SENATE COMMITTEE ON CURRICULAR AFFAIRS

COURSE SUBMISSION AND CONSULTATION FORM

Principal Faculty Member(s) Proposing Course

Name	User ID	College	Department
JEFFREY STONE	jas86	University College (UC)	Not Available
NICOLE ANDEL	nma2	University College (UC)	Not Available
MICHAEL GALLIS	mrg3	University College (UC)	Not Available

Academic Home: University College (UC)

Type of Proposal: ☒ Add ☐ Change ☐ Drop

Course Designation

(GAME 180N) The Art and Science of Virtual Worlds

Course Information

Cross-Listed Courses:

Prerequisites:

Corequisites:

Concurrents:

Recommended Preparations:

Abbreviated Title:	Art Sci Virtual Wo
Discipline:	General Education
Course Listing:	Inter-Domain

Special categories for Undergraduate (001-499) courses

Foundations

☐ **Writing/Speaking (GWS)**

☐ **Quantification (GQ)**

Knowledge Domains

☐ **Health & Wellness (GHW)**

☒ **Natural Sciences (GN)**

☒ **Arts (GA)**

☐ **Humanities (GH)**

☐ **Social and Behavioral Sciences (GS)**

Additional Designations

☐ **Bachelor of Arts**

☐ **International Cultures (IL)**

☐ **United States Cultures (US)**

☐ **Honors Course**

☐ **Common course number - x94, x95, x96, x97, x99**

☐ **Writing Across the Curriculum**

First-Year Engagement Program

☐ **First-Year Seminar**

Miscellaneous

☐ **Common Course**

GE Learning Objectives

☒ **GenEd Learning Objective: Effective Communication**
☒ **GenEd Learning Objective: Creative Thinking**
☒ **GenEd Learning Objective: Crit & Analytical Think**
☐ **GenEd Learning Objective: Global Learning**
☒ **GenEd Learning Objective: Integrative Thinking**
☐ **GenEd Learning Objective: Key Literacies**
☐ **GenEd Learning Objective: Soc Resp & Ethic Reason**

Bulletin Listing

Minimum Credits:	3
Maximum Credits:	3
Repeatable:	NO
Department with Curricular Responsibility:	None (XX)
Effective Semester:	SU1 2018
Travel Component:	NO

Course Outline

A brief outline or overview of the course content:
This course will focus on the myriad ways that narrative arts and physical sciences relate to the development of technologically mediated virtual worlds. In virtual worlds, individuals interact with others in a virtual environment, either through an avatar or through virtual reality hardware. Designing the physical and narrative voyages of avatars through virtual worlds is necessarily a team-centered undertaking requiring recursive editing from a macroscopic and microscopic point of view to refocus project goals and deliverables.

Besides learning the requisite computing and technical skills involved in virtual world development, students enrolled in this course will produce a world design proposal, and storyboards, interactive fiction graphics, or world maps for their virtual world; in this way, they will explore some of the ways that creative writing, particularly interactive fiction and storytelling techniques drawn from non-VR and VR gaming contribute to the planning, design, and execution of virtual worlds. Students will also learn about the basic science behind virtual world concepts such as the physical environment, physical processes (e.g. kinematics, motion), and light; ultimately, they will produce an immersive time-space experience in their proposed world and reflect on the complexity of integrating design elements in a way that creates a satisfying immersive experience.

A listing of the major topics to be covered with an approximate length of time allotted for their discussion:
The major topics to be covered in this course include: the physics of virtual worlds (25%); virtual world planning, design, and creation from the standpoint of creative writing and interactive fiction narratology (25%); applications of virtual world input technologies including goggles, haptics, and vestibular devices in fields including but not limited to education/training, law enforcement, medicine, and entertainment (15%); using computing technologies for creating and building virtual worlds (25%), and theoretical foundations of virtual worlds (10%).

Course Description:
GAME 180N is a multidisciplinary course which introduces students to the theories, concepts, and technologies behind virtual worlds. This course will focus on the myriad ways that narrative arts and physical sciences relate to the development of technologically mediated virtual worlds.

Designing the physical and narrative voyages of avatars through virtual worlds is necessarily a team-centered undertaking requiring recursive editing from a macroscopic and microscopic point of view to refocus project goals and deliverables. Besides learning the requisite computing and technical skills involved in virtual world development, students enrolled in this course will produce a world design proposal, and storyboards, interactive fiction graphics, or world maps for their virtual world; in this way, they will explore some of the ways that creative writing, particularly interactive fiction and storytelling techniques drawn from non-VR and VR gaming contribute to the planning, design, and execution of virtual worlds. Students will also learn about the basic science behind virtual world concepts such as the physical environment, physical processes (e.g. kinematics, motion), and light; ultimately, they will produce an immersive time-space experience in their proposed world and reflect on the complexity of integrating design elements in a way that creates a satisfying immersive experience.

The objectives of the course include: (1) students will work in teams to design a proposed virtual world using world making principles found in interactive fiction narratology and physical principles that embody the avatar and allow it to move in a virtual world environment; (2) students will work in teams to construct a virtual scene, movement in time/space, from that world using computer software tools and mediated through virtual reality hardware; (3) students will be able to discuss developing immersive technology and applications of virtual worlds in business, society, and academia; (4) students will analyze and critique the virtual world designs of other student teams; (5) students will demonstrate comprehension of interactive fiction scene and level structures and world maps as they relate to designing the voyage of the avatar in a virtual world; and (6) students will demonstrate comprehension of physical principles (e.g. kinematics, light) as they apply to virtual worlds.

In addition to directed readings, discussions, and quizzes in computing, narrative arts, and physics (related to concepts inherent in virtual worlds), the course will incorporate hands-on lab exercises and online discussions. A semester-long team project will be the primary means of student evaluation. During this semester-long team project students will design and create their own virtual environment(s) and character(s) using software tools and accepted world design principles. Students will apply a variety of computing concepts in the world creation, including some combination of programming, 360-degree video, and digital imagery. The course will culminate in the oral and visual presentation of their creative and technological works. The semester-long team project will be heavily integrated into the in-class experience and assessed using rubrics that draw on examples and assignment descriptions provided to students.

The name(s) of the faculty member(s) responsible for the development of the course:

- Name: JEFFREY STONE (jas86)

Title:
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- Name: MICHAEL GALLIS (mrg3)

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- Name: NICOLE ANDEL (nma2)

Title:
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City:
Fax:

Course Justification

Instructional, Educational, and Course Objectives:
This section should define what the student is expected to learn and what skills the student will develop.
Virtual worlds are inherently multidisciplinary. The concept of immersing oneself into a virtual environment necessarily implies a suspension of disbelief, and, through this course, students will learn about how virtual dissonances are managed through narrative design and through technology that lead to more immersive experiences. Planning the story, scenes, and characters in the world will assist students in translating the team's vision into an immersive environment, while knowledge of physical properties and processes allow for the creation of more accurate simulations of the natural environment as well as more accurate interaction between virtual world components. Computing technology (e.g. programming, 360-degree video) allows students to integrate the artistic and physical knowledge obtained throughout the course.

The course objectives are as follows: (1) Students will work in teams to design a proposed virtual world using world making principles found in interactive fiction narratology and physical principles that embody the avatar and allow it to move in a virtual world environment; (2) Students will work in teams to construct a virtual scene, movement in time/space, from that world using computer software tools and mediated through virtual reality hardware; (3) Students will be able to discuss developing immersive technology and applications of virtual worlds in business, society, and academia; (4) Students will analyze and critique the virtual world designs of other student teams; (5) Students will demonstrate comprehension of interactive fiction scene and level structures and world maps as they relate to designing the voyage of the avatar in a virtual world; (6) Students will demonstrate comprehension of physical principles (e.g. kinematics, light) as they apply to virtual worlds.

