BAA 3D Game Design 12

District Name: Coquitlam

District Number: 43

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Date Developed: March 1st, 2012

School Name: Heritage Woods Secondary, Centennial Secondary, Gleneagle Secondary

Principal's Name: Mr. Ken Cober

Board/Authority Approval Date:

Board/Authority Signature:

Course Name: 3D Game Design 12

Grade Level of Course: Grade 12

Number of Course Credits: 4 credits

Number of Hours of Instruction: 100 hours

Prerequisite(s): None. It would be advantageous for students to have a background in 3D design, digital arts, and programming.

Special Training, Facilities or Equipment Required: A computer lab with software for both 3D modelling and game design is required. The instructor should have training with a 3D modelling software package and a compatible 3D Game Design platform.

Course Synopsis: 3D Game Design is a 'how to' course designed to teach the fundamental philosophies of game design and apply them in a hands-on manner using a step-by-step process. For students, the majority of their class time in this course will be dedicated to the applied creation of their own working 3D game.

Rationale: 3D Game Design and its various related fields of work are viable occupations for students in BC. A course like this gives students an experience in this field prior to committing to a post-secondary program. With the emergence of free and inexpensive software tools, schools can offer this course in a budget conscious manner.

Organizational Structure:

Unit/Topic	Title	Time
Unit 1	Introduction to 3D Game Design & Planning	10 Hours
Unit 2	Modelling for Game Design	20 Hours
Unit 3	Colour and Texture for 3D Models	10 Hours
Unit 4	Rigging Models	5 Hours
Unit 5	Animation for 3D Game Sprites	10 Hours
Unit 6	Level Design	30 Hours
Unit 7	Introduction to Scripting & Programming	10 Hours
Unit 8	Testing and Publishing a 3D Game	5 Hours
	Total Hours	100 Hours

Unit/Topic/Module Descriptions:

Unit 1: Introduction To 3D Game Design & Planning (10 hours)

1. 3D Game Design snapshot
   Students….
   a. Describe the overall process and workflow of 3D Game Design

2. The History of Video Games
   Students will…
   a. Demonstrate the timeline and progression of video game development and design

3. Careers in 3D Game Design
   Students will…
   a. Describe a career of interest in 3D Game Design
      i. skills necessary
      ii. job markets
      iii. working conditions

4. Creating A Game Concept
   Students will…
   a. Identify and discuss the elements of a great game

b. Design and pitch their own game concept to the class

5. Introduction to the Game Design Document
   Students will:
   i. Describe various games to see how story is conveyed
   ii. Demonstrate proficiency in game story development through a Game Design Document
   iii. Describe a game world and how it will be developed
   iv. Create non-linear game design through the creation of flow charts or mind maps

Unit 2: Modelling For 3D Game Design (20 Hours)

1. Character Design
   a. Students will:
      i. Develop strategies of design that lend to good character persona for animation
      ii. Create a Traits Triangle for character's personalities
      iii. Express the importance of effective character design
      iv. Create memorable game characters that meet criteria for: memorability and appeal
      v. Indentify and apply basic strategies to create dynamic 3D models with low polygon counts
      vi. Create character rotoscopes and use them in game character creation

2. Game Props
   a. Students will:
      i. Demonstrate a thorough knowledge of compositional models using both 2D and 3D strategies
      ii. Develop game props that support the theme of a game design

Unit 3: Character/Model Unwrap and Texturing (10 Hours)

1. Unwrapping Process
   a. Students will:
      i. Plan a character texture map to utilize differing needs for character detail
      ii. Prepare a model for texturing through the unwrapping process

2. Colour and Texture for 3D Models
   a. Students will:
      i. Develop texture strategies that economize and reflect appeal in character development
      ii. Create basic and complex colours and textures for models

Unit 4: Character and Model Rigs (5 Hours)

1. Creating bones
   a. Students will:
      i. Learn how to assign model mesh to a bone for animation
      ii. Create a naming convention for bone structures

