B. DESIGN IIIrd YEAR (ANIMATION) – SCHEME

Paper	Time (In Hours)	Size	Ext. Marks	Midterm/CCE	Total
THEORY (SUBJECT)					
1. GAME PSYCHOLOGY	03	--	80	20	100
2. GAME FEEL	03	--	80	20	100
3. DEFINING RULES	03	--	80	20	100
PRACTICAL					
1. ALTERNATIVE CHARACTER DESIGN	3 Hrs	½ Imperial	80	20	100
2. 3D MODELING & TEXTURING	6 Hrs	--	80	20	100
3. DIGITAL SCULPTING (Z - BRUSH)	6 Hrs		80	20	100
4. 3D RIGGING & ANIMATION	6 Hrs	--	80	20	100
TOTAL					700

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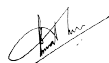Design, Mhow, Indore

PAPER – I (THEORY) – GAME PSYCHOLOGY

• Players – Why do perfectly normal people become crazy online? Why do people cheat hack & peek at Strategy Guides, Nostalgia about old games, why are Fan boys and Fan girls so ready for a fight?

• Game Makers - How do games get us to keep score and compete? How do games get us to grind, complete side quests, and chase achievements? How do developers keep us so excited about new loot?

• Game Seller – How do games make us feel immersed in imaginary worlds? Why do we go crazy for digital Game sales? How do games and apps get you with in-game purchases?, How do games keep players paying?, How do games get players to market to each other?

• The Games – Do we shape our in-game Avatars or do they shape us? Why do we like violent games so much? And should we be worried that we do? Do video games make you smarter?

• The Building block of emotional design, designing for multiplayer emotions, using movement design to create emotions and connections, Bridging distance to create intimacy and connection.

• Game addiction and internet gaming disorder, Social outcomes: online game play, social currency & social ability, Video game and cognitive performance

__Suggested Reading__

1. Getting Gamers: The Psychology of Video Games and Their Impact on the People who play them by Jamie Madigan

2. How Games Move Us: Emotion by Design (Playful Thinking) by Katherine Isbister

PAPER – II (THEORY) – GAME FEEL

• Defining Game Feel

• Principles of Game Feel

• Game Feel and Human Perception

• The Game Feel Model of Interactivity

• Mechanics of Game Feel

• Metrics for Game Feel – Input Metrics, Response Metrics, Context Metrics, Polish Metrics, Metaphor Metrics, Rules Metrics

• Case Study – Super Mario Brothers, Asteroids, Bionic Commando, Super Mario 64, Raptor Safari

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Suggested Reading

1. Game Feel: A Game Designer's Guide to Virtual Sensation (Morgan Kaufmann Game Design Books) 1st Edition by Steve Swink

PAPER – III (THEORY) – DEFINING RULES

- Defining Rules
- Rules on Three Levels
- The Rules of Digital Games
- Games as Emergent Systems
- Games as Systems of Uncertainty
- Games as Information Theory Systems
- Games as Systems of Information
- Games as Cybernetic Systems
- Games as Game Theory Systems
- Games as Systems of Conflict
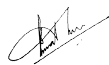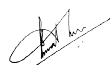- Breaking the Rules

Suggested Reading

1. Rules of Play: Game Design Fundamentals (MIT Press) by Katie Salen Tekinbaş, Eric Zimmerman

PRACTICAL 1 - ALTERNATIVE CHARACTER DESIGN
COURSE OUTLINE

- Introduction to Figure Drawing - Drawing to Animation (any one drawing is only part of a whole)
- Introduction to the skeleton - Volumetric rotations, axis lines, horizontal and vertical mechanics of the skeleton
- Capture the human and animal form effectively using observational drawing skills.
- Explain the relationship between time and the fundamental elements of life drawing.
- Create drawings that reflect figurative rhythmic, structural and proportional aspects of the human form
- Dynamic gesture: Directional Forces How and Why of Application throughout the Figure, Continuous gesture, multiple poses and memory studies.
- The Spine - Anatomy and Structure Curves, relationship to the skull, rib-cage

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- The Pelvis and Shoulder Girdle - Anatomy and Structure, Torso Movement, Relationship to the leg and whole figure

- Upper leg and attachment to the pelvis, knee and foot - Joint Movement, Foot Placement (space)

- The skull - Basic structure, rotations, planes and divisions, Skull/neck relationship, Insertion into torso

