

Bachelor of Science in Game Programming

DEGREE PROGRAM



LaSalle College
Vancouver

QUARTER 1	QUARTER 2	QUARTER 3	QUARTER 4	QUARTER 5	QUARTER 6	QUARTER 7	QUARTER 8	QUARTER 9	QUARTER 10	QUARTER 11	QUARTER 12
GAD110 Introduction to Game Design	GAD100 History of Games	CCM121 Digital Imaging	GAD130 Introduction to Level Design	CCM131 Basic 3D Concepts	GAD121 Minigames and Prototyping	VGP240 3D Graphics and Applications	VGP242 3D Graphics Programming	VGP330 Real-time GPU Programming	VGP334 Animation for Games	VGP336 Gameplay Programming	VGP452 Senior Portfolio
VGP101 Introduction to Computer Programming	VGP102 Object Oriented Programming in C++ I	VGP131 Object Oriented Programming in C++ II	VGP230 2D Games Programming	VGP232 Game Tools and Pipelines	VGP235 Introduction to Mobile Programming	VGP332 Artificial Intelligence	CC310 Preproduction and Project Management	CC449 Production Team I	CC451 Production Team II	CC452 Post-Production	VGP430 Senior Project
MTH101 Applied Mathematics	MTH201 Geometry and Liner Algebra	MTH110 Statistics	VGP220 Algorithms and Data Patterns I	VGP244 Algorithms and Data Patterns II	VGP256 Math and Physics for Games	VGP339 Operating Systems	VGP340 Concurrency and Parallel Programming	VGP331 Network Programming	VGP350 Compiler Theory	VGP337 Neural Networks and Machine Learning	Studio Elective
ENG101 Rhetoric and Composition	ENG103 Academic Writing	PHL101 Critical Thinking	PHY200 Physics of Motion, Light and Sound	MTH221 Calculus for Physics	Liberal Studies Elective 1	Liberal Studies Elective 2	Liberal Studies Elective 3	Studio Elective	Studio Elective	Studio Elective	Studio Elective

6 Game Design/ Art Design Courses 18 credits	+	13 Technical Knowledge Building Courses 45 credits	+	12 Advanced Technical and Industry Courses 39 credits	+	8 Math/ Algorithms Courses 24 credits	+	4 Team Production and Management Courses 18 credits	+	7 Liberal Studies Courses 21 credits	+	5 Studio Elective Courses 15 credits	=	TOTAL 180 CREDITS
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COURSE DESCRIPTIONS

QUARTER 1

GAD110 INTRODUCTION TO GAME DESIGN (3 CREDITS)

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. *Prerequisite: None*

VGP101 INTRODUCTION TO COMPUTER PROGRAMMING (6 CREDITS)

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. *Prerequisite: None*

MTH101 APPLIED MATHEMATICS (3 CREDITS)

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. *Prerequisite: None*

ENG101 RHETORIC AND COMPOSITION (3 CREDITS)

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. *Prerequisite: None*

QUARTER 2

GAD100 HISTORY OF GAMES (3 CREDITS)

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 *Prerequisite: None*

VGP102 OBJECT ORIENTED PROGRAMMING IN C++ I (6 CREDITS)

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: VGP101 (at least a grade of C)*

MTH201 GEOMETRY AND LINEAR ALGEBRA (3 CREDITS)

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*

ENG103 ACADEMIC WRITING (3 CREDITS)

Students will develop academic writing capabilities necessary for success in post-secondary education and professional settings. They will focus on how to craft the best form of expression for specific audiences and purposes. *Prerequisite: ENG101*

QUARTER 3

CCM121 DIGITAL IMAGING (3 CREDITS)

Students develop basic image manipulation skills in a raster-based computer environment. *Prerequisite: None*

VGP131 OBJECT ORIENTED PROGRAMMING IN C++ II (3 CREDITS)

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: VGP102 (at least a grade of C)*

VGP125 INTRODUCTION TO C# PROGRAMMING (3 CREDITS)

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: VGP102 (at least a grade of C)*

MTH110 STATISTICS (3 CREDITS)

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. *Prerequisite: None*

PHL101 CRITICAL THINKING (3 CREDITS)

