DigiPen WANIC Video Game Programming Year 2

Class Meeting Times: Monday - Friday
7:15 a.m. - 9:45 a.m.
12:30 p.m. - 3:00 p.m.

Course high school credits: CTE (2.0), Math Analysis (1.0)

Course Overview:
This course covers the basics of computer programming, video game development, and demystifies the inner workings of a computer. Students will learn to code in the C and C# programming language, and be exposed to several others. Students will learn how to break tasks down into simpler tasks that are easier to implement using pseudocode (fake code) and flow charts. They will learn how computers store data using binary, as well as the logic computers use (this includes logic gates, Boolean algebra, and conditional statements) to build more complex and useful algorithms. Students will get exposure working on interdisciplinary project teams to create multiple games/simulations using a pre-existing game engine.

This course also provides students with the opportunity to earn AP Computer Science Principles credit. For details about this, please visit https://apcentral.collegeboard.org/courses/ap-computer-science-principles/course

Concepts and Skills Covered:

- Fundamentals of game engine architecture.
- Object-oriented programming and essential C++ language features including data structures.
- Vector and matrix algebra as they apply to games.
- Best practices for working on larger programming projects.
- Process that goes into the production of a video game including pitches, design documents, scheduling, milestones, testing, time management, and working on interdisciplinary teams.
- Programming concepts more specifically related to games such as game loops, component-based engine architecture, and game-play programming.

Course Supplies:

Required:

- Notebook - For note taking/drawing flow charts.
- Writing utensils including at least one pencil.
- MAT140 requires a calculator that can perform matrix multiplication

Recommended:

- A home computer (preferably Windows) capable of running the Unity Engine found at https://unity.com/
    - See Canvas for the appropriate version.
- Either use GitHub, an online drive, a Flash drive, or portable hard drive for backing up work.

Competency-Based Approach:

DigiPen uses a competency-based approach for its educational experience, and these course policies reflect that philosophy. In a competency-based system, your progress is measured by your ability to demonstrate mastery of key skills and concepts. The following policies are designed to support your journey towards mastering these competencies.

1. **Course-work Policy:** There is no homework component; all work is done during regular class time, allowing instructors to observe and evaluate mastery of knowledge and skills. Additional in-class work time is built into the schedule to accommodate absences or a slower work pace. Please note that excessive absences will likely affect a student's ability to meet the competencies.
2. **Grading Policy:** Semester grades are determined by competency completion and quality of work. Students with **any number** of assignments marked Missing/ Incomplete/ Revision Required assignments will receive an "N" (No credit) letter grade. ***To earn a passing high school grade, students must score a Meets Competency/Complete on ALL assignments due within a given grading period.*** **"B"** or **"A"** high school letter grades are awarded based on the quality of work submitted.
3. **Quarter Check-Ins:** Prior to the end of each quarter, students with **any number** of Missing/Incomplete/Revision Required assignments and/or perform poorly on student evaluations will automatically receive an email notification home. On a case-by-case basis, students will be required to attend a Parent-Teacher conference and may receive a **"D-"** letter grade at Quarter 1 and Quarter 3 as a warning, which will become a **"N"** (No credit) letter grade at the end of the semester if pace continues.
4. **High School Transcripts**: Only final high school semester grades are submitted at the end of each semester. The WANIC office sends WANIC high school transcripts to each student's public high school. Homeschool and private school families should reach out to

the public high school that their student is registered under for the WANIC program if they want to request a copy of their official transcript.

Assignments:
You are responsible for completing and submitting all required work. Information about all assignments will be posted on the Canvas course. The work is expected to be done during your regular class time and anything you do not finish during the current class period can be resumed in class at a later date.

Each assignment is assessed based on your ability to fulfill general requirements that relate to that assignment. These requirements are often used in multiple assignments, and your overall grade is based on your ability to meet the expectations for these competencies.

