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Raja Mansingh Tomar Music & Arts University, Gwalior, M.P.

Bachelor of Design Game Design Syllabus

2019 - 2020

SUBMISSION DETAILS (PRACTICAL)

B. DESIGN GAME DESIGN YEAR III

Semester – V

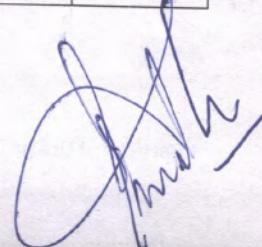
SUBJECT	SIZE	MINIMUM ASSIGNMENT	TOPIC & MEDIUM
Clay Modeling	-	7	Clay
Game Assets 3D	-	50	On Computer
Level Design 3D	-	8	On Computer
3D Game Character	-	4	On Computer

SCHEME OF EXAMINATION

B. DESIGN GAME DESIGN YEAR III

Semester – V

Paper	Time	Size	External Marks	C.C.E.	Total
Autodesk MAYA	3 Hrs.	-	70	30	100
Game Feel	3 Hrs.	-	70	30	100
Digital Modeling	3 Hrs.	-	70	30	100
				Total	300
Practical			External Marks	Internal Assignment	
Clay Modeling	6 Hrs	-	60	40	100
Game Assets 3D	6 Hrs	-	60	40	100
Level Design 3D	6 Hrs	-	60	40	100
3D Game Character	6 Hrs	-	60	40	100
				Total	400
				Grand Total	700



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B. DESIGN GAME DESIGN YEAR III
SEMESTER – V

PAPER – I (THEORY) – AUTODESK MAYA

- The Maya user interface: Creating, manipulating, and viewing objects, Viewing the Maya 3D scene, channel box, attribute editor, navigation tools, Layers. Creating and opening Maya files and project. Digital pipeline in Maya. How the pipeline works?
- 3D Modeling & Texturing : NURBS Modeling: Revolving/Lofting/Extrude/Birail/Bevel a curve to create a surface, Create menu commands, sculpting a NURBS surface, NURBS Boolean, Editing NURBS objects. Converting NURBS to Polygon/Subdivision.
- Texturing: UV texturing mapping, UV unfolding, applying textures to polygon, Introduction to Hypershade, Types of Materials, 2d & 3d textures in maya, creating PSD network, creating textures in Photoshop. Creating and applying Normal map, Bump Map, Displacement, Specular Map and Alpha Map.
- Lighting & Rendering: About Lighting & Rendering, Describe All Types Of Light, Ambient Light, Point Light, Area Light, Directional Light, Volume Light, 3 Point Lighting Technique, Direct & Indirect Lighting, Maya Software & Mental Ray Rendering & Lighting, Physical Sun And Sky, Image Based Lighting, Final Gathering, Global Illumination
- Rigging & Animation: Rigging Fundamentals, Bones creation, IK & FK handle tool, Joint, Skeleton, skinning, Deformers, Principle of Animation, Time line window and time line, Animation Preferences, Animation Editors (Graph editor, trax editor, dope sheet), Ball animation, Path animation, Camera Animation, Weight shifting & Force animation, Set Driven Key (SDK), Play Blast

Suggested Reading

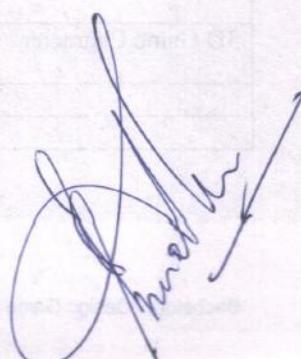
1. Mastering Autodesk Maya by Todd Palamar
2. Beginner's Guide to Character Creation in Maya by Jahirul Amin