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. *Prerequisite: None*

QUARTER 4

GAD130 INTRODUCTION TO LEVEL DESIGN (3 CREDITS)

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. *Prerequisite: None*

VGP230 2D GAMES PROGRAMMING (3 CREDITS)

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: VGP131 (at least a grade of C)*

VGP233 PROGRAMMING FOR GAME ENGINES (3 CREDITS)

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: VGP125*

VGP220 ALGORITHMS AND DATA PATTERNS I (3 CREDITS)

This course is an introduction to algorithms and design patterns. Students learn to recognize the importance of developing fast and efficient algorithms for solving common complex problems in a simple and elegant manner. Students learn efficient sorting, pattern matching, tree traversal, data retrieval, time performance analysis and memory efficiency analysis. Students will explore the standard template library, abstract data types, trees, heaps, hash tables and other advanced object-oriented data types in C++. Furthermore, students will learn to analyze the run-time big O efficiencies, correctness, space efficiency, and optimality of a given algorithm. *Prerequisite: VGP102 (at least a grade of C)*

PHY200 PHYSICS OF MOTION, LIGHT AND SOUND (3 CREDITS)

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*

QUARTER 5

CCM131 BASIC 3D CONCEPTS (3 CREDITS)

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. *Prerequisite: None*

VGP232 GAME TOOLS AND PIPELINES (3 CREDITS)

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: VGP125*

VGP234 INTRODUCTION TO ARTIFICIAL INTELLIGENCE (3 CREDITS)

In this course, students will learn about the basics of Artificial Intelligence and how this can be applied to their game projects. Different types of basic algorithms will be explored such as Finite State Machines, Pathfinding, and Decision Making. Students will learn the theory and apply these concepts into a working game project. *Prerequisite: VGP233 OR GAD160*

VGP244 ALGORITHMS AND DATA PATTERNS II (3 CREDITS)

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: VGP131 (at least a grade of C) and VGP220*

MTH221 CALCULUS FOR PHYSICS (3 CREDITS)

This course will explore Single and Multivariable Differentials, Integral Calculus and Vector Calculus, with application to physics and animation. *Prerequisite: MTH201*

QUARTER 6

GAD121 MINIGAMES AND PROTOTYPING (3 CREDITS)

Students will design, script out, and create small self-contained mini-games and subsequently balance and tune them. Students will learn modern tools for rapid prototyping of various electronic game genres. *Prerequisite: GAD130*

VGP235 INTRODUCTION TO MOBILE PROGRAMMING (3 CREDITS)

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, 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: VGP233 and VGP230*

VGP201 PORTFOLIO I (3 CREDITS)

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*

VGP256 MATH AND PHYSICS FOR GAMES (3 CREDITS)

This course covers the mathematics and physics used in physics engines. Students learn the techniques and concepts needed to program realistic animation of rigid bodies in 3D based on Newtonian mechanics. They are exposed to base techniques for animating articulated bodies and deformable bodies. Topics include collision detection for various primary shapes, collision resolution techniques. Euler, Verlet, and RK4 numerical integration techniques are introduced and implemented. There will be also an introduction to inverse kinematics and its importance in realistic animation in games. *Prerequisite: VGP230, MTH221, and PHY200*

LIBERAL STUDIES ELECTIVE 1

QUARTER 7

VGP240 3D GRAPHICS AND APPLICATIONS (3 CREDITS)

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*

VGP332 ARTIFICIAL INTELLIGENCE (3 CREDITS)

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: VGP234, MTH201, VGP230*

VGP204 SOFTWARE DEVELOPMENT AND TESTING (3 CREDITS)

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: VGP131 (at least a grade of C)*

VGP339 INTRODUCTION TO OPERATING SYSTEMS (3 CREDITS)

This class introduces the basics of Operating Systems and will focus on their different implementations. Topics include the basics of concurrency, processes and threads, disk and memory management, security, distributed systems, and virtual machines. Students will be exposed to these concepts and will apply them in class exercises and projects. *Prerequisite: VGP131 (at least a grade of C), VGP244*

LIBERAL STUDIES ELECTIVE 2

QUARTER 8

VGP242 3D GRAPHICS PROGRAMMING (3 CREDITS)