Assignments are assessed into the following competency categories:

- **Missing/Incomplete:** Assignment has not been submitted correctly.
- **Revision Required/Incomplete**: Assignment has been submitted but does not meet all expectations. The student receives feedback and is required to resubmit with revisions.
- **Meets Competency [HS]/Complete**: Assignment expectations have been met at the high school level and the student is given feedback. Optional revisions may be made for a higher grade upon resubmit.
- **Refined/Complete [HS]**: Assignment submission demonstrates all expectations at a high quality for the high school level. Further improvements would require a collegiate level understanding. Optional revisions may be made for a higher grade upon resubmit.
- **Advanced/Complete [College]**: Work demonstrates a collegiate level of skill and process. The student uses higher order thinking skills to elevate the work above the high school expectations. Optional revisions may be made for a higher grade upon resubmit.
- **Mastery/Complete [College]**: Student work demonstrates highest level of competency for this course.

Assignment Resubmission:
Any assignment can be resubmitted without penalty as many times as needed within the grading period. Exceptions may be made for content that falls outside the scope of the minimum class requirements (such as college material, live events, or group work).

All resubmissions must be uploaded to Canvas before the end of each semester. Keep in mind that once the grading period is over, semester grades cannot typically be changed.
Independent Study Project:

Upon completing the required competencies, students may have time to work on an "Independent Study" project that is non-graded, which encourages students to learn for the sake of learning and further personalize their education based on their professional interests. Students choose the type of project they would like to try, and the instructor then helps students develop an individualized learning plan to achieve their project outcome.

Academic Integrity and Coursework Policy:
To maintain high academic integrity and a productive learning environment, all students must adhere to the following guidelines:

1. **Original Work Requirement**: Students are strictly prohibited from plagiarizing or utilizing any other material produced by others. This includes, but is not limited to, images, music, code, or any other form of creative work. Student work should all be original design.
2. **Generative AI Tools**: The use of generative AI tools is strictly forbidden in all aspects of coursework and assignments, unless the instructor gives explicit permission for select assignments.
3. **In-Class Completion of Assignments**: All assignments must be completed during class time. Work done at home or outside designated class hours will not be accepted for credit.
4. **All content must be school appropriate**: Think "E-rated"!

Violations of these policies will result in the work not being accepted for credit, and serious violations may lead to removal from the course.

Cheating/Plagiarism:
Students are expected to do their own work. Cheating and plagiarism (presenting another's work as one's own) will not be tolerated. Generative AI works are not considered authored by the student.

DigiPen College Transfer Credit:
This course offers the opportunity to earn college transfer credit, meaning that you may be eligible to transfer credits to a college or university upon successful completion. Students have the option to pursue college transfer credit for the following DigiPen courses:

- ***CS170 High-Level Programming II: The C++ Program -*** *This course introduces the C++ language with particular emphasis on its object-oriented features. Topics include stylistic and usage differences between C and C++, namespaces, function and operator overloading, classes, inheritance, templates, and fundamental STL components.*

- ***CS230 Game Implementation Techniques*** *- This presents game implementation techniques and engine architecture. Students investigate foundational concepts of game*

architecture, such as game-system component separation and game flow, while learning about essential elements such as the game state manager, input/output handler, and frame rate controller. This course introduces Windows programming, state machines, and collision detection algorithms, which students will integrate into their own remakes of classic games. As part of their implementation, students create and expand their own collision, vector, and matrix libraries, enabling them to incorporate basic physics engines. Students survey concepts in space partitioning, particle systems, map editors, and other elements as a bridge to more advanced concepts in implementation techniques and engine architecture.

- ***MAT140 Linear Algebra and Geometry*** *- The two main themes throughout the course are vector geometry and linear transformations. Topics from vector geometry include vector arithmetic, dot product, cross product, and representations of lines and planes in three-space. Linear transformations covered include rotations, reflections, shears and projections. Students study the matrix representations of linear transformations along with their derivations. The curriculum also presents affine geometry and affine transformations along with connections to computer graphics. This course also includes a review of relevant algebra and trigonometry concepts.*

Students must "declare intent" to pursue college transfer credit. They will be evaluated using a separate rubric and issued a separate college transfer credit transcript by DigiPen Academy. Full-year attendance is required.

