



Republic of Rwanda
Ministry of Education



RTB | RWANDA
TVET BOARD

3D MODELLING

MMP3D501

Perform 3D Modelling

RQF Level:

5

Learning Hours



Credits:

10

Sector:

ICT AND MULTIMEDIA

Trade:

MULTIMEDIA PRODUCTION

Module Type:

SPECIFIC

Curriculum:

TVET Level 5 in Multimedia Production

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Purpose statement	This module provides skills, knowledge, attitudes, and behavior to be able to produce 3D representations of objects, environments, and concepts. At the end of this module trainee will be able to Make concept, 3d Models, Apply UV Maps, make Baking and Export work.					
Leaning assumed to be in place	N/A					
Delivery modality	Training delivery		100%	Assessment		Total 100%
	Theoretical content		30%	Formative assessment	30%	50%
	Practical work:		70%		70%	
	• Group project and presentation	30%				
	• Individual project /Work	40%				
			Summative Assessment			50%

Elements of Competency and Performance Criteria

Elements of competency	Performance criteria
1. Make concept	1.1. Project parameters are properly defined according to the modeling parameters
	1.2. Workflow is properly set according to the production stages.
	1.3. References sheets are properly set in accordance with model specifications
	1.4. The concept is properly-produced based on project requirements
2. Make models	2.1. Primitive shapes are properly arranged according to the concept arts requirements
	2.2. Forms are produced based on Primitive shapes
	2.3. Mesh is properly edited according to the Its technical Specifications
	2.4. Mesh is properly optimized based on Visual Quality
	2.5. The model is properly created according to the workflow and functionality.
3. Apply UV Maps	3.1. Textures are properly projected according to their technical specifications.
	3.2. UV shells are correctly applied in accordance with texture application.

	3.3. UV Maps are correctly applied according to the distribution efficiency.
4. Make baking	4.1. Mesh is properly analysed based on topology requirements
	4.2. Low poly model is properly created based on the geometry details
	4.3. Mesh details are perfectly transferred based on the high poly model
	4.4. Baking is properly done based on baking setting
5. Export works	5.1. Models are properly analysed based on preview rendering
	5.2. Texture maps are properly exported in accordance with 3D maps technical Specifications
	5.3. Model is properly exported based on file Format

Intended Knowledge, Skills and Attitude

Knowledge	Skills	Attitude
✓ indicating the ability to create 3D models ✓ Describe Modelling principles ✓ Identify concept-creation Techniques ✓ Describe design principles ✓ Identify properties of different materials ✓ Defining anatomy and proportions ✓ Identify errors in mesh	✓ Translate design concepts into 3D models. ✓ Communicate visually with teammates. ✓ Collaborate with other Creatives/stakeholders. ✓ Use Idea-generation techniques ✓ Manage design project ✓ Apply Personal Development methods ✓ Demonstrate Attention to Detail ✓ Perform retopology on the model ✓ apply textures to 3D models	✓ Demonstrate creativity by generating original and innovative design concepts ✓ Be detail-oriented to ensure polished and accurate designs ✓ Embrace continuous learning to stay abreast of new techniques and trends in design ✓ Showcase adaptability in adjusting to changes and feedback ✓ Maintain professionalism by adhering to high standards of conduct ✓ Demonstrate proactivity in taking initiatives ✓ Explore with curiosity, nurturing a desire to experiment with various design approaches.

		✓ Demonstrate resilience in handling criticism and challenges ✓ Demonstrate empathy in understanding audience needs for user-friendly designs. ✓ Explore with curiosity, nurturing a desire to experiment with various design approaches.
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Course content

Learning outcomes	At the end of the module the learner will be able to: 1. Make concept 2. Make models 3. Apply UV Maps 4. Make baking 5. Export works
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Learning outcome 1: Make concept	Learning hours: 15
Indicative content	
• Definition of project parameters ✓ Model types  Organic  Inorganic  Polygonal  NURBS (Non-Uniform Rational B-Splines) ✓ Level of details  Low Poly model  High Poly Model ✓ Functionality  3d modelling  Animation  Virtually Reality Application • Setting up workflow ✓ Pre-Production  Concept	

 Project parameters

✓ Production

 Modelling

 Topology

 UV Mapping

✓ Post-production

 Baking

 export

- **Setting up reference sheet**

✓ Main Views

 Front

 Side

 rear

✓ Details

✓ Colour

✓ Materials

- **Producing concept**

✓ Purpose of the Model

 Gaming

 Animation

 Printing

 Rendering

✓ Types of deliverables

 Images

 3d print

 3d model

✓ Deadlines and milestones

Resources required for the indicative content

Equipment	Computer and Multiple High-Resolution Monitors
Materials	Software License, Internet, Paper, Pen, Pencil and Sketchpads
Tools	Graphic Software ,Graphics Tablet, Drawing Tablet, External Storage, Camera body and Lens
Facilitation techniques	Brainstorming and practical exercises • Brainstorming 1. Trainer help trainee to form small group

	2. Trainer asks trainee to discuss about 3d project parameters, setting up workflow, setting up reference sheeting and producing concept. 3. Trainer supervises discussion and provide support where it is needed 4. Trainee present their work 5. The trainer wraps up with question-and-answer session. • Practical exercises on making concept 1. Trainer asks trainees to set up reference sheet for given concept 2. Trainer checks if the environmental, social, health and safety plans were followed/implemented by Students while setting up reference sheet. 3. Trainer provides inputs and clarification / answer any questions they might have.
Formative assessment methods	• Written based assessment • Oral Presentation • Performance assessment