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

Suggested Reading

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



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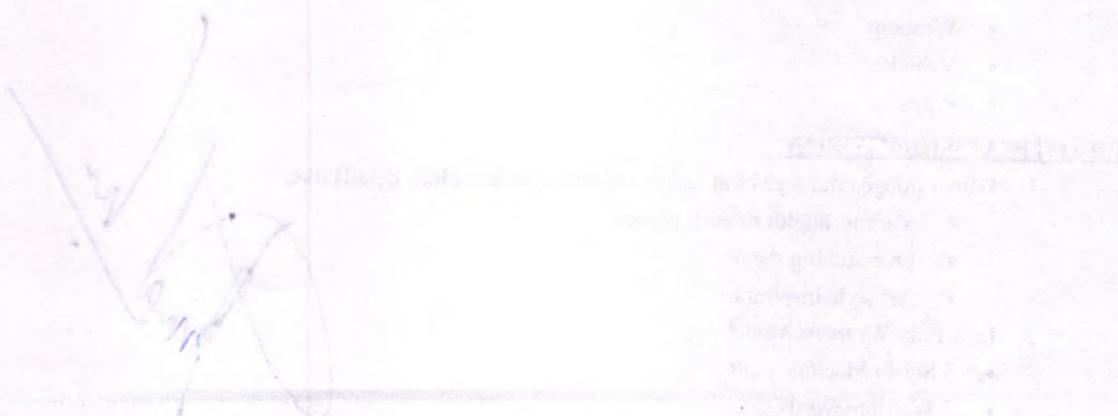
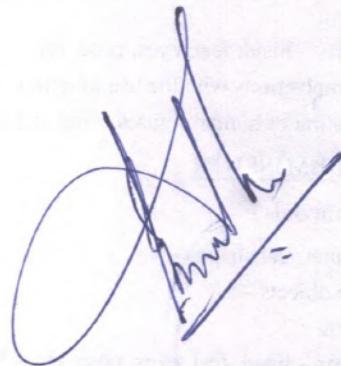
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PAPER – III (THEORY) – DIGITAL MODELING

- What is Digital Modeling?
- Who can become a professional Digital Modeler?
- Fundamentals of a Digital Model – A Models Anatomy, Model Classification: Hard Surface & Organic, Model Styles
- Digital Modeling Methods – Build Out, Primitive Modeling, Box Modeling, Patch Modeling, Digital Sculpting, 3D Scanning, Modeling with Texture & Animation Tools, Importance of mixing methods
- Modeling a Realistic Head – Choosing a method: Edge Extend vs Box Modeling
- 3D Printing – What is 3D Printing, 3D Printing Applications, preparing a 3D model for 3D printing, 3D printing to manufactured toy process

Suggested Reading

1. Digital Modeling by William Vaughan



B. DESIGN GAME DESIGN YEAR III

SEMESTER – V

PRACTICAL

PRACTICAL 1 – CLAY MODELING

COURSE OUTLINE

1. Basic Geometrical shapes
2. Man-made objects
3. Human form
4. Human parts – hand, feet, eyes, nose, etc.
5. Simple compositions with the use of human figures
6. Clay Modeling of human figures using armature

PRACTICAL SUBMISSION

Using clay make models -

1. Basic Geometrical shapes - 5
2. Man-made objects - 5
3. Human form - 2
4. Human parts – hand, feet, eyes, nose, etc. - 5
5. Simple compositions with the use of human figures - 3
6. Clay Modeling of human figures using armature – 3

PRACTICAL 2 – GAME ASSETS (3D)

COURSE OUTLINE

1. Introduction of Maya basic interface
2. Learn how to set up your own project
3. Guide to mastering viewport navigation
4. Geometry modeling basic exercise
5. Modeling exercise using: Extrude, Bevel, Insert Edge Loop and Connect
6. Making 3D model for Game
 - Weapons
 - Vehicles
 - Props

PRACTICAL SUBMISSION

1. Gather image reference of at least 5 objects, should include details like:
 - Various angles of each objects
 - Overarching theme
 - Art style inspiration
2. Low Poly Weapons Model
 - 3 Sci-Fi Machine guns
 - 5 Warrior swords

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3. 2 Low Poly Vehicle Model

Suggested Reading

1. Maya for Games: Modeling and Texturing Techniques by Michael Ingrassia

PRACTICAL 3 – LEVEL DESIGN (3D)

COURSE OUTLINE

1. The basic process of 3d game environment
2. Blocking layout with Basic geometry
3. The structure of a good environment modeling
 - Utilize low poly modeling techniques
 - Clean topology
 - World scale, Naming convention and Version control
4. Creating 3d Model for game
 - House Model
 - Interior and Exterior Model
 - Trees and Plants Model for vegetation
5. Developing layout model using Referencing
6. Building an interesting section of a fantasy environment

PRACTICAL SUBMISSION

1. Tree and Plant Model
2. 2 Building Model
3. 2 Interior Model
4. 2 Exterior Model
5. Create Full Game Environment for Unity
6. Keep polygon budget below 30,000 triangles for entire scene
 - Utilize low poly modeling
 - Detailing should be in texture

