Bachelor of Science in Game Programming

DEGREE PROGRAM GRID

LaSalle College Vancouver

YEAR 1   *BREAK*   YEAR 2   *BREAK*   YEAR 3

QUARTER 1	QUARTER 2	QUARTER 3	QUARTER 4	QUARTER 5	QUARTER 6	QUARTER 7	QUARTER 8	QUARTER 9	QUARTER 10
GAD110 Introduction to Game Design	GAD100 History of Games	CCM121 Digital Imaging	GAD130 Introduction to Level Design	CCM131 Basic 3D Concepts	VGP240 3D Graphics and Applications	VGP242 3D Graphics Programming	VGP330 Real-time GPU Programming	VGP334 Animation for Games	VGP336 Gameplay Programming
VGP107 Intro to Computer Programming	VGP108 Object Oriented Programming in C++ I	VGP134 Object Oriented Programming in C++ II	VGP230 2D Games Programming	VGP232 Game Tools and Pipelines	GAD121 Minigames and Prototyping	VGP201 Portfolio I	VGP340 Concurrency and Parallel Programming	VGP331 Network Programming	VGP499 Senior Portfolio
		VGP133 Intro to C# Programming	VGP236 Programming for Game Engines	VGP241 Algorithms and Data Patterns	VGP235 Intro to Mobile Programming	VGP310 Preproduction and Project Management	VGP449 Production Team I	VGP451 Production Team II	
MTH101 Applied Mathematics	MTH201 Geometry and Liner Algebra				VGP338 Artificial Intelligence	VGP231 Software Development and Testing			VGP454 Post-Production
ENG101 Rhetoric and Composition	PHL101 Critical Thinking	MTH110 Statistics	PHY200 Physics of Motion, Light and Sound	MTH221 Calculus for Physics			Studio Elective	Studio Elective	Studio Elective

6 Game Design/Art Design Courses 18 credits	13 Technical Knowledge Building Courses 39 credits	7 Advanced Technical and Industry Courses 21 credits	4 Team Production and Management Courses 12 credits	5 Mathematics Courses 15 credits	2 Liberal Studies Courses 6 credits	3 Studio Elective Courses 9 credits

= TOTAL 120 CREDITS

Bachelor of Science in Game Programming
COURSE DESCRIPTIONS

LaSalle College Vancouver

QUARTER 1

GAD110 INTRODUCTION TO GAME DESIGN
In this course students will be introduced to the fundamentals of game design theory, terminology, principles, processes, and practices in a hands-on practical setting. Students will experience an entire development cycle for a traditional non-digital game in a collaborative team-based environment: identifying the target audience, envisioning a game idea, pitching, prototyping, playtesting, and creating a final product.
Credits: 3

VGP107 INTRODUCTION TO COMPUTER PROGRAMMING
This course introduces students to the fundamentals of programming concepts and methods, including variables, types, branching, looping, logical and arithmetic operators, arrays, structures. In this course student learn how to use basic algorithms and simple user-defined functions to implement a simple application. This course uses the C programming language and emphasis is on the core concepts of programming.
Credits: 3

MTH101 APPLIED MATHEMATICS
Students will review the essentials of mathematics: algebra, trigonometry, combinatorics, and functions, and apply these tools to problems encountered in animation or physics-based game development. They are introduced to vectors, mechanical energy, motion with constant acceleration, and complex numbers in developing problem-solving skills.
Credits: 3

ENG101 RHETORIC AND COMPOSITION
Students will enhance their oral and written communication practices through focusing on the critical art of reading, writing, reflection, and discussion. They will develop the knowledge and skills to state, develop, organize, and support an argument or position. They will also utilize rhetoric, composition and informal logic of the English Language in assignments.
Credits: 3

QUARTER 2

GAD100 HISTORY OF GAMES
This course introduces students to the history of games and covers the technologies, business models and game genres that have developed over time. Students will develop a written and verbal vocabulary for conducting research, game deconstruction and critical analysis of games
Credits: 3