- Animal Drawings, Quick Gestures Animals

- Review of the human skeleton and major joints, Basic Joint Movement Terminology, Introduction to the muscles of the upper torso, front and back

- The Arm and the Shoulder, Relationship to the Torso, Main Muscle Groups

- The Leg and Buttock, Relationship to the Torso, Main Muscle Groups

- Muscles of the Complete Torso, Mass, volume, movement, form and function

- Muscles of the Hand and Foot

- Introduction to the Walk Cycle, Leg movement, Muscles of the hip, knee, ankle, toe

- Muscles of the Head, Neck and Face, Neck insertion, head rotation

- Facial muscles and features, facial triangle, Review of Human Anatomy

- Overview of anatomy of four legged animals

- Superheroes and Villains: Design, Character Construction, Deconstruction, Continuity of Distortion. Double model. Facial caricature. Media Studies: marker and inks.

- Monsters and Aliens. Transmogrifications of the model continued

- Introduction to Exploring Character and Costume

- Relationship of gesture to costume (dynamics of major folds)

- Relationship between costume, structural anatomy and lyrical & dynamic poses

- Line quality and specific fabric characteristics

- Character mood and psychology

- Costume, light and shadow and design continuity

- Character, archetypes and art direction

- Costume drawing and aesthetics

- Costume, character, performance and humor

- Pattern design, texture and color investigation

PRACTICAL SUBMISSION
1.   Dynamic Poses – 5

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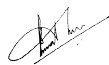**DDU Gorakhpur University,**
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2. Animal Quick Gestures – 10

3. Complete Human Skeleton -1

4. Spine - Anatomy and Structure Curves, relationship to the skull, rib-cage – 1 each

5. The Pelvis and Shoulder Girdle - Torso Movement, Relationship to the leg and whole figure – 1 each

6. Hands- Upper part, Lower part & finger bones – 1 each

7. Upper leg & Lower Leg – 1 each

8. Knee and Foot - Joint Movement, Foot bones – 1 each

9. The Skull - Basic structure, rotations, planes and divisions – 1 each

10. The Arm and the Shoulder – 1 each

11. Leg and Buttock – 1each

12. Muscles of the Complete Torso – 1 each

13. Muscles of the Hand and Foot – 1 each

14. Muscles of the Head, Neck and Face – 1 each

15. Muscles of the hip, knee, ankle, toe – 1 each

16. Facial muscles and features – 3

17. Acting poses with memory drawing - 3

18. Superheroes Character Design – 3

19. Villains Character Design - 3

20. Witch –2 costumes according to mood of witch

21. Monster Design -3

22. Alien Design - 3

23. Mythological Characters & Creatures - 5

Suggested Reading

1. An Atlas of Anatomy for Artists by Fritz Schider

2. Anatomy & Drawing by Victor Perad

3. Drawn to Life- Vol – 1 by Walt Stanchfield & Don Hahn

4. An Atlas of Animal Anatomy for Artists by W.Ellenberger

5. Character Design from the Ground up: Make Your Sketches Come to Life by Kevin Crossley

6. Creating Characters with Personality: For Film, TV, Animation, Video Games, and Graphic Novels by Tom Bancroft

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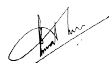**Design, Mhow, Indore**

7. A History of Costumes by Carl Kohler

8. Character Costume Figure Drawing: Step-by-Step Drawing Methods for Theatre Costume Designers by Tan Huaixiang

PRACTICAL 2 – 3D MODELING & TEXTURING
COURSE OUTLINE

• Introduction to Maya 3D Modeling Interface, use of mouse and keyboard, basic tools to be used in creating polygonal shapes and models. Descriptions of polygons, and the elements that make up a polygon in Maya, such as vertices, edges, faces, and UVis. Overview of file keeping, saving files and workspace views. Moving, scaling, rotating and placement of objects in the 3D environment.

• Lecture and Demonstration of new tools, including extrusion of faces, extrusion along a curve and Boolean operations. In class project to create a simple snowman, using spheres, cylinders and cubes to create hat, facial features, buttons and arms. Removal of extra intersecting geometry and labeling of polygons to keep clean file with minimal geometry. Students to bring in a toy or a reference drawing of a hard surface, non-organic object for review to begin HARD SURFACE MODEL.

