# COURSE OUTLINE

## SCHOOL OF COMPUTER TECHNOLOGY

**COURSE NAME:** Advanced Graphics Programming

**COURSE CODE:** GAME3111

**CREDIT HOURS:** 4.0

**PREREQUISITES:** GAME2012

**COREQUISITES:** None

**PLAR ELIGIBLE:** YES ( X ) NO ( )

**EFFECTIVE DATE:** September 2019

**PROFESSOR:** Hooman Salamat **OFFICE #:** 316

**PHONE:** TBA **EMAIL:** Hooman.salamat@georgebrown.ca

**NOTE TO STUDENTS: Academic Departments at George Brown College will NOT retain historical copies of Course Outlines. We urge you to retain this Course Outline for your future reference.**

**FOR OFFICE USE ONLY**

| | | |
|---|---|---|
| **ORIGINATOR:** | **Alexander Richard** | **YYYY-MM-DD** |
| | **SIGNATURE** | **DATE** |
| **CHAIR:** | **Ylber Ramadani** | **YYYY-MM-DD** |
| | **SIGNATURE** | **DATE** |
| **DATE OF REVISION:** | **YYYY-MM-DD** | |

**EQUITY STATEMENT: George Brown College values the talents and contributions of its students, staff and community partners and seeks to create a welcoming environment where equity, diversity and safety of all groups are fundamental. Language or activities which are inconsistent with this philosophy violate the College policy on the Prevention of Discrimination and Harassment and will not be tolerated. The commitment and cooperation of all students and staff are required to maintain this environment. Information and assistance are available through your Chair, Student Affairs, the Student Association or the Human Rights Advisor.**

**George Brown College is dedicated to providing equal access to students with disabilities. If you require academic accommodations visit the Disability Services Office or the Deaf and Hard of Hearing Services Office on your campus.**

**STUDENT RESPONSIBILITIES: Students should obtain a copy of the *Student Handbook* and refer to it for additional information regarding the grading system, withdrawals, exemptions, class assignments, missed tests and exams, supplemental privileges, and academic dishonesty. Students are required to apply themselves diligently to the course of study, and to prepare class and homework assignments as given. Past student performance shows a strong relationship between regular attendance and success.**

**COURSE DESCRIPTION:**
Students explore a wide range of advanced 3D graphics programming topics. Modern games require a delicate balance between visual quality and rendering speed, imposed by the limitations of the available hardware. Students learn to dynamically manage the complexity of 3D scene representations through model, animation, and texture level-of-detail techniques. In addition, advanced geometry handling techniques, mesh optimization, and advanced scene management techniques are studied.

**ESSENTIAL EMPLOYABILITY SKILLS:**
As mandated by the Ministry of Training, Colleges and Universities essential employability skills (EES) will be addressed throughout all programs of study. Students will have the opportunity to **learn (L)** specific skills, to **practice (P)** these skills, and/or **be evaluated (E)** on the EES outcomes in a variety of courses. The EES include communication, numeracy, critical thinking & problem solving, information management, interpersonal and personal skills. The faculty for this course has indicated which of the EES are either Learned (**L**), Practiced (**P**) or Evaluated (**E**) in this course:

| Skill | L | P | E | Skill | L | P | E |
|---|---|---|---|---|---|---|---|
| 1. communicate clearly, concisely and correctly in the written, spoken and visual form that fulfills the purpose and meets the needs of the audience | | X | | 7. locate, select, organize and document information using appropriate technology and information sources | X | X | X |
| 2. respond to written, spoken or visual messages in a manner that ensures effective communication | | X | | 8. show respect for the diverse opinions, values, belief systems, and contributions of others | | X | |
| 3. execute mathematical operations accurately | X | X | | 9. interact with others in groups or teams in ways that contribute to effective working relationships and the achievement of goals | | | |
| 4. apply a systematic approach to solve problems | | X | X | 10. manage the use of time and other resources to complete projects | | | |
| 5. use a variety of thinking skills to anticipate and solve problems | | X | X | 11. take responsibility for one's own actions, decisions and consequences | | X | |
| 6. analyze, evaluate, and apply relevant information from a variety of sources | | X | | | | | |

**COURSE OUTCOMES:**
Upon successful completion of this course the students will have reliably demonstrated the ability to:

1. Use math techniques appropriate to the creation of various applications.
2. Initialize Direct3D to create various applications.
3. Develop lighting and texturing techniques for use in applications.
4. Implement different types of shaders within an application.
5. Dynamically manage scene representations for an application.
6. Utilize advanced geometry handling techniques for a variety of applications.

7. Develop applications that use custom meshes and character animations.
8. Format all deliverables to comply with Canadian laws and policies.

