

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 Game Design I	GAD100 History of Games	CCM121 Digital Imaging	GAD130 Level Design I	CCM131 Basic 3D Concepts	VGP240 3D Graphics and Applications	VGP242 3D Graphics Programming	VGP330 Real-time GPU Programming	VGP334 Animation for Games	VGP320 Database Programming	VGP440 Concurrency & Parallel Programming	VGP452 Senior Portfolio
VGP101 Intro to Computer Programming	VGP102 Object-Oriented Programming in C++	VGP130 Advanced Object Orientated C++	VGP114 Software Development & Testing	VGP230 2D Games Programming	VGP233 Programming for Game Engines	VGP234 Artificial Intelligence	VGP201 Portfolio I	Studio Elective	VGP331 Network Programming	VGP336 Gameplay Programming	VGP301 Professional Development
		VGP113 UML and Object Oriented Design	VGP125 Intro to C# Programming	VGP232 Game Tools & Pipelines	VGP135 Intro to Mobile Programming	CC310 Preproduction & Project Management	CC450 Production Team I	CC451 Production Team II	Studio Elective	VGP430 Senior Project	
MTH100 or MTH101 Applied Math	MTH201 Geometry & Linear Algebra	VGP220 Algorithms & Data Patterns I	VGP248 Physics of Motion Light & Sound	VGP244 Algorithms & Data Patterns II	VGP246 Calculus for Physics	VGP256 Math & Physics for Games			CC452 Post Production	Studio Elective	Studio Elective
ENG101 Rhetoric & Composition	ENG103 Academic Writing	Liberal Studies Electives	Liberal Studies Electives	Liberal Studies Electives	Liberal Studies Electives	Liberal Studies Electives	Liberal Studies Electives	Liberal Studies Electives	Liberal Studies Electives	Studio Elective	CAP499 Capstone

5 Game Design/Art Design Courses 15 credits	+	12 Technical Knowledge Building Courses 36 credits	+	13 Advanced Industry Research Courses 42 credits	+	7 Math/Algorithm Courses 21 credits	+	4 Team Production & Management Courses 18 credits	+	11 Liberal Studies Courses 33 credits	+	5 Studio Elective Courses 15 credits	=	TOTAL 180 CREDITS
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COURSE DESCRIPTIONS

QUARTER 1

GAD110 GAME DESIGN I

Students will be introduced to traditional game theory and design and how they relate to their modern electronic cousin. Students work in teams to apply models and strategies for creating traditional games that are based in solid play mechanics. Students will experience an entire game cycle: identifying the audience, pitching the game, prototyping, creating a final product and play testing.
Credits: 3

VGP101 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 basics algorithms and simple user-defined functions to implement a simple application. This course is language agnostics and emphasis is on the core concepts of programming. Instructor may use a combination of C and Python to achieve the goals.
Credits: 6

MTH100 MATHEMATICS or **MTH101 APPLIED MATHEMATICS**
This course covers the foundational mathematical curriculum required in any software development environment. Students learn to solve relevant video game development problems by applying simple and complex mathematics and logical solutions. Boolean algebra, logic, bit level operations, number representations, and precision are covered. Furthermore, students learn to solve problems using discrete mathematics, 2D/3D vectors, and basic projectile motion.
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 timeline, technological shifts, and key genres in the brief history of electronic video games. The student will develop a written and verbal vocabulary for analyzing games and their cultural significance.
Credits: 3

VGP102 OBJECT ORIENTED IN C++

This is an introduction to object-oriented programming in C++ part a. In this course students are introduced to common object-oriented concepts such as classes, namespaces, inheritance, object-oriented designs, polymorphism, type casting, virtual functions, and const-correctness. Students simulate real world types of problems solving using C++ related to video games programming.
Prerequisite: VGP105 Introduction to Programming
Credits: 6

MTH201 GEOMETRY AND LINEAR ALGEBRA

This course covers the essential analytic geometry and linear algebra tools and techniques used in 3D games and graphics programming. Topics include coordinate systems, vectors, dot & cross product, projection, lines, planes, matrices, determinants, and transformations. Students apply these concepts to problems in game programming. They learn how to represent objects mathematically, and how to perform translation, rotation, scaling, and basic collision detection.
Prerequisite: MTH100 Mathematics or MTH101 Applied Mathematics
Credits: 3