• Hand Model Project. Students will model and entire hand, including 4 fingers, thumb, palm and part of the wrist starting from a primitive cube and adding divisions, splitting polygons, extruding faces to create jointed digits, beveling edges, and refining the topology by adding, scaling and manipulating vertices of the geometry. Hand must resemble a human hand, not a robotic or cartoon 'Mickey Mouse' hand. Wire frame model must remain unsmoothed to retain a smaller file size with minimal geometry.

• Character Model Project. Demonstration and lecture on character designing for 3D modeling. Review of character designs, any revisions required and importing three views into Maya for reference. Students will learn new techniques of creating a symmetrical model by creating an instance of half the model and mirroring the operations performed to ensure equal geometry on each side of the 'Y' axis. Students are encouraged to model the character only, no drapery. Two or 4 legged traditional characters only, no robotic or non-organic characters. Designs must have head, body arms, legs, feet and hands.

• Game Environment Model with Lighting. Create different game environments, both high & low poly. This is brief introduction to mapping and lighting techniques.

• Hair & Fur on characters

• N-Cloth – Introduction to nCloth

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- nDynamics & Dynamics
- Lighting Plug-in in Maya for Rendering – Mental Ray, Arnold, V-Ray Render

PRACTICAL SUBMISSION
To be done in Maya

1. Hard Surface Model - Students to bring in a toy or a reference drawing of a hard surface, non-organic object (non- living) like cars, architecture, etc.
2. Hand Model - Model an entire hand, including 4 fingers, thumb, palm and part of the wrist.
3. Character Models – High Poly & Low Poly both (2 each)
4. 4 legged characters - 2
5. Game Characters - 4
6. Creating hair on a character
7. Flag stimulation
8. Game Environment – Adapting the style of a famous 3d game develop a new game environment using V- ray
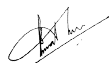
Suggested Reading
1. Digital Modeling by William Vaughan
2. Maya Character Creation: Modeling and Animation Controls by Chris Maraffi
3. Aesthetic 3D Lighting: History, Theory, and Application by Lee Lanier
4. Maya Studio Projects: Game Environments and Props
5. Game Character Development with Maya by Antony Ward

PRACTICAL 3 - DIGITAL SCULPTING (Z - BRUSH)

COURSE OUTLINE

- Sculpting Concepts – Comparing Traditional & Digital Sculpting, Anatomy for Sculptures, Proportions & Measurements, Form, Negative Space & Gesture.
- Digital Sculpting - Introduction to UI, Introduction to tools, Methods of Sculpting by the help of meshes in z brush, Making of Shield (Brush Strokes, Masking, Displacement)
- Model a human skull
- Model human head with details
- Model human basic body

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- A model imported from Maya and fine tune

- Introduction to Z Sphere, Transpose, Modeling Animal using Zsphere

- Gesture poses

- Understanding of UV space and Texturing, Poly paint, Z App link

- Export of Normal, Displacement, Cavity maps

- Assignment - Create a fearsome warrior, a sportsman, a realistic old age face

- Realistic Character Modeling n Texturing - Building up Shapes - (Relative Scale, Form, Detailing), UV

Layout & tiles in 3D space - (Planning, Techniques), Create new textures for painting their existing models,

Utilize Projection Master to work with detail brushes and alpha, Brushes for highly detailed texture painting.

- Create realistic character texture painting

- Create texture for cartoons

PRACTICAL SUBMISSION
   To be done in Z Brush.

1. Create a fearsome warrior

2. Create a sportsman

3. Create a realistic old age face

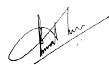4. Create 1 displacement map and apply them in Maya

Suggested Reading

1. Sculpting from the Imagination: Z-Brush (Sketching from the Imagination) by 3DTotal Publishing

2. Z-Brush Characters and Creatures by Kurt Papstein, Mariano Steiner, Mathieu Aerni, 3DTotal Team

3. Introducing Z-Brush 3rd Edition (Serious Skills) by Eric Keller

PRACTICAL 4 – 3D RIGGING & ANIMATION
COURSE OUTLINE

- Joints, hierarchies, UV's and textures

- Rig applications problem solving

- Using constraints, scripts and utilities

- FK/IK joints and skinning

- Advanced Set driven key and rig systems

- Building advanced hierarchies and controls for posing

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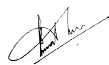H.O.D Applied Arts &
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- Camera Rigging and render settings

