LECTURE FOUR - Interactive Computer Graphics

❖ **Game design** is a large field, drawing from the fields of computer science/programming, creative writing, and graphic design.

❖ **Game designers** take the creative lead in imagining and bringing to life video game worlds. College of Engineering and Information Technology

❖ **Game design** can be considered the planning arm of the entire process for making a video game. No video game gets made without a plan, and game design is, more or less, the process of making that plan. The field is somewhat a hybridization of creativity and technical skills that combine into a cohesive, fleshed out idea that people can work with using concrete and actionable tasks.

❖ **Video game design** is the process of conceiving, planning and directing the creation of an electronic game in which players control images on an electronic display. Video game design demands a strong background in logic, as well as a working knowledge of game theory and human psychology.

The Software you'll Use to Build your Game

❖ **GameMaker Studio 2 -** Among the best game design software options for beginners to experiment with, GameMaker: Studio 2 (GMS 2) features an easy-to-use drag-and-drop interface for variables and game logic, so that you can build entire games without knowing any code.

❖ **Unity** is one of the industry's most powerful and widely used game design software tools, allowing you to create 2D and 3D games for nearly any system—including Windows, Mac, iOS, Android, Facebook, Oculus Rift, Steam VR, PS4, XB1, Wii U, and Switch.

❖ **Unreal Engine** is a complete suite of development tools for anyone working with realtime technology. It gives creators across industries the freedom and control to deliver cutting-edge entertainment, compelling visualizations, and immersive virtual worlds.
❖ **Construct 3** is the best game development software if you've never written a line of code in your life. This game development tool is completely GUI-driven, meaning everything is drag-anddrop. Game logic and variables are implemented using the design features provided by the app itself.

❖ **Godot** supports the creation of both 2D and 3D games. Unlike Unity, however, Godot's support is far better. The 2D aspect of this free game development software was carefully designed from the start, which means better performance, fewer bugs, and a cleaner overall workflow**.**

❖ **Unreal Engine 4 (UE4)** is the most professional. It was created from scratch by the geniuses behind the Unreal franchise—people who know what's needed in a top-shelf engine and what it takes to deliver nextgeneration features. They know exactly what they're doing.

❖ **Defold** is no exception to the rule that the best free game design software allows exporting to a wide range of platforms. Publish your game to Nintendo Switch, Android, iOS, macOS, Linux, Windows, Steam, HTML5, and Facebook.

❖ **RPG Maker MZ** is a great free game maker for those who want to create a game without having to learn any programming. Use the map editor, character generator, and database to create any RPG your imagination churns up.

Creating Levels

❖ **Level design** is a game development discipline that involves the creation of video game levels, locales, missions or stages. This is done using some sort of level editor - software used in game development to construct digital environments.

❖ **Level editors** may also be included in released games to allow players to get creative and make their own levels and scenarios. Level design is both a technical and artistic process.

❖ **Level design** is also known as environment design or game mapping.

❖ **Level design** starts with the conceptual design of the level, which includes sketches, renderings, and even physical models.

Level design incorporates the following steps, but need not implement them all:

❖ Lay out of large map features, buildings, hills, cities, rooms and tunnels for game entities to move around in

❖ Determine the environmental conditions such as day, night and weather

❖ Set up ground rules such as the scoring system, allowable weapons, gameplay types, time limits, or resources

❖ Specify certain map regions where specific gameplay features occur, such as resource creation or harvesting, structure building and even interactive cut scenes.

❖ Specify nonnstatic parts, such as doorways, buttons and levers associated with mechanisms, teleporters and hidden passageways and areas

❖ Specify the locations of various entities such as player, enemy and monster spawn points, as well as ladders, coins, resource nodes and weapons, and save points

❖ Add detail such as level-specific styling and textures, sounds, animation and lighting and music

❖ Introduce scripted events in specific locations triggered by certain player actions

❖ Create the paths that nonplayer characters follow, their responses to specific trigger actions and any dialog they might have with the player.