Evaluation Methods:
Include a statement that explains how the achievement of the educational objective identified above will be assessed. The procedures for determining students' grades should be specifically identified.
In addition to directed readings, discussions, and quizzes in computing, narrative arts, and physics (related to concepts inherent in virtual worlds), the course will incorporate hands-on lab exercises and online discussions. A semester-long team project will be the primary means of student evaluation. During this semester-long team project students will design and create their own virtual environment(s) and character(s) using software tools, virtual reality hardware and accepted world design principles. The course will culminate in the oral and visual presentation of their creative and technological works. The semester-long team project will be heavily integrated into the in-class experience and assessed using rubrics that draw on examples and assignment descriptions provided to students.

Students will construct multiple iterations of team project proposals. These proposals will first involve what the teams hope to accomplish, in light of introductory knowledge. Once some introduction to the computing, art, and physics concepts are presented

in class, the group will then reflect and revise their proposal in light of the new knowledge they've obtained. Each team will also provide feedback to the other teams' proposals, offering suggestions on strengthening the document(s). Finally, each team will attempt to construct their proposed virtual environment(s) and character(s) using knowledge obtained throughout the course.

Relationship/Linkage of Course to Other Courses:
This statement should relate the course to existing or proposed new courses. It should provide a rationale for the level of instruction, for any prerequisites that may be specified, or for the course's role as a prerequisite for other courses.
N/A

Relationship of Course to Major, Option, Minor, or General Education:
This statement should explain how the course will contribute to the major, option, or minor and indicate how it may function as a service course for other departments.
This course provide a general education experience that integrates the GA and GN domains. The purpose of the integrative approach is to educate students about the interdisciplinary nature of technological works, and the various bodies of knowledge that come into play during virtual world design and creation. Virtual worlds and virtual reality are electronic mediums, requiring knowledge of computing concepts such as hardware, software, computer graphics, and programming. Virtual worlds are also a form of narrative and world creation expression and design, but require knowledge of physical properties (e.g. light, spatial relationships) and processes (e.g. motion). Knowledge of computing, art, and science is necessary to create a truly immersive and realistic user experience. This knowledge will be built during the course; no prior specific computing experience (e.g. programming) is assumed. Students will be directed towards world making technologies appropriate for their project and skill levels.

A description of any special facilities:
This course should be taught in a computer classroom. Basic or advanced VR equipment, provided by the Penn State Media Commons, the specific campus, or other means, must be accessible to the enrolled students. The accessibility of the materials through inexpensive and ubiquitous consumer equipment is expected to grow over time. Penn State's Adobe Creative Cloud license and the freely available Unity platform are examples of software tools that can be used in this course. Virtual reality goggles have become inexpensive (some as low as $20) and can be accessed through the Penn State Media Commons.

Frequency of Offering and Enrollment:
The course can be offered during any semester, upon sufficient enrollment. The course is recommended to be offered as two 50-minute lecture/discussion periods along with one 75-minute lab period each week, but can be adapted as necessary.

Alignment with General Education Objectives

☒ **EFFECTIVE COMMUNICATION – the ability to exchange information and ideas in oral, written, and visual form in ways that allow for informed and persuasive discourse that builds trust and respect among those engaged in that exchange, and helps create environments where creative ideas and problem-solving flourish.**

☐ **KEY LITERACIES – the ability to identify, interpret, create, communicate and compute using materials in a variety of media and contexts. Literacy acquired in multiple areas, such as textual, quantitative, information/technology, health, intercultural, historical, aesthetic, linguistic (world languages), and scientific, enables individuals to achieve their goals, to develop their knowledge and potential, to lead healthy and productive lives, and to participate fully in their community and wider society.**

☒ **CRITICAL AND ANALYTICAL THINKING – the habit of mind characterized by comprehensive exploration of issues, ideas, artifacts, and events before accepting or formulating a conclusion. It is the intellectually disciplined process of conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action.**

☒ **INTEGRATIVE THINKING – the ability to synthesize knowledge across multiple domains, modes of inquiry, historical periods, and perspectives, as well as the ability to identify linkages between existing knowledge and new information. Individuals who engage in integrative thinking are able to transfer knowledge within and beyond their current contexts.**

☒ **CREATIVE THINKING – the capacity to synthesize existing ideas, images, or expertise in original ways and the experience of performing, making, thinking, or acting in an imaginative way that may be characterized by innovation, divergent thinking, and intellectual risk taking.**

☐ **GLOBAL LEARNING – the intellectually disciplined abilities to analyze similarities and differences among cultures; evaluate natural, physical, social, cultural, historical, and economic legacies and hierarchies; and engage as community members and leaders who will continue to deal with the intricacies of an ever-changing world. Individuals should acquire the ability to analyze power; identify and critique interdependent global, regional, and local cultures and systems; and evaluate the implications for people's lives.**

☐ **SOCIAL RESPONSIBILITY AND ETHICAL REASONING – the ability to assess one's own values within the social context of problems, recognize ethical issues in a variety of settings, describe how different perspectives might be applied to ethical dilemmas, and consider the ramifications of alternative actions. Individuals should acquire the self-- knowledge and leadership skills needed to play a role in creating and maintaining healthy, civil, safe, and thriving communities.**

What component(s) of the course will help students acheive the General Education Learning Objectives covered in the course? Provide evidence that students in the course have adequate opportunities to achieve the identified learning objectives.
EFFECTIVE COMMUNICATION: Students will work collaboratively on a semester-long project, after which the student groups will present their work to the class and other stakeholders. This project will involve communication in a variety of forms (oral, written, and technological) and involve significant intra- and inter-group communication. Online discussions will also provide mechanisms for student conversations related to the course content.

CRITICAL AND ANALYTICAL THINKING: Students will have the ability to critically assess the work of others (through the feedback

cycles involved in the semester-long team project). Students will also have the opportunity, through directed readings, demonstrations, and personal investigation, to understand the diversity of virtual world applications in business, academia, and society.

INTEGRATIVE THINKING: Students will be expected to apply both narrative and world creation structures (e.g. narrative construction, aesthetic design) and physical principles (e.g. kinematics, light, spatial relationships) in planning and building a scene in time-space in their virtual world. Students will also have the ability, through in-class and online discussions, to demonstrate an understanding of the technical possibilities and limitations of virtual reality and virtual worlds, as well as their inherent interdisciplinary nature.

CREATIVE THINKING: Students will be asked to collaboratively devise a unique and inventive virtual world for their semester-long project. Designing the physical and narrative voyages of avatars through virtual worlds is necessarily a team centered undertaking requiring recursive editing from a macroscopic and microscopic point of view to refocus project goals and deliverables.

How will students be assessed to determine their attainment of the Learning Objective(s) of General Education covered in this course? This assessment must be included as a portion of the student's overall performance in this course.

EFFECTIVE COMMUNICATION: Students will be assessed by (1) written or orally delivered proposals for the semester-long project, discussion, discussion forums, and other assignments; (2) An oral presentation of their work on the semester-long project; and (3) Presentation of the technological portion of the semester-long project.

CRITICAL AND ANALYTICAL THINKING: Students will be assessed by (1) written reviews assessing the work of other teams' semester-long team project proposals; (2) quizzes on directed readings; (3) online discussion forums and in-class exercises which illustrate the applications of virtual reality in business, academia, and society.

INTEGRATIVE THINKING: Students will be assessed by (1) the written and technological assignments associated with the semester-long project, including but not limited to the narrative and physical aspects of their virtual world; (2) online discussion forums and in-class exercises which illustrate their understanding of the technical possibilities and limitations of virtual reality and virtual worlds, as well as their inherent interdisciplinary nature.

CREATIVE THINKING: Students will be assessed by the written and technological assignments associated with the semester-long project.

