

## ***BA DigiPen Academy – 12C***

**District Name: Kamloops/North Thompson**

**District Number: 73**

**Developed by: Justin deVries**

**Date Developed: Spring 2012**

**School Name: Sa-Hali Secondary School**

**Principal's Name: Richard Kienlein**

**Board/Authority Approval Date:**

**Board/Authority Signature:**

**Course Name: BA DigiPen Technical Academy 12A**

**Grade Level Course: Grade 12**

**Number of Course Credits: 4**

**Number of Hours of Instruction: 120**

**Prerequisite(s) recommended:**

- Principals of Math 10
- Principals of Math 11 (or concurrent)
- Physics 11 (concurrent)
- Art course(s)
- BA DigiPen Academy 12A and 12B

**Special Training, Facilities or Equipment Required:**

Computer Science background, or experience in similar area along with training provided by DigiPen Institute of Technology. Facilities should include a computer lab with recent model computer, with reasonable video card and memory. Video projector, DigiPen training software (proprietary game development tools), graphics programs for 2D and 3D graphics (preferably PhotoShop CS3, 3D StudioMax). Printed support materials (workbooks, etc) are provided by DigiPen ó students retain their workbooks.

## **Course Synopsis**

This course is the third of four courses that make up the DigiPen Academy Program. The DigiPen ProjectFUN Computer Science Technology Program is a project-based curriculum targeted at high school students that leverages interest in video game development as a learning vehicle. The program is essentially a computer science course made up of seven modules, each with a unique game that students will produce. In addition to teaching computer science, the material also covers topics in mathematics and production art.

This course introduces some basic ideas and tools from computer science and mathematics as used in game programming. These tools will be used in later sections of the course to build new games.

### **Rationale:**

Vancouver is rapidly attracting a concentration of video game production companies. Employment and compensation opportunities provided in this industry are among the fastest growing in Canada's knowledge-based economy. This program will provide our students with an opportunity to participate in the curriculum of an internationally recognized video game university (DigiPen), while gaining experience with real-world video game creation. Students will also acquire the knowledge and skills to enable them to become successful candidates for other roles within the industry. Students will be able to draw on a cross-curricular knowledge and skills from disciplines such as Mathematics, Physics, Music and Art.

This course is one of four and will engage modules 5 and 6 of 7 modules in the program. The course offers an introduction to real time interactive simulation, motion picture and game elements, and covers computer architecture, and an overview of C programming language. Modules 5 and 6 continue with previous topics and discuss advanced features including array, structure and classes (programming) and introduces bit manipulation and artificial intelligence. Three dimensional modeling, definition and use of parametric equations, hierarchy of inheritance, and the concept of generic programming using templates.

## Organizational Structure

The nature of this course doesn't lend itself to a structured unit-by-unit outline. However, the following table lists the topics and approximate percentage of time spent on these tasks:

Topic	Title	Time
Module 5 ó òClean Sweepö	Game Elements	50 hours
Programming	2 dimensional array representation	
	Structure	
	Class	
Mathematics	Matrices	
	Operations on matrices	
	Determinant Function	
	Determinant Applications	
	Transformations in the plane	
	Combination of standard transformations	
Art and Design	Psychology of Colour	
	Anatomy of Motion	
	Key framing and Tweening	
	Primitives and Modeling	
	More modelling-splines	
Production	GDD layout	
Module 6 ó òMato-hiroö	Game Elements	70 hours
Programming	Classes (advanced topics)	
	Virtual functions	
	Classes overloading	
	3DSmax groupings	
	Programming Templates	
	Dynamic allocation	
	òEnemy searchö algorithms	
	File Input/Output	
	Collision Engines	
	UVW mapping	
Mathematics	Parametric equations	
	Polar coordinates	
	Line and circle collision	
Production Art	3D texturing	

Production	Game Analysis	
	Character Design	
	Your game design	
	Game production 1: background and hero	
	Game production 2: hero map collision	
	Game production 3: enemies	
	Game production 4: getting answers	
	Game production 5: final touches	

## Unit Topic Module Descriptions

Module 5: "Clean Sweep" consists of a hero who must eat all of the "food" in the level to win the game. Sweeper moves up, down, left and right only when there are no blocks in the road. Sweeper has to run away from smart enemies who try to catch him. If the sweeper eats the power pills found in the corners, he will be able to freeze the enemies for a period of time. This model is divided into six tasks, where each task helps students achieve a step in building the game.