Please note:

- Only students who have earned an "Advanced" or "Mastery" grade for all assignments in that college course will receive a college transfer credit transcript.
- DigiPen College Transfer Credit is separate from the WANIC grade recorded on a student's high school transcript.
- Students interested in college transfer credit pathways must submit a completed declaration of intent form with a parental/guardian signature. The instructor will provide declaration of intent forms. DigiPen Academy may choose to decline students who do not currently demonstrate the prerequisite level of competency necessary for college content.
- Withdrawal from college transfer credit must be formalized through a withdrawal form, which must also have a parental/guardian signature.
- Parents/guardians are expected to monitor student progress which will be posted on Canvas.

- Each individual institution determines whether these credits are accepted, so it's important to check with your chosen college or university for their specific policies and to confirm whether the credit will be accepted.

Advanced Placement (AP):
Some DigiPen WANIC courses offer Advanced Placement (AP) credit. If a student intends to take their course's corresponding AP exam, it is the student's responsibility to register for the exam through their home high school at the beginning of the school year. DigiPen WANIC **does not** administer/proctor any AP exam.

Course Competencies:
Below are the essential concepts and skills ("grammar") students must master in this course. Those who demonstrate competency early can advance to other key concepts or work on independent projects during the studio portion of the course.

Assessments will include:

- **Project-based Assignments**: Students will demonstrate their understanding by designing and iterating on projects.
- **Written Reflections**: Students will articulate their understanding of concepts through reflections on readings, lectures, and personal experiences.
- **Peer Reviews**: Students will give and receive feedback on projects.
- **Portfolio Submission**: A collection of their work throughout the year.

Semester 1

- **Programming Concepts (OOP/C++/*CS*170)**
    - Understands pointers and their usage in memory allocation and de-allocation.
    - Understands how references can be used in place of pointers for pass-by-reference behavior in many functions.
    - Understands how simple data structures such as arrays and lists are used in the context of computer programs and simulations.
    - Understands how functions can be overloaded to improve their flexibility and usability.
    - Understands the purpose of classes and encapsulates data to simplify programs.

- **Applied Mathematics (MAT140/CS230)**
    - Understands the Cartesian coordinate system and its applications in programming simulations.
    - Understands vector arithmetic as it applies to game programming, including addition, subtraction, and scalar multiplication.

- Understands how simple physics is implemented in games, including position, velocity, acceleration, and forces, and can manipulate game objects using physics-based movement.

- **Code Quality (CS170)**
  - Understands the importance of documenting file ownership and copyright.
  - Understands how to thoroughly document a function, including a brief, descriptions of each parameter, and a description of what the function returns.
  - Understands how choosing appropriate names for variables, functions, and classes can improve code readability and reduce the need for explicit documentation.

- **Project Workflow**
  - Understands how to use an Integrated Development Environment (IDE) to create, compile, and run large multi-file projects. Understands the importance of version control as a method for backing up work and collaborating with others.
  - Understands how to commit, push, fetch, and pull files and changes from a repository.

Semester 2

- **Programming Concepts (OOP/C++/*CS17*0)**
  - Understands how operators can be overloaded to simplify the use of mathematical operations in a program.
  - Understands how to extend objects with additional behavior using a combination of composition and inheritance.
  - Understands how polymorphism allows the same code to produce different results with different subclasses of objects.
  - Understands how templat*es/g*enerics can be used to reduce code duplication.
  - Understands how standard container libraries and associated algorithms can be used to organize and manipulate collections of data.
  - Understands how to read and write data from files in an object-oriented language.

- **Applied Mathematics (MAT140/CS230)**
  - Understands the mathematics of detecting intersections between simple 2D primitives such as points, circles, and rectangles.
  - Understands the vector dot product and its relationship to the angle between vectors, as well as its typical applications in simulations.
  - Understands how to multiply matrices together to create another matrix. o Understands the matrix operations used in basic graphics programming, including translation, scaling, rotation, and projection.