General Education Domain Criteria

General Education Designation: Inter-Domain

GA Criteria

☐ **Explain the methods of inquiry in arts fields and describe how the contributions of these fields complement inquiry in other areas**

☒ **Demonstrate an expanded knowledge and comprehension of the role that the arts play in various aspects of human endeavor**

☒ **Demonstrate competence in the creation of works of art and design**

☒ **Demonstrate competence in analysis, critical thinking and interpretive reasoning through the exploration of creative works**

☐ **Identify and explain the aesthetic, historic, social, and cultural significance of important works of art and critically assess creative works, their own or others', through evaluative processes of analysis and interpretation**

What components of the course will help students acheive the domain criteria selected above?

Students will work in teams to design and propose a virtual world using generally accepted world making principles found in interactive fiction narratology that embody the avatar and allow for immersion through narrative in a virtual world environment. This will allow students to "Demonstrate competence in the creation of works of art and design" (GA3).

The students' semester-long project work will also allow them to demonstrate comprehension of virtual world creation design and narrative principles as they apply to virtual world stories, thus satisfying that they "Demonstrate an expanded knowledge and comprehension of the role that the arts play in various aspects of human endeavor" (GA2); the aspect of human endeavor in this course is virtual world creation; the team's process of thinking through a world story, a world geography, a world narrative, and a world physics will necessarily demand that they "Demonstrate competence in analysis, critical thinking and interpretive reasoning through the exploration of creative works"(GA4).

By analyzing and critiquing the virtual world designs of other student teams, students will satisfy GA4 ("Demonstrate competence in analysis, critical thinking and interpretive reasoning through the exploration of creative works").

Students investigating the applications of virtual reality and virtual worlds in business, society, and academia will allow students to "Demonstrate an expanded knowledge and comprehension of the role that the arts play in various aspects of human endeavor" (GA2) as well as "Demonstrate competence in analysis, critical thinking and interpretive reasoning through the exploration of creative works" (GA4).

GN Criteria

☒ **Explain the methods of inquiry in the natural science fields and describe how the contributions of these fields complement inquiry in other areas**

☐ **Construct evidence-based explanations of natural phenomena**

☒ **Demonstrate informed understandings of scientific claims and their applications**

☐ **Evaluate the quality of the data, methods, and inferences used to generate scientific knowledge**

☒ **Identify societal or philosophical implications of discoveries in the natural sciences, as well as their potential to address contemporary problems**

What components of the course will help students acheive the domain criteria selected above?

Students working in teams will construct and evaluate virtual world elements using computer software tools and virtual reality hardware. By observing the physical principles at work in these elements, students will be evaluating models of the physics of the virtual worlds through the techniques of the scientific method, thus allowing them to “Demonstrate informed understandings of scientific claims and their applications” (GN3).

By analyzing (through observation and measurement) and reviewing the virtual world designs of other student teams, students will satisfy GN1 (“Explain the methods of inquiry in the natural science fields and describe how the contributions of these fields complement inquiry in other areas”). Students investigating the applications of virtual reality and virtual worlds in business, society, and academia will also allow students to satisfy GN1.

The students’ semester-long project work will allow them to demonstrate comprehension of physical principles (e.g. kinematics, Newton’s Laws, properties and propagation of light, energy) as they apply to virtual worlds, thus satisfying GN5 (“Identify societal or philosophical implications of discoveries in the natural sciences, as well as their potential to address contemporary problems”). Students investigating the applications of virtual reality and virtual worlds in business, society, and academia will also allow students to satisfy GN5.

Integrative Studies

Explain how the intellectual frameworks And methodologies of the two Knowledge Domains will be explicitly addressed in the course and practiced by the students.

GA: Exploring virtual worlds (VW) will provide students with a novel way to immerse themselves in the intersection of the narrative arts, particularly design, scene and level crafting, and storytelling, with applications of virtual reality in gaming, medicine, combat, and police training modalities. Virtual world makers seek to simulate an experience where suspension of disbelief can be achieved through immersion in an environment and through a story. Students will demonstrate an understanding of this main task as it is undertaken by VR narrative artists, the narrative philosophies guiding these developers in the virtual world, and then apply this knowledge to the narrative and world making art in their own projects. They will offer a critique of their own and others narrative and world making art in the course.

GN: Exploring the nature and applications of virtual reality will provide students with a novel way to immerse themselves in the framework and methodologies of the scientific method. Virtual worlds are in part simulations of the natural world, where visitors and intrinsic objects act and interact through prescribed rules. Students use their own observations and observation plans to evaluate the fidelity of virtual worlds as models of the natural world. Since not all aspects of all virtual worlds are intended to mimic with complete fidelity the laws of nature, students will identify the limits of the virtual worlds as a model of nature as well the limits of the students understanding of the laws of nature as a model for particular virtual worlds. Students will naturally develop their own mental models of how particular virtual worlds work and in turn will use their observations to evaluate the limitations of their models in a process that implements the key elements of the scientific method. Students will also be introduced to some of applications of virtual reality that are becoming important in scientific and technological fields, such as training, remote equipment operation, innovative methods of data visualization, and more.

Demonstrate that each Of the two domains will receive approximately equal attention, providing evidence from course topics, assignments, or other course components, and that students will integrate material from both domains.

The course is structured to be team taught, providing approximately equal attention to both the narrative aspect of virtual worlds and the physical concerns (e.g. kinematics) associated with reality simulations. These concepts are reinforced through the use of VR technology, which acts and the implementation mechanism for students designs. Multiple weeks are devoted to narrative arts, physics, and technology-related instruction in order to present students with the background they need to construct feasible, immersive, and entertaining virtual worlds.

Students will necessarily integrate material and demonstrate not only a knowledge of but also the production of work from the two domains (GA, GN) in the development of their semester-long team project. The iterative development of the students’ virtual world, combined with the peer- and instructor feedback mechanisms, will provide ample opportunity for students to demonstrate comprehension of the narrative design principles and physical concepts inherent in reality simulations. Integration of this material, building narrative momentum from world idea to storyboard, to a particular scene, and then coupling these concerns with a technological demonstration of movement in time-space, physical momentum in a scene of that virtual world, is considered the key learning outcome of the project.

Briefly explain the staffing plan. Given that each Inter-Domain course is approved for two Knowledge Domains, it will be taught by an instructor (or instructional team) with appropriate expertise in both domains.

This course is recommended to be team-taught by one (1) faculty member in Computer Science, Computer Engineering, or IST, one (1) faculty member in Physics or Astronomy, and one (1) faculty member in the narrative or visual arts.

Describe the assessments that will be used to determine students' ability to apply integrative thinking.

The semester-long team project will assess students’ ability to apply integrative thinking, beginning with the initial project proposal, continuing through project idea refinement and peer review, and finishing with the final product and oral presentation. Students will also be assessed on their integrative thinking applications in quizzes, online and in-class discussions, and laboratory assignments.

Campuses That Have Offered ( ) Over The Past 4 Years

semester	AB	AL	BK	BR	BW	CR	DS	ER	FE	GA	GV	HB	HN	HY	LV	MA	NK	PC	SH	SL	UP	WB	WC	WS	XC	XP	XS	YK

UPLOADED DOCUMENTS FOLLOW:

GAME 180N: The Art and Science of Virtual Worlds
Penn State University, Campus
Semester & Year

Course Instructors

Dr. Jeffrey A. Stone
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Dr. Michael Gallis
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Course Meeting Time/Place

TBA

Required Textbooks and Course Materials

No textbook is required; online readings will be provided by the instructor(s).

General Education

GAME 180N counts as an interdomain course for general education, satisfying both Arts (GA) and Science (GN) categories.

Course Overview

GAME 180N is a multidisciplinary course which introduces students to the theories, concepts, and technologies behind virtual worlds. Besides learning the requisite computing and technical skills involved in virtual world development, students enrolled in this course will produce a world design proposal as well as storyboards, interactive fiction graphics, or world maps for their virtual world; in this way, students will explore some of the ways that creative writing, particularly interactive fiction and storytelling techniques drawn from non-VR and VR gaming contribute to the planning, design, and execution of virtual worlds. Students will also learn about the basic science behind virtual world concepts such as the physical environment, physical processes (e.g. kinematics, motion), and light; ultimately, students will produce an immersive time-space experience in their proposed world and reflect on the complexity of integrating design elements in a way that creates a satisfying immersive experience.