2. Model Rigs
   a. Students will:
      i. Prepare a 3D model for basic animation by creating a standard bone rig

Unit 5: Animation for 3D Game Sprites (10 Hours)

1. Principles of animation
    a. Students will:
        i. Identify and describe the Principles of Animation – noting their importance
        ii. Identify each of the Principles of Animation and how they apply to 3D Game Design
        iii. Comprehend the timeline of animation

2. Process of animation
    a. Students will:
        i. Demonstrate a proficiency in the process of animation
        ii. Export animation in formats appropriate for a final product
        iii. Create specific actions for characters as needed in a game design document

Unit 6: Level Design (30 Hours)

1. Interior Design
    a. Students will:
        i. Produce rooms for a specific environment
        ii. Connect rooms via doors, elevators and portal devices

2. Textures
    a. Students will:
        i. Apply wad based textures for efficiency
        ii. Create a texture and add it to an existing wad

3. Lighting
    a. Students will:
        i. Discuss how light affects the mood of an environment
        ii. Recognize how light changes depending on its source (ambient, klieg and sunlight)
        iii. Use various lighting schemes for effect

4. Camera Control
    a. Students will:
        i. Describe various ways camera control can be used in game design
        ii. Apply a camera setup to a game environment

5. Particle/Visual Effects
    a. Students will:
        i. Describe the use of particle systems to create atmospheric and visual effects
        ii. Plan and utilize a particle system in a game

6. Sound Design
    a. Students will:
        i. Describe the effect soundscape has on game play
        ii. Manage and create sound effects, dialogue and music for game play

7. Motion Control
    a. Students will:
        i. Describe options for controlling user interaction with the game avatar
        ii. Apply motion controls to both user controlled and computer controlled sprites that affect:
            - Collision detection
            - Waypoints & pathing
            - Triggers

8. Exterior Environments
    a. Students will:
        i. Produce an environment that reflects an outdoor appearance
        ii. Create and use texture maps for atmospheric purposes

9. GUI Interfaces
    a. Students will:
        i. Identify and describe the purpose of a GUI and HUD panels
        ii. Develop a custom GUI or HUD for a game design

Unit 7: Introduction to Scripting and Programming (10 Hours)

Note: this unit is taught so that students can manipulate code rather than create it. 3D Game Engines are difficult to start from scratch and very time consuming. Many companies in the 3D game industry purchase ready-made 3D game engines that only require code manipulation.

1. Introduction To Scripting
    a. Students will:
        i. Identify the main structures and logic of code
        ii. Annotate code
        iii. Identify and describe the process of debugging
        iv. Manipulate and modify code

Unit 8: Beta Testing and Publishing a 3D Game (5 Hours)

1. Game Balance
    a. Students will:
        i. Identify the stages of a software release life cycle
        ii. Evaluate a game for its user readiness
        iii. Play-test a game for difficulty and gaming experience
        iv. Adjust a game according to feedback of game balance testing

2. Publishing
    a. Students will:
        i. Publish a game to a specific format

Instructional Component:

The learning outcomes will be achieved through...

- **Instructor Demonstrations:** Students will be introduced to major concepts through demonstrations. Students will first see a practical application of the concept (examples), watch a demonstration of the concept applied, and then practice the **application** on their own.
- **Practice:** As this course will be taught through the **creation** of a game as a final project, students will learn through **exploration** and **application** of their work on their individual games.
- **Analysis:** Examples will be used throughout the course to provide students with the opportunity to evaluate and analyze games for their effectiveness in course concepts. Students will also game test each other's work and provide feedback on game play.
- **Research:** Although major concepts will be introduced by the instructor, game development has a wide online community that can be utilized to expand and further explore game design. The instructor will highlight online resources that students can use as a starting point for further exploration of game design.
- Class **Discussions** will be used to introduce topics. Students will be encouraged to evaluate the importance of the topic to good game design and the factors that lead to successful application.