ENG103 ACADEMIC WRITING

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 Rhetoric and Composition
Credits: 3

QUARTER 3

CCM121 DIGITAL IMAGING

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

VGP130 ADVANCED OBJECT-ORIENTATED 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: VGP111 Object-Oriented Programming in C++
Credits: 3

VGP113 UML AND TECHNICAL DOCUMENTATION

This course is an introduction to software documentation and planning techniques used in modern software development. The course will focus on utilizing the practical software engineering use-case approach to drive software specifications, requirement gathering, object-oriented design analysis, user documentation, and software designs. Technical design documentation using UML and other technical writing techniques are emphasized.
Prerequisite: VGP111 Object-Oriented Programming in C++
Credits: 3

VGP220 ALGORITHMS AND DATA PATTERNS I

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++.
Prerequisite: VGP111 Object-Oriented Programming in C++
Credits: 3

LIBERAL STUDIES ELECTIVE

Credits: 3

QUARTER 4

GAD130 LEVEL DESIGN I

This is an introductory course covering the level design process and the tools of level editing as they relate to building game environments using an existing commercial game engine. The focus is on generating levels with attention to efficiency and design aesthetics.
Credits: 3

VGP114 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, implementing, maintaining, and testing. Additionally, there will be introductions to software implementation, maintenance, quality assurance, and application troubleshooting.
Prerequisite: VGP111 Object-Oriented Programming in C++
Credits: 3

VGP125 INTRO 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: VGP111 Object-Oriented Programming in C++
Credits: 3

VGP248 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 Geometry and Linear Algebra
Credits: 3

LIBERAL STUDIES ELECTIVE

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

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: VGP111 Object-Oriented Programming in C++, MTH100 Mathematics or MTH101 Applied Mathematics
Credits: 3

VGP232 GAME TOOLS AND PIPELINE

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 and reusable tools. Students will learn how to multiply team efficiency through building tools and pipelines to increase development productivity.
Prerequisite: VGP111 Object-Oriented Programming in C++
Credits: 3

VGP244 ALGORITHMS AND DATA PATTERNS II

This course introduces advanced algorithms including shortest path, advance sorting, hashing, compression, graphs traversal, tree traversal, Greedy method, breath first search, depth first search, divide & 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: VGP220 Algorithms and Data Patterns I
Credits: 3

LIBERAL STUDIES ELECTIVE

Credits: 3

QUARTER 6

VGP240 3D GRAPHICS AND APPLICATIONS

Students are introduced 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.
Prerequisites: MTH201 Geometry and Linear Algebra and VGP130 Advanced Object-Orientated C++ II
Credits: 3

VGP333 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 to integrate all major systems through advanced scripting.
Prerequisite: VGP125 Intro to C# Programming
Credits: 3

VGP135 INTRO TO MOBILE PROGRAMMING

This course introduces the fundamental of programming for online and 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: VGP130 Object-Oriented Programming in C++ II

VGP246 CALCULUS FOR PHYSICS

This course will explore Single variable Differential, Integral Calculus and Vector Calculus, with application to physics and animation.
Prerequisite: VGP248 Physics of Motion Light and Sound
Credits: 3

LIBERAL STUDIES ELECTIVE

Credits: 3

QUARTER 7

VGP242 3D GRAPHICS PROGRAMMING

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 3D Graphics and Applications
Credits: 3

VGP332 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++.
Prerequisites: MTH201 Geometry and Linear Algebra and VGP130 Advanced Object-Orientated C++
Credits: 3

CC310 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. A project or projects are then selected to move forward to Production Team.
Prerequisite: VGP111 Object-Oriented Programming in C++ or upon approval of Academic Director
Credits: 3