VGP108 OBJECT ORIENTED PROGRAMMING IN C++ I
This is an introduction to object-oriented programming in C++. Students are introduced to common object-oriented concepts such as classes, namespaces, inheritance, object-oriented designs, polymorphism, type casting, virtual functions, dynamic memory allocations, const-correctness, advanced data structures and dynamic memory. Students will simulate real world types of problems solving using C++ related to video games programming.
Prerequisite: VGP107 (with at least a grade of C) OR VGP101
Credits: 3

MTH201 GEOMETRY AND LINEAR ALGEBRA
Students will be introduced to the essential analytic geometry and linear algebra tools and techniques. They will demonstrate how to apply coordinate systems, vectors, dot and cross product, projection, lines, planes, matrices, determinants, and transformations to real-world problems.
Prerequisite: MTH101 or MTH100
Credits: 3

PHL101 CRITICAL THINKING
Students learn to identify and develop skills, processes, and techniques to become effective learners. They will analyze and evaluate ideas and theories, as well as learn to apply creative and critical techniques to problem solve, make decisions, and evaluate the media.
Credits: 3

QUARTER 3

CCM121 DIGITAL IMAGING
Students develop basic image manipulation skills in a raster-based computer environment.
Credits: 3

VGP134 OBJECT ORIENTED PROGRAMMING IN C++ II
This course introduces more complex object-oriented programming techniques in C++. This includes templates, operator overloading, smart pointers, reference counting, exception handling, and standard template libraries. The fundamentals of object-oriented programming in C++ through applied design, implementation, troubleshooting, maintenance and testing are reinforced.
Prerequisite: VGP108 (with at least a grade of C) OR VGP102
Credits: 3

VGP133 INTRODUCTION TO C# PROGRAMMING
This course is designed to give students the fundamentals of C# development on the .NET platform. Students will learn the syntax of C#, as well as learning about using the object-oriented programming paradigm to develop solutions in C#. Revisiting the principles and practices of object-oriented programming (OOP), the course provides students with a foundation in OOP that they need to progress to next level of studies in software development. Key object-oriented concepts such as abstraction, encapsulation, inheritance, polymorphism, and interfaces will be covered. Students will also become more familiar with tools such as Visual Studio, NuGet, and Disassemblers.
Prerequisite: VGP133 OR VGP125
Credits: 3

MTH110 STATISTICS
Students will develop skills needed to represent and analyze data through such measures as central tendency, dispersion, probability theory, the binomial distributions, the normal curve and normal distributions, central limit theory, and sampling distributions. Using graphing and polynomial functions and systems of equations and inequalities they will examine how better to interpret and solve select problems.
Credits: 3

QUARTER 4

GAD130 INTRODUCTION TO LEVEL DESIGN
In this course students will be introduced to level design theory, terminology, and development process in a hands-on practical setting. Focus will be on researching, deconstructing, analyzing, and documenting various pre-existing levels from shipped games, as well as designing and building multiplayer and single player levels in a game engine.
Credits: 3

VGP230 2D GAMES PROGRAMMING
This class is a project focused course where the student is responsible for the design, documentation, implementation and testing of a simple two-dimensional game. Students will be provided the 2D engine framework and will be shown how to use and extend the engine for their final game project. This course will introduce game engine architecture including 2D graphics, resource management, data driven design, physics, motion, collision detection, basic artificial intelligence, user interface, and special effects.
Prerequisite: VGP134 (with at least a grade of C) OR VGP131
Credits: 3

VGP236 PROGRAMMING FOR GAME ENGINES
Students will learn how to work in a pre-existing modern game engine framework. They will learn a brand new pipeline and import game assets, prototype gameplay features, build networking gameplay, manipulate audio assets, use a modern 3rd party physics engine, and learn how integrate all major systems through advanced scripting.
Prerequisite: VGP133 OR VGP125
Credits: 3

PHY200 PHYSICS OF MOTION, LIGHT AND SOUND
This course covers Newtonian mechanics, rigid body dynamics, simple harmonic motion, and the basic physics of light and sound propagation in media. Students learn how to apply these principles to problems encountered in physics-based games. Emphasis is placed on formulating solutions in pseudocode.
Prerequisite: MTH201
Credits: 3