The course objectives are as follows:

- Students will work in teams to design a proposed virtual world using world making principles found in interactive fiction narratology and physical principles that embody the avatar and allow it to move in a virtual world environment

- Students will work in teams to construct a virtual scene, movement in time/space, from that world using computer software tools and mediated through virtual reality hardware
- Students will be able to discuss developing immersive technology and applications of virtual worlds in business, society, and academia
- Students will analyze and critique the virtual world designs of other student teams
- Students will demonstrate comprehension of interactive fiction scene and level structures and world maps as they relate to designing the voyage of the avatar in a virtual world
- Students will demonstrate comprehension of physical principles (e.g. kinematics, light) as they apply to virtual worlds.

Course Prerequisite

GAME 180N requires no prerequisites.

Course Format

You will explore the class topics through class lectures, skill building assignments (in class and online), exercises based on the text and supplemental content, and a combination of team and individual assignments.

In addition to directed readings, discussions, and quizzes in computing, narrative arts, and physics, the course will incorporate hands-on lab exercises and online discussions. A semester-long team project will be the primary means of student evaluation. During this semester-long team project students will design and create their own virtual environment(s) and character(s) using software tools and accepted world design principles. Students will apply a variety of computing concepts in the world creation, including some combination of programming, 360-degree video, and digital imagery. The course will culminate in the oral and visual presentation of their creative and technological works. The semester-long team project will be heavily integrated into the in-class experience and assessed using rubrics that draw on examples and assignment descriptions provided to students.

The course grade is determined as follows:

Deliverable	Percentage of Final Grade
Project Pre-Proposal	10
Formal Proposal	20
Final Product and Presentation	35
Peer and Personal Review Quizzes	10
Topic Quizzes	10
Labs & Online Discussions	15
TOTAL:	100

Final letter grades will be based on the following scale:

Letter Grade	Percent Range
A	94.00-100.00
A-	90.00-93.99
B+	87.00-89.99
B	83.00-86.99
B-	80.00-82.99
C+	77.00-79.99
C	70.00-76.99
D	60.00-69.99
F	0.00-59.99

Use of the Canvas Learning Management System

The Canvas Learning Management System (http://psu.instructure.com) will be utilized for all course-related electronic communication. Students should check their Canvas account at least once a day for breaking news and events. Regular Penn State e-mail should NOT be used for course communication. Canvas will also be used to submit assignments.

Inclement Weather Policy

If class is cancelled for any reason, including weather conditions, students should check their Canvas e-mail for instructions on how work will be conducted electronically for that day. The instructor(s) will e-mail students with instructions on work to complete, video lectures to review, reading assignments, and other important issues related to course progress. It is the students' responsibility to be aware of these directions and complete the assigned work before the next class period. If the campus is open, you should assume class will be held as scheduled.

In the event the instructor(s) must cancel class for any reason other than those mentioned above, Canvas e-mail will be used to inform students at least two hours in advance. Note that this does not cover emergencies or acts of god.

Students with Disabilities

Students with disabilities, whether physical, learning, or psychological, who believe that they may need academic adjustments in this class, are encouraged to contact Disability Services as soon as possible to ensure that such adjustments are implemented in a timely fashion. Please schedule an appointment to meet with the Disability Services Liaison at your campus to present your documentation and to verify your eligibility for any classroom adjustments and for academic assistance related to your disability.

Policy on Academic Integrity

Penn State is committed to maintaining academic integrity in this and all other courses it offers. Academic integrity—scholarship free of fraud and deception—is an important educational objective of Penn State. Academic dishonesty can lead to a failing grade or referral to the Office of Judicial Affairs.

Academic dishonesty includes, but is not limited to:

- Cheating
- Plagiarism
- Fabrication of information or citations
- Facilitating acts of academic dishonesty by others
- Unauthorized prior possession of examinations
- Submitting the work of another person or work previously used without informing the instructor and securing written approval
- Tampering with the academic work of other students

In cases where academic integrity is questioned, Penn State's Policy on Academic Integrity requires that the instructor give the student notice of the charge as well as the recommended sanction. Procedures allow the student to accept or contest the charge through discussions with the instructor. If a student accepts the charge and the recommended sanction, the respective College files the case with the Office of Judicial Affairs. If a student chooses to contest, the case will then be managed by the respective College or Campus Academic Integrity Committee. If a disciplinary sanction also is recommended, the case will be referred to the Office of Judicial Affairs.

If you have any doubts as to the meaning of plagiarism or cheating as it applies to this course, you should discuss them with the instructor. Please note that the instructor will utilize electronic resources such as http://turnitin.psu.edu to ensure academic integrity.

Class Schedule

The following schedule outlines the topics to be covered in this course, along with exam dates. A final exam will be provided during the final exam week.

- The course begins on Day, Month, Year
- The course ends on Day, Month, Year

Course length: 16 weeks

We anticipate that we will follow the schedule outlined here, but we may make adjustments based on what actually happens as the semester progresses. We may also change basis for the course grade; if we do so, we will so inform you in writing. Remaining in the course after reading this syllabus will signal that you accept the possibility of changes and responsibility for being aware of them.

Week	Main Topic	Lab
1	Introduction to Virtual Worlds and Virtual Reality	
2	Practical Applications of Virtual Reality	*Intro to VR Software*
3	Design & Creativity in a Virtual Space	*Proposal Examples, Brainstorming*
4	The Physics of Virtual Reality and Virtual Worlds	*Project Pre-Proposal*
5	The Physics of Virtual Reality and Virtual Worlds	*Physics in VR*
6	Project Proposal Experimentation	*VR Software Experimentation*
7	Project Proposal Consultations	*Proposal Peer Review*
8	Exploring and Implementing Physical Models	*Physical Models and VR*
9	The Art of Virtual Worlds and Virtual Reality	*VR Software Experimentation*

10	The Art of Virtual Worlds and Virtual Reality	*VW Design*
11	The Art of Virtual Worlds and Virtual Reality	*VW Design (Software)*
12	Project Development	*VW Construction*
13	Project Development	*VW Construction*
14	THANKSGIVING BREAK	
15	Project Development	*VW Construction (Finish)*
16	Project Presentations	

SENATE COMMITTEE ON CURRICULAR AFFAIRS

COURSE SUBMISSION AND CONSULTATION FORM

Principal Faculty Member(s) Proposing Course

Name	User ID	College	Department
JEFFREY STONE	jas86	University College (UC)	Not Available
NICOLE ANDEL	nma2	University College (UC)	Not Available
MICHAEL GALLIS	mrg3	University College (UC)	Not Available

Academic Home: Behrend College (BC)

Type of Proposal: ☒ Add ☐ Change ☐ Drop

Course Designation

(GAME 180N) The Art and Science of Virtual Worlds

Course Information

Cross-Listed Courses:

Prerequisites:

Corequisites:

Concurrents:

Recommended Preparations:

Abbreviated Title:	Art Sci Virtual Wo
Discipline:	General Education
Course Listing:	Inter-Domain