VGP256 MATH AND PHYSICS FOR GAMES

This course covers the mathematics and physics used in physics engines. Students learn the tools needed to program realistic animation of rigid bodies in 3D based on Newtonian mechanics, and get an introduction to techniques for animating articulated bodies and deformable bodies. Topics include collision detection techniques, Newton Euler equations of motion, Euler, Verlet, and other techniques of numerical integration, Hermite & Bezier spline curves, linear & spherical linear interpolation, Frenet, geodesic, parallel transport & quaternion frames, Lagrange multipliers, introduction to inverse kinematics.
Prerequisite: VGP246 Calculus for Physics
Credits: 3

LIBERAL STUDIES ELECTIVE

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 GPUs. Both pixel and vertex shader techniques will be explored in detail. Potential shaders students will implement includes 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 3D Graphics Programming
Credits: 3

VGP400 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 lead up to their Senior Portfolio which enables them to plan for future programming career objective.
Prerequisite: 105 completed credits and approval of Academic Director
Credits: 3

CC449 PRODUCTION TEAM I

In this course, students continue to work as a team on the production of an electronic games project in a studio environment.
Prerequisite: CC310 Preproduction & Project Management
Credits: 6

LIBERAL STUDIES ELECTIVE

Credits: 3

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 with skinning and complex blending.
Prerequisites: VGP128 Geometry and Linear Algebra and VGP130 Advanced Object-Orientated C++
Credits: 3

STUDIO ELECTIVE

Credits: 3

CC451 PRODUCTION TEAM II

In this course, students continue to work as a team on the production of an electronic games project in a studio environment.
Prerequisite: CC449 Production Team I
Credits: 6

LIBERAL STUDIES ELECTIVE

Credits: 3

QUARTER 10

VGP320 DATABASE PROGRAMMING

In this course students learn to work with a back-end database through a front-end programming language like C++ or C#. Students will learn to create, add, and manipulate tables using 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: VGP130 Advanced Object-Orientated C++ II
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: VGP130 Advanced Object-Orientated C++ II
Credits: 3

STUDIO ELECTIVE

Credits: 3

CC452 POST-PRODUCTION

Using their recently completed project from Production Team, students will learn the post-production process including further tuning and feature addition based on peer feedback, archiving, post-mortem reviews, code and design clean-up and optimization, and the creation of marketing materials.
Prerequisite: CC451 Production Team II
Credits: 3

LIBERAL STUDIES ELECTIVE

Credits: 3

QUARTER 11

VGP440 CONCURRENCY AND PARALLEL PROCESSING

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 work load disbatching, and general performance optimizations.
Prerequisites: VGP130 Advanced Object-Orientated C++ II,v VGP244 Algorithms and Data Patterns II
Credits: 3

VGP336 GAMEPLAY PROGRAMMING

This course is an introduction to game play programming that is focused around working with modern game programming architectures to produce, and prototype game mechanics. Game play 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, path finding, audio, animations, player interactions, physics and networking.
Prerequisites: VGP128 Geometry and Linear Algebra and VGP130 Object-Oriented Programming in C++ II
Credits: 3

VGP430 SENIOR PROJECT

Students, in a team or on their own, will pick a research thesis completed in Senior Research 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: 135 completed credits and approval of Academic Director
Credits: 3

STUDIO ELECTIVE

Credits: 3

STUDIO ELECTIVE

Credits: 3

QUARTER 12

VGP452 SENIOR PORTFOLIO

This course focuses on the completion of a student's portfolio and enables the student to begin their career search. Students are introduced to games interview screening process, technical interviews, whiteboard questions, programming tests, complex problem solving and verbal presentation of tough technical challenges.
Prerequisite: VGP430 Senior Project
Credits: 6

VGP301 PROFESSIONAL DEVELOPMENT

This course will help students prepare to seek entry-level employment in the programming area. Students will be exposed to marketing strategies, as well as how to participate in professional development activities. Course topics include: job search methods, pre-employment networking skills, professional resume preparation, cover letters, thank you letters, and interview skills. Students will also learn other valuable skills that can be applied throughout their career, such as time and stress management, making decisions, and solving problems.
Corequisites: VGP430 Senior Project or VGP452 Senior Portfolio

STUDIO ELECTIVE

Credits: 3

CAP499 CAPSTONE

Credits: 3

***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.*