QUARTER 5

CCM131 BASIC 3D CONCEPTS
Students will be introduced to basic concepts of 3D space, modeling, materials, lighting, and animation. Students will demonstrate their knowledge by producing a project from inception to completion.
Credits: 3

VGP232 GAME TOOLS AND PIPELINES
The role and function of a tools programmer on a games team is introduced to the students. Emphasis is on replacing repetitive tasks in the development process with effective and functional tools. The course will cover productivity tools, pipeline solutions, automated build process, reusable tools, compression, security, and serialization. Students will learn how to multiply team efficiency through building tools and pipelines to increase development productivity.
Prerequisite: VGP133 OR VGP125
Credits: 3

VGP241 ALGORITHMS AND DATA PATTERNS
This course introduces advanced algorithms including shortest path, advance sorting, hashing, graphs traversal, tree traversal, Greedy method, breadth first search, depth first search, divide and conquer, and randomization algorithms. Students will apply their knowledge of algorithmic efficiency analysis to devise more complex algorithms and data structures including both recursive and non-recursive algorithms. Problem solving, algorithm analysis, recursions, and divide and conquer techniques are the main focus to this course.
Prerequisite: VGP134 (with at least a grade of C) OR VGP131
Credits: 3

MTH221 CALCULUS FOR PHYSICS
This course will explore Single and Multivariable Differentials, Integral Calculus and Vector Calculus, with application to physics and animation.
Prerequisite: MTH201
Credits: 3

QUARTER 6

VGP240 3D GRAPHICS AND APPLICATIONS
Students are introduced to the fundamentals of 3D graphics and the underlying mathematics. The students will cover 3D geometry, interpolations, rendering, clipping, matrix transformations, graphics pipelines, lighting, materials, texturing, rasterization, and shading. The class implements each of these concepts in an existing industry standard graphics framework.
Prerequisite: VGP230
Credits: 3

GAD121 MINIGAMES AND PROTOTYPING
Students will design, script out, and create small self-contained minigames and subsequently balance and tune them. Students will learn modern tools for rapid prototyping of various electronic game genres.
Credits: 3

VGP235 INTRO TO MOBILE PROGRAMMING
This course introduces the fundamental of programming for mobile devices. In this course, we focus on the creation of mobile solutions for various modern platforms, including major mobile operating systems. Topics include mobile device architecture, programming languages, and mobile-specific requirements such as restricted resources, user interaction, client-server paradigm, and user interface design. This is a totally project oriented course in which students will implement sample mobile apps for popular platforms (Android or iOS) in order to practice and implement material they have been taught during the course.
Prerequisite: VGP230 & VGP236 OR VGP233
Credits: 3

VGP338 ARTIFICIAL INTELLIGENCE
In this course, there are various artificial intelligence techniques and concepts that will be explored including automated reasoning, various types of pathfinding, bot behaviours, state machines, fuzzy logic, and decision making. There will be exposure to various techniques in creating more realistic AI behaviours through different randomization concepts. Students will apply their learning by implementing and design artificial intelligence algorithms through a 3D framework in C/C++.
Prerequisite: MTH201, VGP230, and VGP236
Credits: 3

QUARTER 7

VGP242 3D GRAPHICS PROGRAMMING
In this course, students will apply their 2D/3D mathematics, computer graphics, and programming knowledge to interface with a real-world software development kit including Microsoft DirectX SDK. Students will learn to build graphics software through interfacing, integrating, and linking with libraries and header files within the DirectX SDK environment. Students will also learn to use the DirectX User Documentation to navigate and find information on how to interface with the low-level subsystems within the framework.
Prerequisite: VGP240
Credits: 3

VGP201 PORTFOLIO I
Students assemble and critique works from completed courses and discover the limits of their programming knowledge. Students research potential employers and learn about the different positions available for them. Students are expected to present a plan that leads up to their Senior Portfolio which enables them to plan for future programming career objective.
Prerequisite: Permission of the Program Director / Chief Academic Officer
Credits: 3

VGP310 PREPRODUCTION AND PROJECT MANAGEMENT
Students work on a game prototype and learn to invent new game ideas. The students are introduced to the theory of project management and how it applies to modern game development.
Prerequisite: Permission of the Program Director / Chief Academic Officer
Credits: 3