Special categories for Undergraduate (001-499) courses

Foundations

☐ **Writing/Speaking (GWS)**

☐ **Quantification (GQ)**

Knowledge Domains

☐ **Health & Wellness (GHW)**

☒ **Natural Sciences (GN)**

☒ **Arts (GA)**

☐ **Humanities (GH)**

☐ **Social and Behavioral Sciences (GS)**

Additional Designations

☐ **Bachelor of Arts**

☐ **International Cultures (IL)**

☐ **United States Cultures (US)**

☐ **Honors Course**

☐ **Common course number - x94, x95, x96, x97, x99**

☐ **Writing Across the Curriculum**

First-Year Engagement Program

☐ **First-Year Seminar**

Miscellaneous

☐ **Common Course**

GE Learning Objectives

☒ **GenEd Learning Objective: Effective Communication**
☒ **GenEd Learning Objective: Creative Thinking**
☒ **GenEd Learning Objective: Crit & Analytical Think**
☐ **GenEd Learning Objective: Global Learning**
☒ **GenEd Learning Objective: Integrative Thinking**
☐ **GenEd Learning Objective: Key Literacies**
☐ **GenEd Learning Objective: Soc Resp & Ethic Reason**

Bulletin Listing

Minimum Credits:	3
Maximum Credits:	3
Repeatable:	NO
Department with Curricular Responsibility:	None (XX)
Effective Semester:	SU1 2018
Travel Component:	NO

Course Outline

A brief outline or overview of the course content:
This course will focus on the myriad ways that narrative arts and physical sciences relate to the development of technologically mediated virtual worlds. In virtual worlds, individuals interact with others in a virtual environment, either through an avatar or through virtual reality hardware. Designing the physical and narrative voyages of avatars through virtual worlds is necessarily a team-centered undertaking requiring recursive editing from a macroscopic and microscopic point of view to refocus project goals and deliverables.

Besides learning the requisite computing and technical skills involved in virtual world development, students enrolled in this course will produce a world design proposal, and storyboards, interactive fiction graphics, or world maps for their virtual world; in this way, they will explore some of the ways that creative writing, particularly interactive fiction and storytelling techniques drawn from non-VR and VR gaming contribute to the planning, design, and execution of virtual worlds. Students will also learn about the basic science behind virtual world concepts such as the physical environment, physical processes (e.g. kinematics, motion), and light; ultimately, they will produce an immersive time-space experience in their proposed world and reflect on the complexity of integrating design elements in a way that creates a satisfying immersive experience.

A listing of the major topics to be covered with an approximate length of time allotted for their discussion:
The major topics to be covered in this course include: the physics of virtual worlds (25%); virtual world planning, design, and creation from the standpoint of creative writing and interactive fiction narratology (25%); applications of virtual world input technologies including goggles, haptics, and vestibular devices in fields including but not limited to education/training, law enforcement, medicine, and entertainment (15%); using computing technologies for creating and building virtual worlds (25%), and theoretical foundations of virtual worlds (10%).

Course Description:
GAME 180N is a multidisciplinary course which introduces students to the theories, concepts, and technologies behind virtual worlds. This course will focus on the myriad ways that narrative arts and physical sciences relate to the development of technologically mediated virtual worlds. Designing the physical and narrative voyages of avatars through virtual worlds is necessarily a team-centered undertaking requiring recursive editing from a macroscopic and microscopic point of view to refocus project goals and deliverables. Besides learning the requisite computing and technical skills involved in virtual world development, students enrolled in this course will produce a world design proposal, and storyboards, interactive fiction graphics, or world maps for their virtual world; in this way, they will explore some of the ways that creative writing, particularly interactive fiction and storytelling techniques drawn from non-VR and VR gaming contribute to the planning, design, and execution of virtual worlds. Students will also learn about the basic science behind virtual world concepts such as the physical environment, physical processes (e.g. kinematics, motion), and light; ultimately, they will produce an immersive time-space experience in their proposed world and reflect on the complexity of integrating design elements in a way that creates a satisfying immersive experience.

The objectives of the course include: (1) students will work in teams to design a proposed virtual world using world making principles found in interactive fiction narratology and physical principles that embody the avatar and allow it to move in a virtual world environment; (2) students will work in teams to construct a virtual scene, movement in time/space, from that world using computer software tools and mediated through virtual reality hardware; (3) students will be able to discuss developing immersive technology and applications of virtual worlds in business, society, and academia; (4) students will analyze and critique the virtual world designs of other student teams; (5) students will demonstrate comprehension of interactive fiction scene and level structures and world maps as they relate to designing the voyage of the avatar in a virtual world; and (6) students will demonstrate comprehension of physical principles (e.g. kinematics, light) as they apply to virtual worlds.

In addition to directed readings, discussions, and quizzes in computing, narrative arts, and physics (related to concepts inherent in

virtual worlds), the course will incorporate hands-on lab exercises and online discussions. A semester-long team project will be the primary means of student evaluation. During this semester-long team project students will design and create their own virtual environment(s) and character(s) using software tools and accepted world design principles. Students will apply a variety of computing concepts in the world creation, including some combination of programming, 360-degree video, and digital imagery. The course will culminate in the oral and visual presentation of their creative and technological works. The semester-long team project will be heavily integrated into the in-class experience and assessed using rubrics that draw on examples and assignment descriptions provided to students.

The name(s) of the faculty member(s) responsible for the development of the course:

- Name: JEFFREY STONE (jas86)

Title:
Phone:
Address:
Campus: LV
City:
Fax:

- Name: MICHAEL GALLIS (mrg3)

Title:
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City:
Fax:

- Name: NICOLE ANDEL (nma2)

Title:
Phone:
Address:
Campus: SL
City:
Fax:

Course Justification

Instructional, Educational, and Course Objectives:
This section should define what the student is expected to learn and what skills the student will develop.
Virtual worlds are inherently multidisciplinary. The concept of immersing oneself into a virtual environment necessarily implies a suspension of disbelief, and, through this course, students will learn about how virtual dissonances are managed through narrative design and through technology that lead to more immersive experiences. Planning the story, scenes, and characters in the world will assist students in translating the team's vision into an immersive environment, while knowledge of physical properties and processes allow for the creation of more accurate simulations of the natural environment as well as more accurate interaction between virtual world components. Computing technology (e.g. programming, 360-degree video) allows students to integrate the artistic and physical knowledge obtained throughout the course.

The course objectives are as follows: (1) Students will work in teams to design a proposed virtual world using world making principles found in interactive fiction narratology and physical principles that embody the avatar and allow it to move in a virtual world environment; (2) Students will work in teams to construct a virtual scene, movement in time/space, from that world using computer software tools and mediated through virtual reality hardware; (3) Students will be able to discuss developing immersive technology and applications of virtual worlds in business, society, and academia; (4) Students will analyze and critique the virtual world designs of other student teams; (5) Students will demonstrate comprehension of interactive fiction scene and level structures and world maps as they relate to designing the voyage of the avatar in a virtual world; (6) Students will demonstrate comprehension of physical principles (e.g. kinematics, light) as they apply to virtual worlds.

Evaluation Methods:
Include a statement that explains how the achievement of the educational objective identified above will be assessed. The procedures for determining students' grades should be specifically identified.
In addition to directed readings, discussions, and quizzes in computing, narrative arts, and physics (related to concepts inherent in virtual worlds), the course will incorporate hands-on lab exercises and online discussions. A semester-long team project will be the primary means of student evaluation. During this semester-long team project students will design and create their own virtual environment(s) and character(s) using software tools, virtual reality hardware and accepted world design principles. The course will culminate in the oral and visual presentation of their creative and technological works. The semester-long team project will be heavily integrated into the in-class experience and assessed using rubrics that draw on examples and assignment descriptions provided to students.

Students will construct multiple iterations of team project proposals. These proposals will first involve what the teams hope to accomplish, in light of introductory knowledge. Once some introduction to the computing, art, and physics concepts are presented in class, the group will then reflect and revise their proposal in light of the new knowledge they've obtained. Each team will also provide feedback to the other teams' proposals, offering suggestions on strengthening the document(s). Finally, each team will

attempt to construct their proposed virtual environment(s) and character(s) using knowledge obtained throughout the course.

