



# The Volgenau School of Engineering

## APPLIED COMPUTER SCIENCE, B.S.

### Concentration in Computer Game Design

2018-2019

The Bachelor of Science degree in Applied Computer Science (BS ACS) has been created for those students who want the knowledge and expertise of computer science to work in one of the many disciplines that require advanced computing techniques. These fields do not merely “use” computing but create new and interesting problems for the computer scientist. One such field is the area of Computer Game Design.

The objectives of the BS ACS concentration in Computer Game Design are to provide students with the following:

1. The fundamental knowledge regarding theory, methods and applications of Computer Science.
2. A foundation in artistic creativity subjects associated with digital entertainment.
3. Knowledge of concepts that integrate Computer Science and artistic creativity to develop computer games.
4. Preparation for employment as a programmer in the computer games industry.
5. Preparation for graduate studies in fields such as Computer Science and digital entertainment.

### Application Area

Computer game development is a global multi-billion dollar industry with popular titles generating millions of dollars in revenue, sometimes in their first few weeks of release. Creating such titles require teams of highly skilled individuals covering such disciplines as computer science, art, animation, music, and storytelling. This program is aimed at those individuals wishing to pursue a career as a programmer in the computer games industry. As part of a highly skilled team, programmers should have an appreciation of all the disciplines in the game development process. Therefore, this program of study provides students with not only a sound background in Computer Science but also an opportunity to undertake courses in the College of Visual and Performing Arts. In addition, a number of Computer Science courses have been specially designed for this program to allow students to become proficient in the computer game development process (by actually creating games during their program of study). Many industries prize skills associated with computer game programming. Any industry that requires efficient programmers that are experts in developing graphical simulations with real-time requirements will benefit from this degree. Such industries include military, aerospace, architecture, geology, and emergency response.

### Degree Requirements

The BS ACS Game Design concentration can be successfully completed within the normal 120 semester hour degree at GMU. In addition to Mason Core requirements including humanities, and social science, the BS ACS Game Design concentration requires foundation, core, and elective courses as described in this brochure.

Course requirements provide students with expertise in programming, systems, software engineering, formal methods and analysis of algorithms. At least 45 semester hours of the degree requirements must be at the 300 level or above.

**ACS Foundation Courses:** CS 110, 112, 211;  
MATH 113, 114, 125, 203.

**ACS Core:**  
CS 262, 310, 321, 330, 367, 471, 483.

**One CS course numbered above 400.**

All BS ACS majors must complete at least 36 additional credits to meet the course requirements of Computer Game Design concentration. These credits will include CS 306 (Synthesis of Ethics and Law for the Computing Professional) and STAT 344 (Probability and Statistics for Engineers and Scientists I).

### Computer Game Design Concentration

**Foundation:**  
AVT 104; GAME 230; CS 306, 325, 351; STAT 344

**Core:**  
CS 425, 426, 451; AVT 382, 383

**One approved elective** chosen from:  
CS 332, CS 455, CS 475, CS 480, CS 485, SWE 432,  
GAME 332, AVT 370, AVT 374, AVT 487

**Natural Science:** PHYS 160/161 and one additional lab science.

### Sample Schedule

Below is one example of how the ACS in Computer Game Design major may be achieved within eight semesters.

<b>FIRST SEMESTER (14 CREDITS)</b>	
CS 110 Essentials of Computer Science	3
CS 112 Introduction to Programming	4
MATH 113 Analytical Geometry & Calculus	4
Mason Core (ENGH 101)	3

<b>SECOND SEMESTER (14 CREDITS)</b>	
AVT 104 Studio Fundamentals I	4
CS 211 Object-Oriented Programming	3
MATH 114 Analytical Geometry & Calculus II	4
GAME 230 History of Computer Game Design	3

<b>THIRD SEMESTER (15 CREDITS)</b>	
MATH 125 Discrete Mathematics	3
CS 262 Low-Level Programming	3
CS 310 Data Structures	3
COMM 100	3
Mason Core	3

<b>FOURTH SEMESTER (16 CREDITS)</b>	
CS 325 Introduction to Game Design	3
CS 351 Visual Computing	3
CS 367 Computer Systems and Programming	4
MATH 203 Linear Algebra	3
Mason Core	3

<b>FIFTH SEMESTER (16 CREDITS)</b>	
AVT 382 Digital Art and Animation	3
CS 330 Formal Methods and Models	3
ENGH 302 Advanced Composition	3
PHYS160/161 University Physics I + Lab	4
Mason Core	3

<b>SIXTH SEMESTER (15 CREDITS)</b>	
AVT 383 Three Dimensional Digital Art	3
CS 321 Software Engineering	3
CS 451 Computer Graphics	3
Lab science	4
Elective	2

<b>SEVENTH SEMESTER (15 CREDITS)</b>	
CS 425 Game Programming I	3
CS 483 Analysis of Algorithms	3
STAT 344 Prob/Stat for Engrs & Scientists	3
Mason Core	3
Game Elective	3

<b>EIGHTH SEMESTER (15 CREDITS)</b>	
CS 306 Synthesis of Ethics & Law	3
CS 471 Operating Systems	3
CS 426 Game Programming II	3
CS Senior Elective	3
Elective	3

## A Closer Look at Game Design Specific Courses

The following courses have been created specifically for this program and tailor the standard computer science degree for game programming.

### CS 325 Computer Game Design

*Prerequisite: Grade of C or better in CS 211.* Game design, in various electronic entertainment technologies, involves a diverse set of skills and backgrounds, from narrative and art to computer programming. This course surveys the technical aspects of the field, with an emphasis on programming.

### CS 351 Visual Computing (Typically Offered Spring)

*Prerequisite: Grade of C or better in CS 262 and CS 310.* The focus of this course is programming essential mathematical and geometric concepts underlying computer graphics. It covers fundamental topics in computational geometry, 3D modeling, graphics algorithms, and graphical user interfaces using both 2D and 3D implementations. Furthermore, it reinforces object oriented programming practices.

### CS 425 Game Programming I (Typically Offered Fall)

*Prerequisites: Grade of C or better in CS 310 and 351.* The course will provide an introduction to technologies and techniques used in modern computer games. Teams will explore the various facets of a complete design, using sophisticated tools. The course will involve a project in which a game is prototyped; this prototype and initial design will serve as the starting point for the project in CS 426.

### CS 426 Game Programming II (Typically Offered Spring)

*Prerequisite: C or better in CS 325 and 425.* This is a project-oriented course. It is a continuation of CS 425 with an emphasis on the implementation of a complete game.