Assessment Component:

- Effective formative assessment via:
    - Clearly articulated and understood learning intentions and success criteria
    - Questions posed by students, peers and teachers to move learning forward
        - Discussions and dialogue
    - Feedback that is timely, clear and involves a plan
    - Students are resources for themselves and others – peer and self-assessment
    - Student ownership

Formative assessment used to adapt learning experiences and inquiry plans on an on-going basis to meet specific learning goals.

Development, awareness and action, based upon metacognition intended to lead to learner independence and self-coaching.

Summative Assessment:

Summative assessments will be determined as students demonstrate proficiency/mastery toward particular learning outcomes. Summative assessments and final grades will reflect the following:

- Students will work collaboratively with the teacher to determine summative achievement on assignments and letter grades based upon dialogue, and evidence of learning
- Behaviour and work habits will NOT be included when determining letter grades
- Marks will not be deducted for late work
- Extra credit and bonus marks will not be awarded
- Plagiarizing will not result in reduced marks/grades –the student will be required to demonstrate their learning authentically
- Attendance will not be considered toward letter grade
- Only individual learning demonstrated –no group marks – will be used to determine grades
- Letter grades will reflect learning towards the learning outcomes articulated above
- Letter grades will be based upon criteria provided/agreed upon toward the learning outcomes
- Letter grades will be determined in relation to the learning outcomes – not in comparison to the achievement of other students
- Poor work will not be assessed towards grades – students will only be assessed on quality work
- Professional judgment and evidence will be used to determine final letter grade in consultation with the student
- Zeros will not be assigned to missed assignments – all required assignments must be completed
- Formative or practice towards learning outcomes will not be included in final grade assessment
- Most recent evidence toward learning outcomes will be used to assign letter grades – learning is not averaged over time

Learning Resources:

Student Textbook: N/A

Software Resources:

The following 3D Modelling and Animation packages have been tested and work for this course:

- Blender: A free program available online. www.blender.org/
- Animation Master by Hash Inc: Affordable licensing for schools. www.hash.com
- Maya: very specific hardware requirements and expensive licensing but it does offer a free student version. www.autodesk.com/maya/
- 3D Studio Max: expensive licensing but there is a 30 day free trial. www.autodesk.com/3ds-max/

The following 3D Game Design software could be used:

- Game Studio: an affordable 3D game design software suite with templates for game creation. A free student version is available. www.3dgamestudio.com/
- Unreal Game Engine: very powerful 3D environment software but expensive licensing. A student version is available. www.unrealengine.com/

Teacher Resources:

- The Official Guide To 3D Gamestudio
  By: Michael Duggan
  Publisher: Thomson Course Technology
  Pub. Date: 2007
  ISBN-10: 1-59863-362-7
  ISBN-13: 978-159863-362-7

- Animation: Master A Complete Guide
  By: David Rogers
  Publisher: Nelson Education Ltd.
  Pub. Date: May 25, 2006
  ISBN-10: 1584504757
  ISNN-13: 978-1584504757

- Beginning Blender: Open Source 3D Modeling, Animation, and Game Design
  By: Lance Flavell
  Publisher: Apress
  Pub. Date: November 30, 2010
  Print ISBN: 978-1-4302-3126-4
  Web ISBN: 1-4302-3126-2
  Pages in Print Edition: 446

- Introducing Character Animation with Blender
  By: Tony Mullen
  Publisher: Sybex
  Pub. Date: February 22, 2010
  Print ISBN: 978-0-470-42737-8
  Web ISBN: 0-470427-37-X
  Pages in Print Edition: 480

- Animating with Blender: How to Create Short Animations from Start to Finish
  By: Roland Hess
  Publisher: Focal Press
  Pub. Date: September 26, 2008
  Print ISBN-10: 0-240-81079-1
  Print ISBN-13: 978-0-240-81079-9
  Web ISBN-10: 0-08-092811-0
  Web ISBN-13: 978-0-08-092811-1
  Pages in Print Edition: 368

- Beginning Blender: Bounce, Tumble, and Splash!
  By: Tony Mullen
  Publisher: Wiley Publishing, Inc., Indianapolis, Indiana
  Pub. Date: June 30, 2008
  ISBN-13: 978-0470192801