- **Software Architecture (CS230)**
    - Understands the advantage of keeping the interface and implementation of a system separate.
    - Understands how to create an intuitive, well-documented interface that other programmers can understand and use.
    - Understands the importance of minimizing the number of responsibilities of each individual class within a program.
    - Understands the importance of minimizing dependencies between different classes within a program.

Additional Outcomes

- **Programming Concepts (CS170)**
    - Understands how to implement simple data structures such as dynamic arrays and lists.

- **Simulation Implementation Techniques (CS230, probably better suited for studio/independent study)**
    - Understands the typical flow of a game loop, including the loading and unloading of resources, creation and destruction of objects, and updating and drawing of objects.
    - Understands how game engines can be broken up into many independent modules for things like graphics, physics, levels, game objects, etc.
    - Understands the resources typically used to draw 2D graphics, including textures, quadrilateral meshes, sprites, and animations and how to use them.
    - Understands how a simple but flexible game object architecture can be created using a combination of inheritance and composition.
    - Understands how to implement a simple n-squared collision detection system between all game objects.
    - Understands how to deserialize a file written in a simple text format to turn it into an object in a program.

- **Simulation Implementation Techniques (additional content)**
    - Understands how to draw a tile map using sprites and a 2D array of integer data.
    - Understands how to detect and resolve simple 2D map collisions using a 2D array of binary data.
    - Understands how to implement sound effects and music in a simulation using an external library.

- Understands the purpose of a pixel shader and how to make simple changes to a shader to affect the colors of objects.
- Understands how to implement a simple system for sending and receiving events between objects in a simulation.
- Understands how space partitioning can be used to speed up collision detection between objects in a simulation.

- **Applied Mathematics (MAT140/CS230)**
  - Understands how the normal vector to a line can be used to define an equation for the line.
  - Understands how vectors can be used to define equations for lines in all spatial dimensions.
  - Understands how to compute the orthogonal projection of a vector onto another vector.
  - Understands how to compute intersections between lines using a normal equation and a vector equation.
  - Understands how to use dot products and projections to compute the intersection and reflection of a moving point and a line.

- **Project Workflow (CS230)**
  - Understands how to use static and dynamic libraries in a program via an IDE.
  - Understands how to create a static library using an IDE.

Additional Policies and Course Requirements

WANIC Expectations & Policies – Student Handbook:

Students are expected to review and follow the school rules, procedures, and processes outlined in the WANIC Student Handbook. WANIC Skill Center follows Lake Washington School District policies. Rules will not be reprinted in the syllabi.

Program Schedule & Hours

DigiPen WANIC follows the Lake Washington School District (LWSD) calendar. All students are expected to attend classes per the LWSD calendar. This means that even if their home high school is not in session (e.g., LEAP days, snow days, mid-winter break, spring break), students are expected to attend the DigiPen WANIC class.

Classes run Monday to Friday and there are two sessions:

- 7:15 a.m. - 9:45 a.m.
- 12:30 p.m. - 3:00 p.m.

DigiPen does not assume any responsibility for students before or after scheduled class times. If a student arrives more than 15 minutes before the start of class, they should stay in the DigiPen café and not wander through the campus. Teachers will NOT allow students into the classroom until 15 minutes before scheduled start.

Behavioral Expectations:

- Students are always expected to maintain a respectful and professional demeanor. This includes respecting the opinions and contributions of peers, instructors, administrative staff, and guest speakers. Bullying or threatening others, whether online or in person, is not permitted.
- Do not damage or steal anyone's personal property, or DigiPen property or equipment.
- Walk in the hallways and classrooms and stay with your class unless you have permission to do otherwise.
- Students must notify the Instructor if they need to leave the classroom in the middle of class. Any time a student leaves the classroom, they must sign out on the Sign-Out/Sign-In sheet in the class binder, and sign back in when they return to the classroom.