Suggested Reading

1. Creating games with Unity and Maya by Adam Watkins

PRACTICAL 4 – 3D CHARACTER MODELING

COURSE OUTLINE

1. The process of 3d character creation
2. The structure of a good character model
 - Polygon count
 - The default position
 - Clean topology
 - The structure of the joints

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- World scale, Naming convention and Version control

4. 3D Character creation step by step

1. Creating 3D model sheet
 - Match character front and side view in Photoshop
 - Import character sheet into Maya
2. Creating 3D model in Maya (Male and Female)
 - Torso, Hand, Feet, Head, Face, Cloth, Hair

PRACTICAL SUBMISSION

1. 1 Low Poly Male Character
2. 1 Low Poly Female Character
3. 1 Low Poly Animal Model
4. 1 Low Poly Warrior With Full Armor

Suggested Reading

1. Game character development by Antony War
2. Maya 8.0 character modeling by Gary Oliverio

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SUBMISSION DETAILS (PRACTICAL)

B. DESIGN GAME DESIGN YEAR III

Semester – VI

SUBJECT	SIZE	MINIMUM ASSIGNMENT	TOPIC & MEDIUM
3D Model Texturing	-	30	On Computer
3D Model Rigging	-	10	On Computer
3D Model Animation	-	10	On Computer
Unreal Engine	-	20	On Computer

SCHEME OF EXAMINATION

B. DESIGN GAME DESIGN YEAR III

Semester – VI

Paper	Time	Size	External Marks	C.C.E.	Total
Defining Rules	3 Hrs.	-	70	30	100
Lighting and Shading	3 Hrs.	-	70	30	100
Introduction of Unreal Engine	3 Hrs.	-	70	30	100
				Total	300
Practical			External Marks	Internal Assignment	
3D Model Texturing	6 Hrs	-	60	40	100
3D Model Rigging	6 Hrs	-	60	40	100
3D Model Animation	6 Hrs	-	60	40	100
Unreal Engine	6 Hrs	-	60	40	100
				Total	400
				Grand Total	700

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B. DESIGN GAME DESIGN YEAR III

SEMESTER –VI

PAPER – I (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

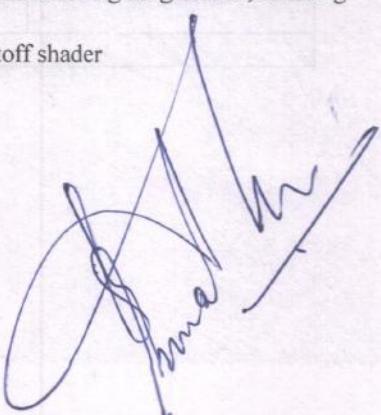
1. Rules of Play: Game Design Fundamentals (MIT Press) by Katie Salen Tekinbaş, Eric Zimmerman

PAPER – II (THEORY) – LIGHTING AND SHADING

- Fundamentals of Lighting Design : Visual Goals of lighting design, Lighting Challenges, Your Workspace & Creative control
- Types of Lights
- Shadows & Occlusion : The Visual Function of Shadows, Shadow Algorithms, Occlusion
- Shaders & Rendering : Shading Surfaces, Anti- Aliasing, Raytracing, Global Illumination
- Diffuse Shading : Creating a basic Surface Shader , Adding properties to a Surface Shader , Using properties in a Surface Shader ,Creating a custom diffuse lighting model
- Using Textures for Effects : Scrolling textures by modifying UV values , Animating sprite sheets , Packing and blending textures , Normal mapping
- Reflecting Your World : Creating Cubemaps in Unity3D, Simple Cubemap reflection in Unity3D , Masking reflections in Unity3D , Normal maps and reflections in Unity3D , Creating a simple dynamic Cubemap system
- Lighting Models : The Lit Sphere lighting model , The diffuse convolution lighting model , Creating a vehicle paint lighting model , Skin shader , Cloth shading
- Transparency : Creating transparency with alpha , Transparent cutoff shader