Relationship/Linkage of Course to Other Courses:
This statement should relate the course to existing or proposed new courses. It should provide a rationale for the level of instruction, for any prerequisites that may be specified, or for the course's role as a prerequisite for other courses.
n/a

Relationship of Course to Major, Option, Minor, or General Education:
This statement should explain how the course will contribute to the major, option, or minor and indicate how it may function as a service course for other departments.
This course provide a general education experience that integrates the GA and GN domains. The purpose of the integrative approach is to educate students about the interdisciplinary nature of technological works, and the various bodies of knowledge that come into play during virtual world design and creation. Virtual worlds and virtual reality are electronic mediums, requiring knowledge of computing concepts such as hardware, software, computer graphics, and programming. Virtual worlds are also a form of narrative and world creation expression and design, but require knowledge of physical properties (e.g. light, spatial relationships) and processes (e.g. motion). Knowledge of computing, art, and science is necessary to create a truly immersive and realistic user experience. This knowledge will be built during the course; no prior specific computing experience (e.g. programming) is assumed. Students will be directed towards world making technologies appropriate for their project and skill levels.

A description of any special facilities:
This course should be taught in a computer classroom. Basic or advanced VR equipment, provided by the Penn State Media Commons, the specific campus, or other means, must be accessible to the enrolled students. The accessibility of the materials through inexpensive and ubiquitous consumer equipment is expected to grow over time. Penn State's Adobe Creative Cloud license and the freely available Unity platform are examples of software tools that can be used in this course. Virtual reality goggles have become inexpensive (some as low as $20) and can be accessed through the Penn State Media Commons.

Frequency of Offering and Enrollment:
The course can be offered during any semester, upon sufficient enrollment. The course is recommended to be offered as two 50-minute lecture/discussion periods along with one 75-minute lab period each week, but can be adapted as necessary.

Alignment with General Education Objectives

☒ **EFFECTIVE COMMUNICATION – the ability to exchange information and ideas in oral, written, and visual form in ways that allow for informed and persuasive discourse that builds trust and respect among those engaged in that exchange, and helps create environments where creative ideas and problem-solving flourish.**

☐ **KEY LITERACIES – the ability to identify, interpret, create, communicate and compute using materials in a variety of media and contexts. Literacy acquired in multiple areas, such as textual, quantitative, information/technology, health, intercultural, historical, aesthetic, linguistic (world languages), and scientific, enables individuals to achieve their goals, to develop their knowledge and potential, to lead healthy and productive lives, and to participate fully in their community and wider society.**

☒ **CRITICAL AND ANALYTICAL THINKING – the habit of mind characterized by comprehensive exploration of issues, ideas, artifacts, and events before accepting or formulating a conclusion. It is the intellectually disciplined process of conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action.**

☒ **INTEGRATIVE THINKING – the ability to synthesize knowledge across multiple domains, modes of inquiry, historical periods, and perspectives, as well as the ability to identify linkages between existing knowledge and new information. Individuals who engage in integrative thinking are able to transfer knowledge within and beyond their current contexts.**

☒ **CREATIVE THINKING – the capacity to synthesize existing ideas, images, or expertise in original ways and the experience of performing, making, thinking, or acting in an imaginative way that may be characterized by innovation, divergent thinking, and intellectual risk taking.**

☐ **GLOBAL LEARNING – the intellectually disciplined abilities to analyze similarities and differences among cultures; evaluate natural, physical, social, cultural, historical, and economic legacies and hierarchies; and engage as community members and leaders who will continue to deal with the intricacies of an ever-changing world. Individuals should acquire the ability to analyze power; identify and critique interdependent global, regional, and local cultures and systems; and evaluate the implications for people's lives.**

☐ **SOCIAL RESPONSIBILITY AND ETHICAL REASONING – the ability to assess one's own values within the social context of problems, recognize ethical issues in a variety of settings, describe how different perspectives might be applied to ethical dilemmas, and consider the ramifications of alternative actions. Individuals should acquire the self-- knowledge and leadership skills needed to play a role in creating and maintaining healthy, civil, safe, and thriving communities.**

What component(s) of the course will help students acheive the General Education Learning Objectives covered in the course? Provide evidence that students in the course have adequate opportunities to achieve the identified learning objectives.
EFFECTIVE COMMUNICATION: Students will work collaboratively on a semester-long project, after which the student groups will present their work to the class and other stakeholders. This project will involve communication in a variety of forms (oral, written, and technological) and involve significant intra- and inter-group communication. Online discussions will also provide mechanisms for student conversations related to the course content.

CRITICAL AND ANALYTICAL THINKING: Students will have the ability to critically assess the work of others (through the feedback cycles involved in the semester-long team project). Students will also have the opportunity, through directed readings, demonstrations, and personal investigation, to understand the diversity of virtual world applications in business, academia, and

society.

INTEGRATIVE THINKING: Students will be expected to apply both narrative and world creation structures (e.g. narrative construction, aesthetic design) and physical principles (e.g. kinematics, light, spatial relationships) in planning and building a scene in time-space in their virtual world. Students will also have the ability, through in-class and online discussions, to demonstrate an understanding of the technical possibilities and limitations of virtual reality and virtual worlds, as well as their inherent interdisciplinary nature.

CREATIVE THINKING: Students will be asked to collaboratively devise a unique and inventive virtual world for their semester-long project. Designing the physical and narrative voyages of avatars through virtual worlds is necessarily a team centered undertaking requiring recursive editing from a macroscopic and microscopic point of view to refocus project goals and deliverables.

How will students be assessed to determine their attainment of the Learning Objective(s) of General Education covered in this course? This assessment must be included as a portion of the student's overall performance in this course.

EFFECTIVE COMMUNICATION: Students will be assessed by (1) written or orally delivered proposals for the semester-long project, discussion, discussion forums, and other assignments; (2) An oral presentation of their work on the semester-long project; and (3) Presentation of the technological portion of the semester-long project.

CRITICAL AND ANALYTICAL THINKING: Students will be assessed by (1) written reviews assessing the work of other teams' semester-long team project proposals; (2) quizzes on directed readings; (3) online discussion forums and in-class exercises which illustrate the applications of virtual reality in business, academia, and society.

INTEGRATIVE THINKING: Students will be assessed by (1) the written and technological assignments associated with the semester-long project, including but not limited to the narrative and physical aspects of their virtual world; (2) online discussion forums and in-class exercises which illustrate their understanding of the technical possibilities and limitations of virtual reality and virtual worlds, as well as their inherent interdisciplinary nature.

CREATIVE THINKING: Students will be assessed by the written and technological assignments associated with the semester-long project.

General Education Domain Criteria

General Education Designation: Inter-Domain

GA Criteria

☐ **Explain the methods of inquiry in arts fields and describe how the contributions of these fields complement inquiry in other areas**

☒ **Demonstrate an expanded knowledge and comprehension of the role that the arts play in various aspects of human endeavor**

☒ **Demonstrate competence in the creation of works of art and design**

☒ **Demonstrate competence in analysis, critical thinking and interpretive reasoning through the exploration of creative works**

☐ **Identify and explain the aesthetic, historic, social, and cultural significance of important works of art and critically assess creative works, their own or others', through evaluative processes of analysis and interpretation**

What components of the course will help students acheive the domain criteria selected above?

Students will work in teams to design and propose a virtual world using generally accepted world making principles found in interactive fiction narratology that embody the avatar and allow for immersion through narrative in a virtual world environment. This will allow students to "Demonstrate competence in the creation of works of art and design" (GA3).

The students' semester-long project work will also allow them to demonstrate comprehension of virtual world creation design and narrative principles as they apply to virtual world stories, thus satisfying that they "Demonstrate an expanded knowledge and comprehension of the role that the arts play in various aspects of human endeavor" (GA2); the aspect of human endeavor in this course is virtual world creation; the team's process of thinking through a world story, a world geography, a world narrative, and a world physics will necessarily demand that they "Demonstrate competence in analysis, critical thinking and interpretive reasoning through the exploration of creative works"(GA4).