**DELIVERY METHODS / LEARNING ACTIVITIES:**
The instructional methods of this course are comprised of a combination of textbook resources, lectures, lab demonstrations, outline notes and examples, exercises, and assignments.

**LIST OF TEXTBOOKS AND OTHER TEACHING AIDS:**
***Required:***

None

***Recommended / Optional:***

Introduction to 3D Game Programming with DirectX 12
By: Frank Luna
ISBN-13: 978-1-942270-06-5
Publisher: Mercury Learning and Information

**TESTING POLICY:**

Students are required to adhere to all George Brown College policies and procedures regarding withdrawals, exemptions, attendance, class assignments and academic dishonesty (refer to http://www.georgebrown.ca/about/policies/ and Student Code of Conduct and Discipline Policy).

Students are required to complete lab tests, quizzes, exams as well as take-home assignments. If a student misses a test for valid reasons, including medical, and can provide a doctor's note, he/she will be given a chance to rewrite the test at a later date.

**ASSIGNMENT POLICY:**

All assignments must be submitted on the due date of each respective assignment by means specified by their professor for that assignment. For every day past the due date there will be 10% penalty unless the student has notified the professor (via e-mail, phone or in person) ahead of due date that he/she has a valid reason for late submission. Submissions will no longer be accepted after five days past an assignment due date.

**EVALUATION SYSTEM:**

| **Assessment Tool:** | **Description:** | **Outcome(s) assessed:** | **EES assessed:** | **Date / Week:** | **% of Final Grade:** |
|---|---|---|---|---|---|
| Assignments (2) | Practical DirectX asst. | 1-8 | 1-7, 10, 11 | 5, 13 | 30 |
| Labs (8/10) | Weekly DirectX exercises | 1-8 | 1-7, 11 | 2-6, 10-14 | 20 |
| Midterm Exam | Test on code and theory | 1-4 | 2, 4-7, 11 | 7 | 20 |
| Final Project | Test on code and theory | 3-7 | 1-7, 10, 11 | 15 | 30 |
| | | | | **TOTAL:** | **100%** |

**GRADING SYSTEM**

**The passing grade for this course is: D (50%)**

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **A+** | **90-100** | **4.0** | **B+** | **77-79** | **3.3** | **C+** | **67-69** | **2.3** | **D+** | **57-59** | **1.3** | **Below 50** | **F** | **0.0** |
| **A** | **86-89** | **4.0** | **B** | **73-76** | **3.0** | **C** | **63-66** | **2.0** | **D** | **50-56** | **1.0** | | | |
| **A-** | **80-85** | **3.7** | **B-** | **70-72** | **2.7** | **C-** | **60-62** | **1.7** | | | | | | |

**Excerpt from the College Policy on Academic Dishonesty:**
**The *minimal* consequence for submitting a plagiarized, purchased, contracted, or in any manner inappropriately negotiated or falsified assignment, test, essay, project, or any evaluated material will be a grade of zero on that material. To view George Brown College policies please go to www.georgebrown.ca/policies**

## TOPICAL OUTLINE:

| Week | Topic / Task | Outcome(s) | Content / Activities | Resources |
|---|---|---|---|---|
| 1 | - Introduction, Math Review | 1 | | Ch. 1-3 |
| 2 | - Direct3D Initialization | 2 | Lab | Ch. 4 |
| 3 | - Rendering Pipeline | 2 | Lab | Ch. 5 |
| 4 | - Drawing in Direct3D | 1-4 | Lab | Ch. 6, 7 |
| 5 | - Lighting, Texturing | 1-4, 8 | Lab | Ch. 8, 9 |
| 6 | - Blending, Stenciling<br>**- Assignment 1 Due** | 1-4 | Lab Review | Ch. 10, 11 |
| 7 | **MIDTERM EXAM** | 1-4 | | |
| 8 | *INTERSESSION WEEK* | | | |
| 9 | - Geometry Shader, Compute Shader | 1-4 | | Ch. 12, 13 |
| 10 | - The Tessellation Stages | 5 | Lab | Ch. 14 |
| 11 | - FPS Camera, Instancing, Frustum Culling<br>**- Assignment 2 Due** | 5, 6 | Lab | Ch. 15, 16 |
| 12 | - Picking | 5,6 | Lab | Ch. 17 |
| 13 | - Mapping | 5, 6, 8 | Lab | Ch. 18-20 |
| 14 | - Ambient Occlusion | 6, 7 | Lab | Ch. 21 |
| 15 | - Quaternions, Character Animation<br>**- Final Project Due** | 3-8 | | Ch. 22, 23 |

**Please note: this schedule may change as resources and circumstances require.**

For information on withdrawing from this course without academic penalty, please refer to the College Academic Calendar: **http://www.georgebrown.ca/registernow/important-dates.aspx**