Suggested Reading

1. Unity Shaders and Effects Cookbook by Kenny Lammers
2. Digital Lighting & Rendering by Jeremy Birn



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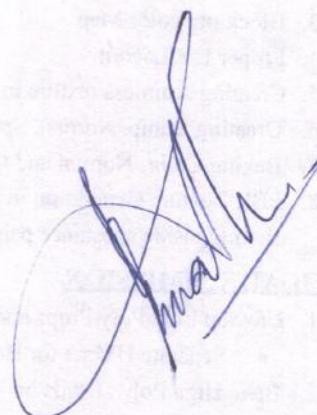
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PAPER – III (THEORY) – INTRODUCTION OF UNREAL ENGINE

- Overview : History of Unreal engine, Components of unreal engine, Unreal engine and its powerful Editors
- Game Objects : BSP Brush, Static Mesh, Materials : Creating a Material, Material Versus Textures, Textures/UV Mapping, Level of Detail, Collisions – Collision Configuration Properties, Interactions, Introducing Volumes- Blocking Volume, Camera Blocking Volume, Trigger Volume, Nav Mesh Bound Volume, Physics Volume, Introducing Blueprints – Level Blueprint.
- Material and Light : Material, The Material Editor, Rendering Pipelines, Shaders, Lights – Configuring a Point Light with More Settings, Adding and Configuring a Spot Light, Using the IES Profile, Adding and Configuring a Directional Light, Static , Stationary or Movable Lights.
- Particle System and Sound : What is a Particle System, Exploring an existing Particle System, The main Components of a Particle System, The Design Principles of a Particle System, Sound and Music, How Do We Produce Sound and Music for Games, Audio Quality, How are Sound Recorded, The Unreal Audio System, Getting Audio into Unreal, The Sound Cue Editor.
- Terrain and Cinematics : Introducing Terrain Manipulation, Introducing Cinematics, Why do we need cut scenes?, Cinematic Techniques – Adjusting Camera Functions, Camera Movement, Capturing a Scene, Unreal Matinee Editor

Suggested Reading

1. Learning Unreal Engine Game Development by Joanna Lee



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B. DESIGN GAME DESIGN YEAR III

Semester –VI

PRACTICAL

PRACTICAL 1 – 3D MODEL TEXTURING

COURSE OUTLINE

1. Concept of Unwrapping and Texturing for Game Model
2. UV Mapping Techniques
 - Planer Mapping
 - Cylindrical Mapping
 - Spherical Mapping
 - Automatic Mapping
3. Block out color Map
4. Proper UV Layout
5. Creating seamless texture in Photoshop
6. Creating Bump, Normal, Specular and Transparency Maps
7. Baking Color, Normal and Occlusion Map in Maya
8. PBR Texture Generation in Substance Painter
 - Baking inside substance painter

PRACTICAL SUBMISSION

1. Unwrap Low Poly Props and Characters
 - Separate UV set for Body, Cloth and Armor
2. Bake High Poly Details on Model
3. Texture all your environment
4. Create all Maps for Game Model
 - Diffuse Map, Normal Map, Occlusion Map, Specular Map and Transparency Map

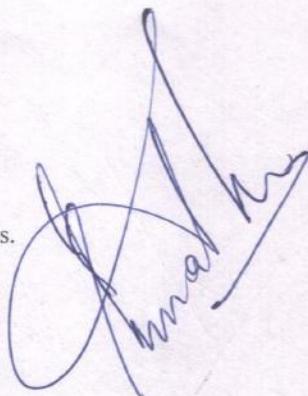
Suggested Reading

1. Maya for Games: Modeling and Texturing Techniques by Michael Ingrassia

PRACTICAL 2 – 3D MODEL RIGGING

COURSE OUTLINE

- Introduction to rigging
- Working with connections: Connection Editor, Outliner & Constraints.
- Set driven key/ Parent & Child Connections
- Deformers- Lattice, Wrap, Cluster.
- Deformers- Sculpt, Jiggle, Wire, Blend Shapes
- Introduction to Joints & IK Handles
- Creating an Arm Setup : FK/IK Blend
- Creating a Leg Set-up
- Creating a Biped Rig: Setting up the Skeleton & Finishing the rig with controls
- Skin Binding



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- Paint weights
- Four-Wheeler Rigging
- Animation Essentials and Perception of Motion (Timing, curves, handles, holds, slow in and out)
- Acquainted with keys of Basic concept of bouncing ball
- Explain Graph Editor with Timing & Spacing in bouncing ball
- Adding squash and stretch
- Understanding of Body balance, weight & arc
- Detail explanation of Graph Editor & Dope Sheet
- Biped Walk cycle in place(Stationary)
- Biped Walk cycle progressive
- Run cycle
- Jump with distance
- Ball Throw
- Lip-Sync- AEIOU
- Lip-Sync with dialogue
- Expressions with Joy, anger, shock, etc.
- Camera animation