By analyzing and critiquing the virtual world designs of other student teams, students will satisfy GA4 ("Demonstrate competence in analysis, critical thinking and interpretive reasoning through the exploration of creative works").

Students investigating the applications of virtual reality and virtual worlds in business, society, and academia will allow students to "Demonstrate an expanded knowledge and comprehension of the role that the arts play in various aspects of human endeavor" (GA2) as well as "Demonstrate competence in analysis, critical thinking and interpretive reasoning through the exploration of creative works" (GA4).

GN Criteria

☒ **Explain the methods of inquiry in the natural science fields and describe how the contributions of these fields complement inquiry in other areas**

☐ **Construct evidence-based explanations of natural phenomena**

☒ **Demonstrate informed understandings of scientific claims and their applications**

☐ **Evaluate the quality of the data, methods, and inferences used to generate scientific knowledge**

☒ **Identify societal or philosophical implications of discoveries in the natural sciences, as well as their potential to**

address contemporary problems

What components of the course will help students acheive the domain criteria selected above?

Students working in teams will construct and evaluate virtual world elements using computer software tools and virtual reality hardware. By observing the physical principles at work in these elements, students will be evaluating models of the physics of the virtual worlds through the techniques of the scientific method, thus allowing them to “Demonstrate informed understandings of scientific claims and their applications” (GN3).

By analyzing (through observation and measurement) and reviewing the virtual world designs of other student teams, students will satisfy GN1 (“Explain the methods of inquiry in the natural science fields and describe how the contributions of these fields complement inquiry in other areas”). Students investigating the applications of virtual reality and virtual worlds in business, society, and academia will also allow students to satisfy GN1.

The students’ semester-long project work will allow them to demonstrate comprehension of physical principles (e.g. kinematics, Newton’s Laws, properties and propagation of light, energy) as they apply to virtual worlds, thus satisfying GN5 (“Identify societal or philosophical implications of discoveries in the natural sciences, as well as their potential to address contemporary problems”). Students investigating the applications of virtual reality and virtual worlds in business, society, and academia will also allow students to satisfy GN5.

Integrative Studies

Explain how the intellectual frameworks And methodologies of the two Knowledge Domains will be explicitly addressed in the course and practiced by the students.

GA: Exploring virtual virtual worlds (VW) will provide students with a novel way to immerse themselves in the intersection of the narrative arts, particularly design, scene and level crafting, and storytelling, with applications of virtual reality in gaming, medicine, combat, and police training modalities. Virtual world makers seek to simulate an experience where suspension of disbelief can be achieved through immersion in an environment and through a story. Students will demonstrate an understanding of this main task as it is undertaken by VR narrative artists, the narrative philosophies guiding these developers in the virtual world, and then apply this knowledge to the narrative and world making art in their own projects. They will offer a critique of their own and others narrative and world making art in the course.

GN: Exploring the nature and applications of virtual reality will provide students with a novel way to immerse themselves in the framework and methodologies of the scientific method. Virtual worlds are in part simulations of the natural world, where visitors and intrinsic objects act and interact through prescribed rules. Students use their own observations and observation plans to evaluate the fidelity of virtual worlds as models of the natural world. Since not all aspects of all virtual worlds are intended to mimic with complete fidelity the laws of nature, students will identify the limits of the virtual worlds as a model of nature as well the limits of the students understanding of the laws of nature as a model for particular virtual worlds. Students will naturally develop their own mental models of how particular virtual worlds work and in turn will use their observations to evaluate the limitations of their models in a process that implements the key elements of the scientific method. Students will also be introduced to some of applications of virtual reality that are becoming important in scientific and technological fields, such as training, remote equipment operation, innovative methods of data visualization, and more.

Demonstrate that each Of the two domains will receive approximately equal attention, providing evidence from course topics, assignments, or other course components, and that students will integrate material from both domains.

The course is structured to be team taught, providing approximately equal attention to both the narrative aspect of virtual worlds and the physical concerns (e.g. kinematics) associated with reality simulations. These concepts are reinforced through the use of VR technology, which acts and the implementation mechanism for students designs. Multiple weeks are devoted to narrative arts, physics, and technology-related instruction in order to present students with the background they need to construct feasible, immersive, and entertaining virtual worlds.

Students will necessarily integrate material and demonstrate not only a knowledge of but also the production of work from the two domains (GA, GN) in the development of their semester-long team project. The iterative development of the students’ virtual world, combined with the peer- and instructor feedback mechanisms, will provide ample opportunity for students to demonstrate comprehension of the narrative design principles and physical concepts inherent in reality simulations. Integration of this material, building narrative momentum from world idea to storyboard, to a particular scene, and then coupling these concerns with a technological demonstration of movement in time-space, physical momentum in a scene of that virtual world, is considered the key learning outcome of the project.

Briefly explain the staffing plan. Given that each Inter-Domain course is approved for two Knowledge Domains, it will be taught by an instructor (or instructional team) with appropriate expertise in both domains.

This course is recommended to be team-taught by one (1) faculty member in Computer Science, Computer Engineering, or IST, one (1) faculty member in Physics or Astronomy, and one (1) faculty member in the narrative or visual arts.

Describe the assessments that will be used to determine students' ability to apply integrative thinking.

The semester-long team project will assess students’ ability to apply integrative thinking, beginning with the initial project proposal, continuing through project idea refinement and peer review, and finishing with the final product and oral presentation. Students will also be assessed on their integrative thinking applications in quizzes, online and in-class discussions, and laboratory assignments.

Campuses That Have Offered ( ) Over The Past 4 Years

semester	AB	AL	BK	BR	BW	CR	DS	ER	FE	GA	GV	HB	HN	HY	LV	MA	NK	PC	SH	SL	UP	WB	WC	WS	XC	XP	XS	YK

Review History

This section represents all consultation history that has occurred on this proposal

UPLOADED DOCUMENTS FOLLOW:

GAME 180N: The Art and Science of Virtual Worlds
Penn State University, Campus
Semester & Year

Course Instructors

Dr. Jeffrey A. Stone
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Course Meeting Time/Place

TBA

Required Textbooks and Course Materials

No textbook is required; online readings will be provided by the instructor(s).

General Education

GAME 180N counts as an interdomain course for general education, satisfying both Arts (GA) and Science (GN) categories.

Course Overview

GAME 180N is a multidisciplinary course which introduces students to the theories, concepts, and technologies behind virtual worlds. Besides learning the requisite computing and technical skills involved in virtual world development, students enrolled in this course will produce a world design proposal as well as storyboards, interactive fiction graphics, or world maps for their virtual world; in this way, students will explore some of the ways that creative writing, particularly interactive fiction and storytelling techniques drawn from non-VR and VR gaming contribute to the planning, design, and execution of virtual worlds. Students will also learn about the basic science behind virtual world concepts such as the physical environment, physical processes (e.g. kinematics, motion), and light; ultimately, students will produce an immersive time-space experience in their proposed world and reflect on the complexity of integrating design elements in a way that creates a satisfying immersive experience.

The course objectives are as follows:

- Students will work in teams to design a proposed virtual world using world making principles found in interactive fiction narratology and physical principles that embody the avatar and allow it to move in a virtual world environment

- Students will work in teams to construct a virtual scene, movement in time/space, from that world using computer software tools and mediated through virtual reality hardware
- Students will be able to discuss developing immersive technology and applications of virtual worlds in business, society, and academia
- Students will analyze and critique the virtual world designs of other student teams
- Students will demonstrate comprehension of interactive fiction scene and level structures and world maps as they relate to designing the voyage of the avatar in a virtual world
- Students will demonstrate comprehension of physical principles (e.g. kinematics, light) as they apply to virtual worlds.

Course Prerequisite

GAME 180N requires no prerequisites.

Course Format

You will explore the class topics through class lectures, skill building assignments (in class and online), exercises based on the text and supplemental content, and a combination of team and individual assignments.