The 3C's

❖ **3C's** are responsible for your initial experience; how you feel when in control of the game, how you interact with the basic core mechanics of the game, and really, whether those first few minutes are fun or not.

❖ **Character (Level 5) -** A player can derive what a character's personality traits may be depending on how that character's physical appearance is made. Their physical appearance can also be used in order to communicate certain types of information (like HP or currently equipped items) to the player. When designing your characters, it's always a good practice to try looking at their silhouettes. Usually, you would want your characters to easily be noticed or seen on the screen, even if there's a lot of things happening on it.

❖ **Character customization** has allowed players to express themselves more in a game. Being able to have a different hat, clothes, or physique from other players give them a sense of importance and uniqueness.

❖ **Camera (Level 6)** - Camera views can make or break your game. They should be crafted with utmost care. Different views are used for different purposes. The camera is one of the most important elements in a 3D game. It acts as the player's eyes, letting them see the game world from different points of view.

❖ **First person perspective** combines the camera and the doll, which means the player sees through the doll's eyes. He uses one set of controls to move the doll's body and another to turn its head.

❖ **Third Person Camera** allows you better visibility of the world, vs an isometric camera that gives you a strategic view of the world you're in.

❖ **Controls (Level 7)** - Allow players to interact with your game easily by having accessible controls. Don't have weird control schemes or make your players do unusual gestures in order to input something.. unless having unusual or frustrating controls is your selling point.

Making your Game

❖ **A simulator** is a type of interactive system whose primary responsibility it is to simulate something.

❖ All games are **contests,** but not all contests are games. The issue is that while contests are competitive, they do not require meaningful decisions.

❖ A **puzzle** is another word for "a problem". A puzzle has a single correct answer -- a "solution"

Fixing and Adjusting

❖ **Dynamic difficulty adjustment (DDA)** is a method of automatically modifying a game's features, behaviors, and scenarios in real-time, depending on the player's skill, so that the player, when the game is very simple, does not feel bored or frustrated, when it is very difficult.

Creating your Assets

❖ **Game assets** include graphics (characters, environments, logos), background music, special effects and sound effects. There are many tools and resources available to create your own game assets or use assets that already exist.

❖ **Blender** - A free and open source 3D creation suite. It supports the entirety of the 3D pipeline—modeling, rigging, animation, simulation, rendering, compositing and motion tracking, even video editing and game creation.

❖ **Maya** - 3D animation, modeling, simulation, and rendering software. Use it for animation, environments, motion graphics, virtual reality, and character creation. Free one month trial. Free three years for students.

❖ **Gimp** - Free software for image editing on Windows, OS X, GNU/Linux and other operating systems DaFont - Archive of freely downloadable fonts. Browse by alphabetical listing, by style, by author or by popularity.

❖ **Google Fonts** - A library of over 800 free fonts.

❖ **Aseprite** - A pixel-art tool to create 2D animations, sprites and other game graphics. A free trial is available.

❖ **Adobe Photoshop CC** - Software used to edit and alter existing images and photographs.

❖ **Pyxel Edit** - A pixel art editor designed to make it fun and easy to make tilesets, levels and animations.

❖ **GraphicsGale** - A free animation graphic editor that allows you to preview your animations while editing sprites. GraphicsGale supports many formats, including .ico, .gif, .avi, .cur, and .ani.
❖ **Open Game Art** - A variety of freely licensed, high-quality art for game developers.

Music and Sound Effects

❖ **Audiokinetic Wwise** - Advanced, feature-rich audio software for interactive media and video games. Available for free to non-commercial users and under license for commercial video game developers.

❖ **Freesound -** A collaborative database of Creative Commons Licensed sounds to browse, download and share

❖ **BeepBox** - An online tool for sketching and sharing chiptune melodies

❖ **Bosca Ceoil** - A free tool for beginners to create music with a built-in tutorial to walk you through each step

❖ **Sunvox** - A modular synthesizer with pattern-based sequencer (tracker) to compose music on any device or system. Free for most operating systems, except Android and iOS

Types of 3D Animation

❖ **3D Video and Film** - Among the types of 3D animation, 3D video and film is the most common. It is a 3D visual feature of moving images within a digital realm. This type uses motion graphics to move the subjects around a 3D space. Unlike other types, 3D video and film is purely visual, which means there's no interaction required. Hence, it is also called Passive 3D Animation

❖ **Interactive 3D -** This is a 3D animation production that features purely digital realm and created using a 3D computer software. While 3D video and film animation relies on the visual experience, this type involves user interaction. This allows users to be in first- or third-person points of view and move within the 3D world through a computer screen, with mouse and keyboards as external controls.

