



**COWLEY COLLEGE  
& Area Vocational Technical School**

**COURSE PROCEDURE FOR**

<p><b>VIRTUAL REALITY PROGRAMMING CIS1859    3 Credit Hours</b></p>
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**Student Level:**

This course is open to students on the college level in either the Freshman or Sophomore year.

**Catalog Description:**

**CIS1859 – VIRTUAL REALITY PROGRAMMING (3 hrs)**

This course will prepare students to write basic games in the virtual reality environment. The topics will include: virtual reality principles, performance, player input, game resources, particle effects, UI elements, audio, graphics to simulate reality, multi-player networking, and publishing a virtual reality game.

**Prerequisites:**

None.

**Co-requisites:**

None

**Controlling Purpose:**

This course is designed to prepare students to write virtual reality programs. The student will learn the various techniques to simulate reality in a game in order to foster the 3D look and feel of a virtual reality game.

**Learner Outcomes:**

Upon completion of the course, the student will be able to write virtual reality programs that include the game elements: performance, player input, game resources, particle effects, UI elements, audio, graphics to simulate reality, and multi-player networking. In addition, the student will understand the basic principles of virtual reality and publishing techniques.

**Units Outcomes and Clock Hours of Instruction for Core Curriculum:**

The following outline defines the minimum core content not including the final examination period. Instructors may add other material as time allows.

**Evaluation Key:**

- A = All major and minor goals have been achieved and the achievement level is considerably above the minimum required for doing more advanced work in the same field.
- B = All major goals have been achieved, but the student has failed to achieve some of the less important goals. However, the student has progressed to the point where the goals of work at the next level can be easily achieved.
- C = All major goals have been achieved, but many of the minor goals have not been achieved. In this grade range, the minimum level of proficiency represents a person who has achieved the major goals to the minimum amount of preparation necessary for taking more advanced work in the same field, but without any major handicap of inadequacy in his background.
- D = A few of the major goals have been achieved, but the student's achievement is so limited that he is not well prepared to work at a more advanced level in the same field.
- F = Failing, will be computed in GPA and hours attempted.
- N = No instruction or training in this area.

### UNIT 1: Virtual Reality Concepts

Outcomes: Demonstrate knowledge of the basics of virtual reality, intent, vergence-accommodation conflict, components of a virtual reality headset, constellation tracking, importance of input, and frame rates

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Explain the concept of virtual reality
						Describe the importance of intent in virtual reality design
						Define vergence-accommodation conflict
						List the components of a virtual reality headset
						Explain constellation tracking, importance of input, and frame rates

### UNIT 2: Virtual Reality Configurations

Outcomes: Demonstrate the knowledge necessary to explain the purpose of the utilities and API of Oculus as well as configure the environment for development

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Describe the interfacing between Oculus utilities and a game engine
						Enable interaction with gaze-based mechanics
						Define the purpose of the virtual reality API

**UNIT 3: Performance Issues**

Outcomes: Implement techniques to enhance the performance of a virtual reality game including the Unity profiler, coroutines, mesh optimization, LODs, allocation of memory, and object pooling

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Use the Unity profiler
						Use coroutines to split up complex work
						Optimize a mesh using Simplygon
						Display dynamic detail using LODs
						Explain the importance of allocating memory
						Use object pooling

**UNIT 4: Interaction with Virtual Worlds**

Outcomes: Implement programs using basic player input and create custom Unity input axes

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Design basic player input
						Implement gameplay around input
						Create custom Unity input axes

**UNIT 5: Establishing Presence in a Game**

Outcomes: Write simple programs to implement particle effects, a skybox, and player interaction as well as place resources in the game world

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Setup the game environment
						Accentuate depth with particle effects
						Customize the skybox
						Enable player interaction with the world
						Populate the game world with resources
						Use resources to interact with the environment

**UNIT 6: Depth and Intuition in a User Interface**

Outcomes: Implement programs that use a virtual reality input module, a simple menu, and incorporates UI elements in the game world

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Add a virtual reality input module
						Construct a simple menu
						Add UI elements to the game world

**UNIT 7: 3D Audio**

Outcomes: Explain the basics of audio and Unity audio as well as implement programs that use 2D stereo audio, basic 3D spatialization, head-related transfer function, and audio in the game world

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Explain the basics of the science of audio
						Describe the basics of Unity audio
						Implement 2D stereo audio
						Add basic 3D spatialization
						Incorporate head-related transfer function
						Implement audio in the game world

**UNIT 8: Tone and Realism with Graphics**

Outcomes: Write programs that simulate realism using rendering techniques, color grading, and shaders

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Describe the rendering pipeline
						Implement forward and deferred rendering
						Add tone with color grading
						Change the appearance of objects with shaders

**UNIT 9: Implementing Networking of Players**

Outcomes: Implement a simple networked based game including a lobby space, spawn points, and synchronization of data

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Create a lobby space for joining matches
						Create a networked game
						Define player spawn points
						Use Unity's matchmaker system
						Incorporate the multiplayer lobby
						Synchronize data in multiplayer matches

**UNIT 10: Publishing on the Oculus Store**

Outcomes: Explain the process of publishing to the Oculus store

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Package a final Unity build
						Describe the Oculus submission guidelines
						Upload a build to Oculus

**Projects Required:**

Varies, refer to syllabus.

**Textbook:**

Contact Bookstore for current textbook.

**Materials/Equipment Required:**

None

**Attendance Policy:**

Students should adhere to the attendance policy outlined by the instructor in the course syllabus.

**Grading Policy:**

The grading policy will be outlined by the instructor in the course syllabus.

**Maximum class size:**

Based on classroom occupancy

**Course Time Frame:**

The U.S. Department of Education, Higher Learning Commission and the Kansas Board of Regents define credit hour and have specific regulations that the college must follow when developing, teaching and assessing the educational aspects of the college. A credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally-established equivalency that reasonably approximates not less than one hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work for approximately fifteen weeks for one semester hour of credit or an equivalent amount of work over a different amount of time. The number of semester hours of credit allowed for each distance education or blended hybrid courses shall be assigned by the college based on the amount of time needed to achieve the same course outcomes in a purely face-to-face format.

**Refer to the following policies:**

[402.00 Academic Code of Conduct](#)

[263.00 Student Appeal of Course Grades](#)

[403.00 Student Code of Conduct](#)

**Disability Services Program:**

Cowley College, in recognition of state and federal laws, will accommodate a student with a documented disability. If a student has a disability which may impact work in this class and which requires accommodations, contact the Disability Services Coordinator.