- Advanced controls and custom attributes

- Deformation order and blendshapes

- Rivets, follicles, nulls and granular control systems

- Squash and stretch deformations and rigs

- Leg rigging, empty group nodes, custom pivot points

- Looking at different practical rig solutions

- Four-Wheeler Rigging

- Animation Essentials and Perception of Motion. Designing animation in Maya - 3D considerations. Timing, curves, handles, holds, slow in and out

- Walk Cycle: How cycles work and PIXAR walk design. Planning animations-thumbnails and key poses. Gravity, balance, believable weight and driving forces. Center of gravity and legs. Time allowing begins upper body, arms and head. Adding squash and stretch

- Quadruped Walk Cycle

- Driving forces: mood, personality, attitude

- Analyzing dialogue: listen for weak and strong parts

- Planning animation: thumbnail out poses you see in your head. Acting it out: become the character for a few hours

- Blocking Pass: pose your character for basic feel and timing fine tuning and moving holds second

Pass: critical in-betweens overlapping action and overshoots

- Third Pass: block in facial expressions and simple mouth shapes

- Fourth Pass: head squash and stretch animation, eye and tongue details

- Lip-sync Pass: simplify - show dominant vowels and consonants

- Final Pass: fix mistakes and push the poses

- Character Multiple Action Performance-

- Rig planning: considerations and workflows Hierarchies: grouping, parenting and pivot points Bones: basic character hierarchy

- Inverse and forward kinematics

- Skinning: volume distribution and custom deformations -The arm, hand and leg The Face: blendshapes

- Advanced overview of squash and stretch rigging

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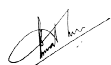**Design, Mhow, Indore**

- Camera rigging and motion paths

PRACTICAL SUBMISSION

1. Design a flexible and functional spine rig. This assignment will be an Introduction to using simple Maya constraints, Set Driven Key and groups.

2. Design an FK-IK arm and hand rig. Continue to expand on methods for manipulating Maya joints and their related geometry. Editing and designing character skin weights.

3. Design a flexible and easy to pose quadruped rig. This assignment will be an introduction to using simple Maya constraints, SDK, connection editor and other tools.

4. Build a complete head/face rig. The controls developed for the face will reflect the CG animation process. There will be main overall controls for posing of the eyes and facial expressions but also a collection of finer controls for squash and stretch etc.

5. Squash & Stretch Assignment

6. Biped Walk Cycle Assignment

7. Quadruped Walk Cycle Assignment

8. Character Multiple Action Performances (Basic) – 2 Characters

9. Animate a car

Suggested Reading

1. Rig it Right! Maya Animation Rigging Concepts by Tina O'Hailey

2. How to Cheat in Maya 2014: Tools and Techniques for Character Animation by Kenny Roy

3. The Art of 3D Computer Animation and Effects by Isaac V. Kerlow

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B. DESIGN IVth Year (GAME DESIGN) – SCHEME

Paper	Time (In Hours)	Size	Ext. Marks	Midterm/CCE	Total
THEORY (SUBJECT)					
1. ARTIFICIAL INTELLIGENCE IN GAMING	03	--	80	20	100
2. VIRTUAL REALITY	03	--	80	20	100
3. GAME PRODUCTION & MANAGMENT	03	--	80	20	100
PRACTICAL					
1. LEVEL DESIGN (3D)	6 Hrs	--	80	20	100
2. GAME ASSETS (3D)	6 Hrs	--	80	20	100
3. GAME ENGINE (3D)	6 Hrs	--	80	20	100
4. FINAL 3D GAME DESIGN PROJECT	6 Hrs	--	80	20	100
TOTAL					700

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PAPER – I (THEORY) – ARTIFICIAL INTELLIGENCE IN GAMING

- What is AI?

- Academic AI & Game AI Differences

- Model of Game AI – Movement, Decision Making, Strategy, Infrastructure, Agent Based AI

- What are algorithms, data structures & representations?

- The Complexity Fallacy – When simple things look good, when complex things look bad, the perception Window & Changes of Behavior

- Kinds of AI in Games – Hacks, Heuristics & Algorithms

- Speed & memory – Processor Issues, Memory Concerns, PC Constraints, Console Constraints

- The AI Engine – Structure of AI Engine
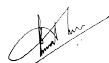
Suggested Reading

1. Artificial Intelligence for Games by Ian Millington, John Funge

PAPER – II (THEORY) – VIRTUAL REALITY

- What is Virtual Reality – Stereoscopic Displays, Motion Tracking Hardware, Input Devices, and Computing Platforms?

