Visual & Game Programming

DIPLOMA PROGRAM

LaSalle College
Vancouver

QUARTER 1	QUARTER 2	QUARTER 3	QUARTER 4	QUARTER 5	QUARTER 6
VGP126 — Applied Mathematics	**VGP128** — Geometry and Linear Algebra	**VGP248** — Physics of Motion, Light and Sound	**VGP220** — Algorithms and Data Patterns I	**VGP244** — Algorithms and Data Patterns II	**VGP242** — 3D Graphics Programming
VGP101 — Introduction to Computer Programming	**VGP102** — Object-Oriented Programming in C++	**VGP114** — Software Development and Testing	**VGP233** — Programming for Game Engines	**VGP201** — Portfolio I	**VGP430** — Senior Project
		VGP131 — Object Oriented Programming in C++ II	**CC310** — Preproduction and Project Management	**CC449** — Production Team I	**CC451** — Production Team II
GAD100 — History of Games	**CCM121** — Digital Imaging	**VGP125** — Introduction to C# Programming	**VGP230** — 2D Games Programming		
GAD110 — Game Design I	**GAD130** — Introduction to Level Design	**VGP113** — UML and Object Oriented Design	**VGP232** — Game Tools and Pipelines	**VGP240** — 3D Graphics and Applications	Elective

4 Game Design/Art Design Courses — 12 credits	+	9 Technical Knowledge Building Courses — 33 credits	+	4 Advanced Industry Research Courses — 12 credits	+	5 Math/Algorithm Courses — 15 credits	+	3 Team Production & Management Courses — 12 credits	+	2 Elective Courses — 6 credits	=	TOTAL 90 CREDITS

LCI EDUCATION NETWORK MEMBER

Visual & Game Programming

COURSE DESCRIPTIONS

QUARTER 1

VGP126 APPLIED MATHEMATICS (3 CREDITS)
Students will review the essentials of high school 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

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

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

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

QUARTER 2

VGP128 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: VGP126

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)

CCM121 DIGITAL IMAGING (3 CREDITS)
Students develop basic image manipulation skills in a raster-based computer environment.
Prerequisite: None

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

QUARTER 3

VGP248 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 physics-based games.
Prerequisite: VGP128 or GE129 or MTH201

VGP114 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: VGP102 (with at least a grade of C)

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)

VGP113 UML AND TECHNICAL DOCUMENTATION (3 CREDITS)
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: VGP102 (with at least a grade of C)

QUARTER 4

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)

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

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

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)

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

QUARTER 5

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

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

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

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

QUARTER 6

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 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

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

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

ELECTIVE (3 CREDITS)

**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.

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