Disruptive Behavior Policy:

Disruptive Behavior is considered anything that negatively impacts others' ability to learn and work during dedicated class time.

- Step 1: Student receives a verbal warning from the instructor, and an internal record is made.
- Step 2: Should the behavior continue or escalate, student will meet with office admin. Parent/Guardian will be notified by admin staff via email/phone call.

- Step 3: Depending on the circumstances and nature of the behavior, the student may not be allowed to continue with the WANIC program until a parent-teacher conference is conducted.

Attendance Policies:
Parents/guardians must email WANIC (wanic@lwsd.org) and DigiPen (wanic@digipen.edu) if a student will be absent, late, or needs to leave early. Failure to notify will result in unexcused absences. Students are responsible for coordinating with instructors to make up missed class time.

To be dismissed early, a parent/guardian must notify wanic@lwsd.org AND wanic@digipen.edu prior. If the office does not receive notification, students may not leave until notification has been received from a parent/guardian (via email or phone).

Being 30 minutes late or more will be recorded as an absence; however, we still encourage students to attend class even if they can only make it for a portion.

- If you are late to class, you are marked as **TARDY.**
- If you arrive **+30 minutes late,** you are marked as **ABSENT.**
    - When marked as ABSENT, a phone call and email will be sent home. **Parent/Guardian must notify the office to excuse the absence.**

For late pick-up, please note that WANIC staff and classrooms are not available after 3:30PM. If the student's ride home is arriving after 3:30PM, students must wait downstairs in the front lobby entrance or cafe. If you are aware of the delayed pick-up ahead of time, please notify the WANIC office via email at wanic@lwsd.org AND wanic@digipen.edu.

If the student does not have a phone, they may ask to use the front desk or security's phone to call. If the parent/guardian needs to contact DigiPen after 3:30 p.m., please call the front desk line at (425) 629-5000.

WANIC Attendance Policies and Procedures: https://wanic.lwsd.org/students-and-families/attendance

****Families are asked to avoid calling or texting students during WANIC class time. For urgent needs, please contact the DigiPen WANIC office at (425) 629-5007 or wanic@digipen.edu.**

Food & Drink:
No food is allowed in the classrooms. Drinks must be in sealed containers.

Technology Use Policy:

During all instructional time, personal electronic devices must be silenced, not visible, and not in use. This includes but is not limited to cell phones, smartwatches, smart glasses and other wearable technology, personal laptops and tablets, and any other device capable of communication, internet access or audio, video, or image capture.

- Non-educational use of devices (e.g., laptops, phones, tablets) during class is prohibited to ensure a focused learning environment.
- Misuse of school or personal technology may lead to the device being temporarily confiscated during class time or other appropriate actions being taken.
- No cell phone usage in class: Cell phones should be silenced and put away during class time. Use of cell phones should only be used when approved by instructors for curriculum use. Recording of any kind is prohibited on campus.
- Proper Use of Equipment: School devices are monitored by DigiPen IT.
    - Do not download anything onto school laptops or devices unless permitted by the instructor.
    - Do not log in to your personal accounts (such as personal or school district Google Drive, One Drive, Microsoft accounts etc.).
- Notify the instructor if you encounter any issues or faulty equipment right away.

Personal devices, including phones, may be used only for educational purposes during class. Non-educational use is prohibited to ensure focus. Misuse of any personal technology in the classroom may result in temporarily confiscating the device or other appropriate actions.

****Families are asked to avoid calling or texting students during WANIC class time. For urgent needs, please contact the DigiPen WANIC office at (425) 629-5007 or wanic@digipen.edu.**

Please Note:

- The policies listed in this syllabus may be updated throughout the year, and we will notify you of any changes.
- DigiPen is a private institution independent from Washington state school districts. As a result, some policies may differ from those of your school or district.
- The WANIC program is specifically designed for minors, meaning certain policies will differ from those that apply to DigiPen's college programs.
- We are committed to fostering a safe and supportive learning environment. If you have any questions or concerns about this agreement or other policies, please get in touch with us at wanic@digipen.edu.