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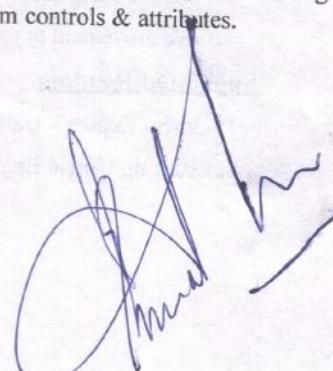
PRACTICAL SUBMISSION

1. Car Rigging or Prop Rigging or Basic Biped Rig
2. Any action contains biped walk cycle or run cycle (Ex; Character run & climb a wall)

PRACTICAL 3 – 3D MODEL ANIMATION

COURSE OUTLINE

- Creating a complete skeleton with IK/FK switch
- Building advanced hierarchies and controls for posing
- Camera Rigging
- Advanced controls and custom attributes
- Facial rigging with expressions (Joy, anger, shock, etc.)
- Importance of Rig planning: considerations and workflows Hierarchies: grouping, parenting and pivot points Bones: character hierarchy
- Advance Skinning method: volume distribution and custom deformations -The arm, hand and leg
- Advance full Character (Biped & Quadruped) rigging with custom controls & attributes.
- Animate a character walk to stop
- Turn around animation
- Use of Redirect
- Use of Bake & Anim layers
- Importance of Anim Import & Export
- Animate a dialogue with multiple characters (Facial Animation)
- Animate a action scene.
- Details explanation from Layout to final animation
- Creature Animation: T-Rex, Lion, Dragon etc
- Character acting while walking (use of Anim Layer)
- Self recorded ref of Animation (action or action)



PRACTICAL SUBMISSION

1. Design a flexible and easy to pose quadruped or Biped rig (Full Body & Facial).
2. Multiple character acting or action performance or quadruped walk cycle or Run cycle.

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PRACTICAL 4 – UNREAL ENGINE

2019 – 2020

COURSE OUTLINE

- Introducing Unreal Engine 4 – Installing Unreal, Creating Your First Project, Learning the Interface, View Modes and Visualizers, Playing a Level
- Understanding the Gameplay Framework – Available Resources, Asset References and the Reference Viewer, Gameplay Framework
- Coordinates, Transforms, Units, and Organization – Understanding Cartesian Coordinates, working with Transforms, Assessing Units and Measurements, Organizing a Scene
- Working with Static Mesh Actors – Static Mesh Assets, Static Mesh Editor, Viewing UV Layouts, Collision Hulls, Static Mesh Actors
- Applying Lighting and Rendering – Learning Light Terminology, Understanding Light Types, Using Light Properties, Building Lighting
- Using Materials – Understanding Materials, Physically Based Rendering (PBR), Material Input Types, Creating Textures, Making a Material
- Using Audio System Elements – Introducing Audio Basics, Using Sound Actors, Controlling Sounds with Audio Volumes
- Creating Landscapes and Foliage – Working with Landscapes, Sculpting Shapes and Volumes, Using Foliage
- World Building – Building Worlds, World Building Process
- Crafting Effects with Particle Systems – Understanding Particles and Data Types, working with Cascade, Using Common Modules, Setting Up Materials for Particles, Triggering Particle Systems
- Using Skeletal Mesh Actors – Defining Skeletal Meshes, Importing Skeletal Meshes, Learning Persona, Using Skeletal Mesh Actors
- Matinee and Cinematics – Matinee Actors, Matinee Editor, Curve Editor, working with Other Tracks, working with Cameras in Matinee, Making Keys
- Working with UMG – Creating a Widget Blueprint, Navigating the UMG Interface, Creating a Start Menu, Sample Menu System

PRACTICAL SUBMISSION

1. Import the assets, interface, environment & characters developed in 3rd year in Unreal
2. Make proper scenes using the same assets, interface, environment & characters with proper lighting & cameras in Unreal.
3. Animate the character in environment by the help of script
4. Give movement to props & assets according to the environment

Suggested Reading

1. Unreal Engine 4 Game Development in 24 Hours, Sams Teach Yourself by Aram Cookson
2. Learning Unreal Engine Game Development by Joanna Lee (Author)