❖ **Virtual Reality 3D** - Among 3D animation types, virtual reality (VR) is the one that has opened a complete new world for users. Like interactive 3D, this features purely digital realm created in a 3D computer software. However, VR is used and experienced in a more immersive way. This type requires a device, such as Google Glass and Oculus, to allow its users to interact with the physical space. Among the types of 3D animation, virtual reality 3D is the most immersive and complex to create.

Types of 3D Animation Techniques

❖ **Inverse Kinematics -** This technique mimics the motion of skeleton joints to give the subject an illusion of natural body movement. Hence, this is often used in rigging the subject's arms and legs. With this, animators could easily make their characters move automatically, as long as they prepared the bone chain properly. This technique allows animators to simplify their animation process and create advanced animations with lesser effort.

❖ **Fluid Simulation** - This method is used to create realistic fluid animation for water, lava, bubbles, and others. Fluid simulation or fluid animation is often used to make special effects for movies, games, and ads. The level of complexity of this method may vary depending on the perceived output.

❖ **3D Skeletal Animation** - This technique animates an object or a character by laying the surface of the digital sculpture known as skin or mesh as well as the foundation underneath known as the rig or skeleton. This method is often used to produce human-like animations and complex objects.

Coloring and Lighting your Game Level

❖ Find the right lights Each White ambiance light comes with preset Light recipes — different shades of white light specially chosen by lighting experts to support you throughout the day. Set the lights to a cool blue daylight for your household tasks and use warmer, dimmer tones while you game.

Play Testing

❖ **Playtesting** is a method of quality control that takes place at many points during the video game design process. A selected group of users play unfinished versions of a game to work out flaws in gameplay, level design and other basic elements, as well as to discover and resolve bugs and glitches. In addition, the process mainly involves clarifying the vague points, adding fun elements or reducing boredom, balancing the victory situations, and so on.

❖ **Playtesting** is very common among PC games and role-playing games. It has become an integral part of game design. The costs to produce a game have increased along with gamers' expectations.

Playtests are usually carried out at four points in the design process:

❖ **Gross Playtesting:** This is the initial playtest where the most basic running model is used. Users are primarily looking for problems in gameplay. Generally, the playtesting is carried out by the main design team working on the game.

❖ **In-House Playtesting:** This is a more comprehensive playtest carried out by people within the company and/or by contracted playtesters. The goal at this stage is to work out any remaining kinks in gameplay and prepare the game for wider testing.

❖ **Blind Testing:** Beta versions of the game are sent out to groups of playtesters who have no prior experience with the game. By approaching the game as regular users, playtesters at this phase will provide feedback that professionals with experience in game design may have overlooked.

❖ **Final Playtesting:** This is the last playtest before the game is launched. The game version will be as close to the final version as possible, and much of the feedback at this stage will be aesthetic rather than dealing with basic mechanics or level design.

Finalizing Your Game

❖ **Pitching Decisions** - Upon selecting "Game Over" you will be given the option to assign pitching decisions for the game. However, pitching decisions may also be assigned through the post-game box score.

❖ **Unfinished Games** - If you have a game that is listed as unfinished, you can either open the game in the app and finalize it using the above instructions, or you can go to the box score on the website. You will see a Finalize button directly below the game tabs.

❖ **Post Game Box Score** - After a game has been finalized the post game box score will be available for review from both the app and the GameChanger website.

❖ **Resuming A Finalized Game** - If you finalize a game and wish to either resume scoring, or correct a scoring play through the app, you may always re-enter a previously finalized game.