- Applications of Virtual Reality – 360º panoramas, etc.

- Virtual Reality Hardware – What is Oculus Rift, Samsung Gear VR, Google Card Board

- Describe VR Input Devices

- How is VR used in Game Engines?

Suggested Reading

1. Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile 1st Edition by Tony Parisi

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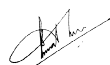# PAPER – III (THEORY) – GAME PRODUCTION & MANAGMENT

- Introduction – Production cycle, pre-production, production, testing, post production
- Project Management Methods
- Developer and Publisher Relationships – Pitching a game to a publisher, financing options, Managing developer publisher relationships, third party game approval
- Game Plan – Schedule, staffing, budgets, outsourcing, middleware
- Game Build & Testing – Build process, multilingual builds; build notes, preventing piracy, Testing Schedule, testing pipeline, testing cycle, external testing, and game documentations.

Suggested Reading

1. The Game Production Handbook 3rd Edition by Heather Maxwell Chandler

PRACTICAL 1 – LEVEL DESIGN (3D) COURSE OUTLINE

- Concept Art for 3D Games.
- Level Design Goals & Hierarchies in 3D games
- Level Design – levels in different games, level separation, level order, level flow.
- Components of a level – action, exploration, puzzle solving, storytelling, aesthetics.
- Elements of a good level – Players cannot get stuck, Sub goals, landmarks, critical path, limited back tracking, success the first time, navigable areas clearly mark, choices.
- Level Design Process – Preliminary, Conceptual & sketched outlines, Base architecture, base game play, refining game play, architecture, aesthetics.
- Level Design for different game genres
- Creating 3d environment for games.
- Planning the low polygon environment – technological assumptions, point of view, theme, Genre, World size, game fiction
- Modeling large urban environment – blocking out the level, setting up the grid, world measurement & Scale, modeling the path, UV mapping the meshes, repeating buildings, detailing

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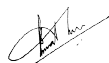**Design, Mhow, Indore**

- Texturing the large urban environment – Texture creation, tiling base materials, non – tiling illumination Mapped details, non – tiling full brightness details, non – tiling details requiring alpha channeling, creating alpha channel

- Introduction to natural environment - technological assumptions, perspective, theme, Genre, World size, game fiction

- Filling the world – terrain, manual terrain creation, free form terrain painting, terrain texturing, trees and foliage, plants, cloud, water, using mechanical and organic textures

- Interface Design in 3D Games

- Case Study of levels & user interface in famous 3d games like GTA V, Assassins Creed, Tomb Raider, NFS, Street Fighter, Battlefield, Dragon Age, Counter Strike, Hitman, Mario, etc.

PRACTICAL SUBMISSION

1. Developing 5 different concept art after case study

2. Adapting the style of any 2 games from the case study develop 2 levels for each game with user interface in MAYA.

3. Create 6 levels with increasing difficulty for your own game

Suggested Reading
1. An Architectural Approach to Level Design by Christopher W. Totten
2. Level Design for Games: Creating Compelling Game Experiences by Phil Co
3. Game Development Essentials: Game Interface Design 2nd Edition by Kevin Saunders, Jeannie Novak
4. 3D Game Environments: Create Professional 3D Game Worlds by Luke Ahearn

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PRACTICAL 2 – GAME ASSETS (3D)

COURSE OUTLINE

- Study of props in 3d games
- Designing game props like Weapons, Vehicles, etc. according to requirement of the game.
- Study of Game Characters in 3D Games
- Developing Game Characters for different genres of 3D games.
- Rigging & adding controllers in game characters.
- Creating animation loops like walk, run, jump, attack, etc. based on the game requirement to be used in Unity. Baked 3D Animation.
- Moving assets by deformation
- Case study of assets, characters & animation of different genres of 3D Games.

