVED, that the Mānoa Faculty Senate recommends approval of the proposal to establish an Undergraduate Certificate in Creative Computational Media at the University of Hawai'i at Mānoa.

Supporting Document:
Proposal for Undergraduate Certificate in Creative Computational Media

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