VGP231 SOFTWARE DEVELOPMENT AND TESTING
This course is an introduction to software engineering techniques used in modern application and game development. The course will cover topics relating to software development process such as requirement gathering, planning, designing, implementation, maintenance, and testing. Additionally, there will be introductions to software implementation, maintenance, and general software, quality assurance, and application troubleshooting.
Prerequisite: VGP134 (with at least a grade of C) OR VGP131
Credits: 3

QUARTER 8

VGP330 REAL-TIME GPU PROGRAMMING
Students will create more advanced visual effects that utilize real time programmable shader pipeline available on modern graphics processing units (GPUs). Both pixel and vertex shader techniques will be explored in detail. Potential shaders that students will implement may include morphing, bump mapping, normal mapping, specular mapping, parallax mapping, motion blur, and depth of field. All custom shaders in this course will be written in a High Level Shader Language (HLSL) in a preexisting 3D graphics programming framework.
Prerequisite: VGP242
Credits: 3

VGP340 CONCURRENCY AND PARALLEL PROGRAMMING
This is an introduction to concurrency programming, basics of asynchronous game application designs, and platform technologies across different gaming consoles and hardware. The next generation of technology in game consoles and applications is moving away from traditional programming approaches towards a more asynchronous paradigm. Modern software design topics covered in this course include threading, concurrency, data pipelines, parallel processing, batch processing, asynchronous design patterns, asynchronous workload dispatching, and general performance optimizations.
Prerequisite: VGP134 (with at least a grade of C) OR VGP131, and VGP244 OR VGP241
Credits: 3

VGP451 PRODUCTION TEAM II
In this course, students work as a team on the production of an electronic games project in a studio environment.
Prerequisite: VGP449 OR CC449 OR Permission of the Program Director / Chief Academic Officer
Credits: 3

VGP449 PRODUCTION TEAM I
In this course, students work as a team on the production of an electronic games project in a studio environment.
Prerequisite: VGP310 OR CC310 OR Permission of the Program Director / Chief Academic Officer
Credits: 3

STUDIO ELECTIVE
Credits: 3

QUARTER 9

VGP334 ANIMATION FOR GAMES
Students will explore the fundamentals of animation programming and pipelines for video games. They will have hands-on experience building the major parts of an animation system and pipeline including key frame/skeleton animation playback, animation evaluation trees, and complex blending techniques. Furthermore, students will learn the complex mathematics behind animation playback and blending. Following this course, students will be able to make video games with smooth animations, skinning and complex blending.
Prerequisite: VGP330, MTH201
Credits: 3

VGP331 NETWORK PROGRAMMING
This course is an introduction to the fundamentals of basic networking including transport protocols, network routing, and error handling. Students will also learn about network topologies commonly found in games such as client server, peer to peer, star, distributed star, and tree. Common networking concepts in games such as dead reckoning, determinism, synchronization, and error handling are introduced and demonstrated in class.
Prerequisite: VGP340 and VGP244 OR VGP241
Credits: 3

QUARTER 10

VGP336 GAMEPLAY PROGRAMMING
This course expands on game play programming that is focused around working with modern game programming architectures to produce, and prototype game mechanics. Gameplay programming will focus on developing, expanding, and utilizing existing technologies to produce fun and interactive game mechanics. A high level of emphasis will be working hands-on with numerous game subsystems including enemy behaviors, artificial intelligence, pathfinding, audio, animations, player interactions, physics and networking.
Prerequisite: VGP334, MTH201
Credits: 3

VGP499 SENIOR PORTFOLIO
This course focuses on the completion of a student's portfolio and enables the student to begin to seek entry-level employment upon graduation. Students are introduced to the game industry interview screening process, technical interviews, whiteboard questions, programming tests, complex problem solving and verbal presentation of tough technical challenges.
Prerequisite: Permission of the Program Director / Chief Academic Officer
Credits: 3

VGP454 POST-PRODUCTION
In this course, students work as a team on the production of an electronic games project in a studio environment.
Prerequisite: CC451 OR VGP451 OR Permission of the Program Director / Chief Academic Officer
Credits: 3

STUDIO ELECTIVE
Credits: 3