### Computer Science

*It is expected students will:*

- Continue to develop their understanding of Object Oriented Programming in C++.
- Acquire an understanding of how two-dimensional arrays are applied
- Acquire an understanding of classes and structures

### Mathematics:

*It is expected students will:*

- Develop an understanding of matrices and operations on matrices
- Will acquire an understanding of determinant functions and determinant applications
- Will acquire an understanding of transformations in the plane, as well as a combination of standard transformations

### Production Art

*It is expected students will:*

- Develop an understanding of the psychology of colour, and the anatomy of motion.
- Develop an understanding of key framing and tweening, as well as primitive modeling and modeling splines

### Production

*It is expected students will:*

- Extend their skills in writing under the Game Design Document format

## Module 6: "Mato-hiro"

In module 6, students will build a game called "Mato-hiro". In this game Hero, the main character, visits multiple sites where quests are given. To fulfill each quest, he must pick the correct sprite from the various sprites spread throughout the zone and return it to where the quest began. To win, Hero must complete all the quests. Hero should be very careful because the region is filled with enemies who will follow him and try to end his quest prematurely.

### Computer Science

*It is expected students will:*

- Gain understanding of classes, virtual functions, overloaded classes, 3D Studio Max groupings as game design elements

- Understand the use of programming templates, dynamic allocation, Enemy Search algorithms, File input/output, collision engines, UVW mapping used in 3D modeling.

#### Mathematics

*It is expected students will master the following:*

- Learn to apply parametric equations to game design elements
- Use of polar coordinates
- Understand and apply line and circle collision to game design elements

#### Production Art

*It is expected students will:*

- Understand and apply 3D texturing

#### Production

*It is expected students will:*

- Engage in game analysis
- Gain an understanding of character design and apply it to their own game designs for:
  - Creation of a background and hero
  - Design hero map collision
  - Design enemies
- Engage in a testing phase for their projects and engage in revisions as needed

## Instructional Components

- Direct instruction
- Indirect instruction
- Interactive instruction
- Independent, guided practice
- Modeling
- Group work ó principal component in assessment

## Student Expectations

- Ability to work cooperatively
- High level of classroom maturity
- Leadership in classroom activities, small group interactions
- Good Math skills
- Basic knowledge of computer operation

## Learning Resources

- Printed materials: DigiPen *Technical Academy: Modules 5 & 6*
- Computer Lab
- Video projector
- Software

## Student Fees

- \$150/year

## Assessment

Topic	Title	Percent Value
Module 5 ó ðClean Sweepö	Game Elements	
Programming	2 dimensional array representation	10
	Structure	
	Class	
Mathematics	Matrices	15
	Operations on matrices	
	Determinant Function	
	Determinant Applications	
	Transformations in the plane	
	Combination of standard transformations	
Art and Design	Psychology of Colour	15
	Anatomy of Motion	
	Key framing and Tweening	
	Primitives and Modeling	
	More modelling-splines	
Production	GDD layout	5

Module 6 ó ðMato-hiroö	Game Elements	
Programming	Classes (advanced topics)	15
	Virtual functions	
	Classes overloading	
	3DSmax groupings	
	Programming Templates	
	Dynamic allocation	
	ðEnemy searchö algorithms	
	File Input/Output	
	Collision Engines	
	UVW mapping	
Mathematics	Parametric equations	10
	Polar coordinates	
	Line and circle collision	
Production Art	3D texturing	5
Production	Game Analysis	25
	Character Design	
	Your game design	
	Game production 1: background and hero	
	Game production 2: hero map collision	
	Game production 3: enemies	
	Game production 4: getting answers	
	Game production 5: final touches	

Assessments will be both formative and summative and consist of conversations, group presentations, concept quizzes, class work, projects, and a large final assessment piece.