PRACTICAL SUBMISSION

1. Develop own props for levels developed - 20 props
2. Develop characters for your own 3D Game.
3. Create animation loops for characters developed according to the requirement of the game.
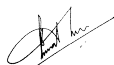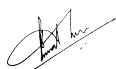
Suggested Reading
1. Maya Studio Projects: Game Environments and Props by Michael McKinley
2. Game Character Development with Maya by Antony Ward

PRACTICAL 3 – GAME ENGINE (3D)

COURSE OUTLINE

- Introduction to Unity 3D
- Scripting – Scripts, Variables, Operators, Conditionals, Iteration, Methods, Input, Accessing Local Components, accessing other objects
- Polish and Deploy – Managing Scenes, Persisting Data and Objects, Unity Player Settings, Building You're Game

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- Real World Mechanic – Principles of Vectors, Defining 3D Space, Local and World Coordinate systems, Laws of Physic, Physics and the principle of Animation, 3D Tricks for Optimizing Game Space, Fog, Moving Textures, Blob Shadows

- Animation Mechanics – Sprites, Texture Atlas, Animated Sprites, Baked 3D Animation, Biomechanics, Single – Filed 3D Animation, Secondary Animation, Skinning & Matrix Palette Generation, Animation Blending, Post – Processing, Compression Techniques, Animation System Architecture, Animation Pipeline, Action State Machines, Animation Controllers

- Adding enemies & Projectiles to the 3D Game – Recasting, Scripting reactive targets, Spawning enemy prefabs, basic AI

- Developing graphics for your game – Building basic 3D scenery, white boxing, texturing the scene with 2D images, generating sky visuals using texture images, working with custom 3D models, creating effects using particle systems

- Putting a 2D GUI in a 3D Game

- Creating third person 3D Game – player moment & Animation, adjusting the camera view for third person, implementing the jump action, setting up animations on the player character

- Adding interactive device and items within the game – Creating other devices, interacting with objects by bumping into them, managing inventory data and game state, inventory UI for using and equipping items

- Collision and Rigid Body Dynamics – Collision Detection System, Rigid body Dynamics, Integrating a Physics Engine into your Game

- Types of maps, Screen Space & World Space, Adding the map, adding places of interest, Creating MapPoint prefabs for reuse, Updating Navigation Prompt Script, Updating Navigation Manager Script, Travelling by click or touch, Transitions, Updating Build settings to include new screens

- Shop – Building your Shop, Laying out your inventory, getting paid,

- Efficient RPG UI overlays, the battle state manager, starting the battle, Selecting Weapons, GUI

- Leveling Up, Balancing, Preparing the battle manager script, beefing up the enemy, selecting a target, mixing up 2D & 3D, Particle effects, creating materials for particle effects.

- Building an action RPG, developing overarching game structure, controlling mission flow and multiple levels, completing a level by reaching the exit, losing the level chord enemies, handling the players progression through the game

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- Sound effects and Music – importing sound effects, playing sound effects, audio control interface, background music

- Events Systems, Exploring Randomness, Basic AI, State Machines, Sensors

- Building in game menu structures – the screens, the flow

- Working with settings – Using Player Prefs, Serializing your data

PRACTICAL SUBMISSION

1. Develop at least one of each element mentioned in the course outline on Unity.

Suggested Reading

1. Holistic Game Development with Unity: An All-in-One Guide to Implementing Game Mechanics, Art, Design and Programming by Penny de Byl

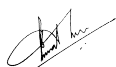2. Game Engine Architecture 1st Edition by Jason Gregory (Author), Jeff Lander (Foreword), Matt Whiting (Foreword)

PRACTICAL 4 – FINAL 3D GAME DESIGN PROJECT

COURSE OUTLINE

- Creating Storyline & Storyboard for your own game.

- Develop 3D Characters, Environments, Levels & Assets

- Develop 3D Animation Sprites & Assets Sprite Sheets

- Import all to unity

- Create Rules & Logic

- Develop the entire functioning game in UNITY for different platforms

- Test the game for bugs & develop reports

PRACTICAL SUBMISSION

1. Following the procedure mentioned in course outline develop your own 3d game in unity for multiple platforms. Assets, levels & characters can be used from previous Practical's.

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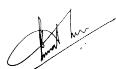**DDU Gorakhpur University,**
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2. Create a trailer for the game developed

3. Do game testing of your own developed game in Final 3D Game Design Project

4.   Submit the game with final reports

Suggested Reading

1. The Game Production Handbook by Heather Maxwell Chandler
2. The Ultimate Guide to Video Game Writing and Design by Flint Dille
3. Holistic Game Development with Unity: An All-in-One Guide to Implementing Game Mechanics, Art, Design and Programming by Penny de Byl
4. Game Engine Architecture 1st Edition by Jason Gregory (Author), Jeff Lander (Foreword), Matt Whiting (Foreword)
5. Maya Studio Projects: Game Environments and Props by Michael McKinley
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