In this course, students will apply their 2D/3D mathematics, computer graphic, 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*

CC310 PREPRODUCTION AND PROJECT MANAGEMENT (3 CREDITS)

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*

VGP320 DATABASE PROGRAMMING (3 CREDITS)

In this course students learn to work with a backend database through a frontend programming language like C++ or C#. Students will learn to create, add, and manipulate tables using structured query language (SQL) database technologies. They will be introduced to modern data models, relational database systems, data normalization, and general database querying. Special focus will be given on building databases that allow for optimal look ups and queries. *Prerequisite: VGP131 (at least a grade of C) and VGP233*

VGP340 CONCURRENCY AND PARALLEL PROGRAMMING (3 CREDITS)

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: VGP131 (at least a grade of C) and VGP244*

LIBERAL STUDIES ELECTIVE 3

QUARTER 9

VGP330 REAL-TIME GPU PROGRAMMING (3 CREDITS)

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 pre-existing 3D graphics programming framework. *Prerequisite: VGP242*

CC449 PRODUCTION TEAM I (6 CREDITS)

In this course, students work as a team on the production of an electronic games project in a studio environment. *Prerequisite: CC310 or Permission of the Program Director*

VGP331 NETWORK PROGRAMMING (3 CREDITS)

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*

STUDIO ELECTIVE

QUARTER 10

VGP334 ANIMATION FOR GAMES (3 CREDITS)

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*

CC451 PRODUCTION TEAM II (6 CREDITS)

In this course, students work as a team on the production of an electronic games project in a studio environment. *Prerequisite: CC449 or Permission of the Program Director*

VGP350 COMPILER THEORY (3 CREDITS)

This course covers the methods in the design and implementation of compilers, and their applications to general purpose and domain specific languages. Topics include finite automata, context free grammar, and expressions. Students will create their own simplified compiler to apply the concepts learned in class. *Prerequisite: VGP131 (at least a grade of C), and VGP244*

STUDIO ELECTIVE

QUARTER 11

VGP336 GAMEPLAY PROGRAMMING (3 CREDITS)

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*

CC452 POST-PRODUCTION (3 CREDITS)

In this course, students work as a team on the production of an electronic games project in a studio environment. *Prerequisite: CC451 or Permission of the Program Director*

CAP499 CAPSTONE (3 CREDITS)

The student will select a specific subject that can be effectively presented using graphic and/or web design. This course will provide an introduction to various research methodologies and evaluation will focus on the research process, including the identification of a research problem, literature and/or content review, research purpose and hypotheses, data collection and analysis, and research evaluation. During this time students will conduct research sufficient for a professional presentation as a graduate project, to be submitted and defended during their final quarter. *Prerequisite: Permission of the Program Director*

VGP337 NEURAL NETWORKS AND MACHINE LEARNING (3 CREDITS)

This course introduces the fundamentals of Machine Learning and Neural Networks, which are becoming the new developments for technology in the 21st century and are fundamentally changing all aspects of our lives. Students will program machines, software and applications that can learn from raw data, correct their mistakes, improve as a true intelligent agent should do, analyze data, and make intelligent decisions based on it. Learning the basics of machine learning and various techniques, concepts, algorithms and nomenclature is a fundamental knowledge any software developer should have to be able to successfully apply these techniques. This is a theory and hands-on course. Students learn the theory, history and current state of the industry as well as apply it for various small case studies and a final project. *Prerequisite: VGP332*

STUDIO ELECTIVE

QUARTER 12

VGP452 SENIOR PORTFOLIO (6 CREDITS)

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*

VGP430 SENIOR PROJECT (3 CREDITS)

Students, in a team or on their own, will pick a research thesis completed in Senior Research/Capstone and turn it into a practical coding project. The student will learn how to manage their time, the project risk and effectively complete a project that demonstrates coding abilities, creativity, the ability to adapt and effective problem solving. *Prerequisite: Permission of the Program Director*

STUDIO ELECTIVE

STUDIO ELECTIVE

^{**}Where no prerequisite is provided, none is required.

^{*}Course descriptions describe the learning opportunities that are provided through the classroom and coursework. It is each student's responsibility to participate in the activities that will lead to successfully meeting the learning outcomes.