In addition to directed readings, discussions, and quizzes in computing, narrative arts, and physics, the course will incorporate hands-on lab exercises and online discussions. A semester-long team project will be the primary means of student evaluation. During this semester-long team project students will design and create their own virtual environment(s) and character(s) using software tools and accepted world design principles. Students will apply a variety of computing concepts in the world creation, including some combination of programming, 360-degree video, and digital imagery. The course will culminate in the oral and visual presentation of their creative and technological works. The semester-long team project will be heavily integrated into the in-class experience and assessed using rubrics that draw on examples and assignment descriptions provided to students.

The course grade is determined as follows:

Deliverable	Percentage of Final Grade
Project Pre-Proposal	10
Formal Proposal	20
Final Product and Presentation	35
Peer and Personal Review Quizzes	10
Topic Quizzes	10
Labs & Online Discussions	15
TOTAL:	100

Final letter grades will be based on the following scale:

Letter Grade	Percent Range
A	94.00-100.00
A-	90.00-93.99
B+	87.00-89.99
B	83.00-86.99
B-	80.00-82.99
C+	77.00-79.99
C	70.00-76.99
D	60.00-69.99
F	0.00-59.99

Use of the Canvas Learning Management System

The Canvas Learning Management System (http://psu.instructure.com) will be utilized for all course-related electronic communication. Students should check their Canvas account at least once a day for breaking news and events. Regular Penn State e-mail should NOT be used for course communication. Canvas will also be used to submit assignments.

Inclement Weather Policy

If class is cancelled for any reason, including weather conditions, students should check their Canvas e-mail for instructions on how work will be conducted electronically for that day. The instructor(s) will e-mail students with instructions on work to complete, video lectures to review, reading assignments, and other important issues related to course progress. It is the students' responsibility to be aware of these directions and complete the assigned work before the next class period. If the campus is open, you should assume class will be held as scheduled.

In the event the instructor(s) must cancel class for any reason other than those mentioned above, Canvas e-mail will be used to inform students at least two hours in advance. Note that this does not cover emergencies or acts of god.

Students with Disabilities

Students with disabilities, whether physical, learning, or psychological, who believe that they may need academic adjustments in this class, are encouraged to contact Disability Services as soon as possible to ensure that such adjustments are implemented in a timely fashion. Please schedule an appointment to meet with the Disability Services Liaison at your campus to present your documentation and to verify your eligibility for any classroom adjustments and for academic assistance related to your disability.

Policy on Academic Integrity

Penn State is committed to maintaining academic integrity in this and all other courses it offers. Academic integrity—scholarship free of fraud and deception—is an important educational objective of Penn State. Academic dishonesty can lead to a failing grade or referral to the Office of Judicial Affairs.

Academic dishonesty includes, but is not limited to:

- Cheating
- Plagiarism
- Fabrication of information or citations
- Facilitating acts of academic dishonesty by others
- Unauthorized prior possession of examinations
- Submitting the work of another person or work previously used without informing the instructor and securing written approval
- Tampering with the academic work of other students

In cases where academic integrity is questioned, Penn State's Policy on Academic Integrity requires that the instructor give the student notice of the charge as well as the recommended sanction. Procedures allow the student to accept or contest the charge through discussions with the instructor. If a student accepts the charge and the recommended sanction, the respective College files the case with the Office of Judicial Affairs. If a student chooses to contest, the case will then be managed by the respective College or Campus Academic Integrity Committee. If a disciplinary sanction also is recommended, the case will be referred to the Office of Judicial Affairs.

If you have any doubts as to the meaning of plagiarism or cheating as it applies to this course, you should discuss them with the instructor. Please note that the instructor will utilize electronic resources such as http://turnitin.psu.edu to ensure academic integrity.

Class Schedule

The following schedule outlines the topics to be covered in this course, along with exam dates. A final exam will be provided during the final exam week.

- The course begins on Day, Month, Year
- The course ends on Day, Month, Year

Course length: 16 weeks

We anticipate that we will follow the schedule outlined here, but we may make adjustments based on what actually happens as the semester progresses. We may also change basis for the course grade; if we do so, we will so inform you in writing. Remaining in the course after reading this syllabus will signal that you accept the possibility of changes and responsibility for being aware of them.

Week	Main Topic	Lab
1	Introduction to Virtual Worlds and Virtual Reality	
2	Practical Applications of Virtual Reality	*Intro to VR Software*
3	Design & Creativity in a Virtual Space	*Proposal Examples, Brainstorming*
4	The Physics of Virtual Reality and Virtual Worlds	*Project Pre-Proposal*
5	The Physics of Virtual Reality and Virtual Worlds	*Physics in VR*
6	Project Proposal Experimentation	*VR Software Experimentation*
7	Project Proposal Consultations	*Proposal Peer Review*
8	Exploring and Implementing Physical Models	*Physical Models and VR*
9	The Art of Virtual Worlds and Virtual Reality	*VR Software Experimentation*

10	The Art of Virtual Worlds and Virtual Reality	*VW Design*
11	The Art of Virtual Worlds and Virtual Reality	*VW Design (Software)*
12	Project Development	*VW Construction*
13	Project Development	*VW Construction*
14	THANKSGIVING BREAK	
15	Project Development	*VW Construction (Finish)*
16	Project Presentations	

Course Abbreviation and Number: GAME 180N: The Art and Science of Virtual Worlds

Credits: 3 credits

Prerequisites/Co-requisites/Concurrent Requirements/Recommended Preparation: None

Course Attributes/Designations: Inter-domain, Natural Sciences (GN), Arts (GA)

General Education Learning Objectives: The following General Education Learning Objectives will be covered in this course:

- EFFECTIVE COMMUNICATION – the ability to exchange information and ideas in oral, written, and visual form in ways that allow for informed and persuasive discourse that builds trust and respect among those engaged in that exchange, and helps create environments where creative ideas and problem-solving flourish.
- CRITICAL AND ANALYTICAL THINKING – the habit of mind characterized by comprehensive exploration of issues, ideas, artifacts, and events before accepting or formulating a conclusion. It is the intellectually disciplined process of conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action.
- INTEGRATIVE THINKING – the ability to synthesize knowledge across multiple domains, modes of inquiry, historical periods, and perspectives, as well as the ability to identify linkages between existing knowledge and new information. Individuals who engage in integrative thinking are able to transfer knowledge within and beyond their current contexts.
- CREATIVE THINKING – the capacity to synthesize existing ideas, images, or expertise in original ways and the experience of performing, making, thinking, or acting in an imaginative way that may be characterized by innovation, divergent thinking, and intellectual risk taking.

Course Description: GAME 180N is a multidisciplinary course which introduces students to the theories, concepts, and technologies behind virtual worlds. Besides learning the requisite computing and technical skills involved in virtual world development, students enrolled in this course will produce a world design proposal as well as storyboards, interactive fiction graphics, or world maps for their virtual world; in this way, students will explore some of the ways that creative writing, particularly interactive fiction and storytelling techniques drawn from non-VR and VR gaming contribute to the planning, design, and execution of virtual worlds. Students will also learn about the basic science behind virtual world concepts such as the physical environment, physical processes (e.g. kinematics, motion), and light; ultimately, students will produce an immersive time-space experience in their proposed world and reflect on the complexity of integrating design elements in a way that creates a satisfying immersive experience.

In addition to directed readings, discussions, and quizzes in computing, narrative arts, and physics (related to concepts inherent in virtual worlds), the course will incorporate hands-on lab exercises and online discussions. A semester-long team project will be the primary means of student evaluation. During this semester-long team project students will design and create their own virtual environment(s) and character(s) using software tools and accepted world design principles. Students will apply a variety of computing concepts in the world creation, including some combination of programming, 360-degree

video, and digital imagery. The course will culminate in the oral and visual presentation of their creative and technological works. The semester-long team project will be heavily integrated into the in-class experience and assessed using rubrics that draw on examples and assignment descriptions provided to students.