Additional Information:

Optional curriculum topics may include:

- Shaders and bump maps
- Custom scripting – programming behaviours
- Multiplayer options
- Animated cut-scenes
- CD labels, manuals, boxes, and websites for expansion of publishing unit

Example Rubrics:

3D MODELING EVALUATION RUBRIC

Criteria	Beginner (1 or 2)	Developing (3)	Accomplished (4)	Exemplary (5)
Shape (artistic)	Little evidence of form creation, model has little to no symmetry. Obvious defects.	Forms created with varying success. Symmetry of model may vary.	Model parts are proportional to the whole, forms look correct at all angles, model is properly balanced and shows a good use of emphasis (if applicable).	Model has excellent visual impact, resulting in a model that is inviting and pleasing to the eye.
Technique (technical)	Model contains open patches and/or dangling control points, reliance on 3 point patches, creases throughout the model.	Model contains few creases, most of the splines well spaced with varying success in design. Evidence of preplanning process.	Splines follow definable paths, no evidence of creasing, model limits the number of splines used to cut down on complexity.	Superb results with low density mesh. Patch count limited to roughly under 500. The use of 5 point patches evident.
Textures & Colour	Obvious areas where model needs to have colour but does not contain it.	Proper use of groupings for ease of colouring and editing. Model fully coloured but may be somewhat simplified.	Good use of colour implying intent of model design (imitationalism, formalism, emotionalism). Use of variety of strategies (ie: materials, surface colour, decals).	Use of value gradations, textures appear tactile (real to the touch). Texture is well organized and could be easily used to create more models based on original design.
Game Ready	No skeleton or bones present, little attention to properly modeling for animation. No export.	Skeleton present with few errors. Export included.	Joints properly constructed to allow for bend (3 cross sections), basic actions present. No inverted normals leading to holes in the model.	Model contains cp weights. Real efficiency with both design and low memory requirement.

Game Project Evaluation

Criteria	Beginner (1 to 2)	Developing (3)	Accomplished (4)	Exemplary (5)
Game Design Document	Partially completed, wrong responses	Fully completed, some responses incorrect	Fully completed, correct responses	Fully completed, correct responses with well documented Flow Charts
Layout Background Art	Partially completed backgrounds, some missing	All Layouts present, limited design elements present	All Layouts follow the elements of design	All Layouts follow the elements of design, they create a real mood to the game
Character Sprites	Limited number of sprites, ineffectual design	A complete list of sprites with varied success	All sprites demonstrate an understanding of sprite creation and add to the flavour of the game. Use of bounding colours and emphasis evident.	Outstanding Sprite creation demonstrating artistic talent
Sprite Animation	Many sprites are unanimated	Limited scope of animation	All sprites are properly animated with visual cues to their actions	Sprite animation demonstrate many of the principles of animation
Story Development	Little story development	Story present with limited scope	A rich story development that is both intriguing and imaginative, all necessary game screens included	A rich story development that is both intriguing and imaginative, a game booklet is present with final project
Game Mechanics and sound	Obvious flaws that demonstrate a lack of attention to detail, lack of sound	Game runs relatively well, sound track included	No real flaws, creative use of scripts evident, good sound track	Project demonstrates a real ingenuity of creative thinking in use of scripts, score, and cast, great sound track
Playability	Lack of testing evident, game too hard/easy or too short	Game balance evident	Balanced game with creative approach to winning. In game instructions explaining basic movement and elements of game play.	A game that keeps the user engaged throughout the session. All areas complete and present new obstacles to overcome.
Presentation	Game burned on CD	Game burned on CD, CD cover with game art included	Game burned on CD, CD cover with game art included. Internet ready.	Game burned on CD, CD cover with game art included, game comes with its own box! Internet ready.
Design Interface	Very little thought evident in user interface	Interface present with varying success	A straight forward interface, user friendly	A creative interface meshing well with game play area and a visual cohesive design.