Learning outcome 2: Make models	Learning hours: 30
Indicative content	
• Arranging primitive shapes ✓ Primitive shapes + Cube + Sphere + Cylinder + Cone + Plane ✓ Form ✓ style • Producing forms ✓ Selection of Primitive Shapes ✓ Creation of Primitive Objects ✓ Transformation and Manipulation + Scale shape	

-  Rotate shape
-  Moving shape
- ✓ Refinement and Detailing
-  Adding edges, vertices, and faces

- **Editing of mesh**

- ✓ Vertices
- ✓ Edges
- ✓ Faces
- ✓ Polygonal count
- ✓ Mesh topology

- **Optimization of mesh**

- ✓ Mesh Complexity
 -  Polygonal count level
- ✓ Clean Topology
 -  Smooth shading
 -  Deformation (Animation)
 -  Efficient rendering
- ✓ Texture quality
 -  Proper resolution
- ✓ Material properties
 -  Roughness
 -  Metalness
 -  reflection

- **Creating models**

- ✓ Planning
 -  Gathering references
 -  Creating concept art
- ✓ Modeling
 -  Make blocking
 -  Add details

-  Refine mesh
- ✓ Texturing
 -  Adding colour
- ✓ Materials
 -  Material properties
- ✓ Rendering
 -  Processing 3d model into 2d image

Resources required for the indicative content

Equipment	Computer and Multiple High-Resolution Monitors
Materials	Software License, Internet, Paper, Pen, Pencil and Sketchpads
Tools	3D Modelling Software , Texturing and Baking Software, Rendering Software, Graphics Tablet, Drawing Tablet, External Storage.
Facilitation techniques	Trainer guide, Brainstorming • Brainstorming 1. Trainer help trainee to form small group 2. Trainer asks trainee to discuss about Primitive shapes, forms, and Mesh. 3. Trainer supervises discussion and provide support where it is needed 4. Trainee present their work 5. The trainer wraps up with question-and-answer session. • Trainer Guide 1. Trainer demonstrates steps to arrange primitive shapes, to produce forms, to edit mesh, optimize mesh and creating models. 2. Trainee follows trainer 3. Trainer asks trainee to repeat those steps. 4. Trainees ask for clarification if any. • Video tutorial • Practical exercise
Formative assessment methods	• Written based assessment • Oral Presentation • Performance assessment • Product assessment

Learning outcome 3: Apply UV Maps		Learning hours: 20
Indicative content		
• Projection of textures ✓ Mesh Unwrapping ✓ Consider Seams ✓ Texture size Consideration • Applying UV shells ✓ Material assignment - Diffuse - Ambient - Specular ✓ Seam and shell borders • Applying UV maps ✓ Project Textures - Diffuse Texture - Normal Map - Ambient Occlusion		
Resources required for the indicative content		
Equipment	Computer and Multiple High-Resolution Monitors	
Materials	Software License, Internet	
Tools	3D Modelling Software , Texturing and Baking Software, Rendering Software, Graphics Tablet, Drawing Tablet, External Storage.	
Facilitation techniques	Trainer guide and Video tutorial • Trainer Guide 1. Trainer uses the models modelled in last activities and demonstrate steps to apply UV maps using project textures and UV shells 2. Trainee follows trainer 3. Trainer asks trainee to repeat those steps of applying UV maps. 4. Trainer supervises the activity	

	5. Trainees ask for clarification if any. • Video tutorial 1. Trainer Project/display video tutorial on application of UV maps 2. Trainee watch the tutorial and repeat all steps from video tutorial. 3. Trainer supervises all activities and give clarification if any. • Practical exercise
Formative assessment methods	• Written based assessment • Oral Presentation • Performance assessment • Product assessment

Learning outcome 4: Make baking	Learning hours:20
Indicative content	
• Analysing mesh ✓ Quad dominance ✓ Organized flow ✓ Even polygon distribution • Creation of Low Poly ✓ Vertices ✓ Edges ✓ Faces • Transferring Mesh details ✓ Baking Option ✚ Normal Map ✚ Ambient Occlusion Map ✚ Diffuse Map ✓ Baking setting ✚ High Quality Filtering ✚ Tangent Space Normal Maps ✚ Custom Baking Channels • Baking ✓ Baking techniques ✚ Normal Maps	

 Ambient occlusion  Curvature Maps ✓ Baking setting  Resolution  sample rate  distance ✓ Baking Process	
Resources required for the indicative content	
Equipment	Computer and Multiple High-Resolution Monitors
Materials	Software License, Internet.
Tools	3D Modelling Software , Texturing and Baking Software, Rendering Software, Graphics Tablet, Drawing Tablet, External Storage.
Facilitation techniques	Brainstorming and Trainer guide • Brainstorming 1. Trainer help trainee to form small group 2. Trainer asks trainee to discuss and analyse mesh basing on topology requirements. 3. Trainer supervises discussion and provide support where it is needed 4. Trainee present their work 5. Trainer provides expert view for recovering gaps in trainees understanding 6. The trainer wraps up with question-and-answer session. • Trainer Guide 1. Trainer demonstrates steps to create low poly model and transfer mesh details. 2. Trainee follows trainer 3. Trainer asks trainee to repeat those steps of creating low poly model and transfer mesh details. 4. Trainer supervises the activity 5. Trainees ask for clarification if any. • Practical exercise

	• Video tutorials
Formative assessment methods	• Written based assessment • Oral Presentation • Performance assessment • Product assessment

Learning outcome 5: Export works	Learning hours: 15
Indicative content	
• Analysing models ✓ Composition  Focal Point  Rules of Third  Leading Lines ✓ Lighting and Shading ✓ Textures ✓ Materials ✓ Modeling • Exporting texture maps ✓ Texture File Format ✓ Texture Resolution ✓ Texture compression • Exporting models ✓ Prepare model  Model selection  Model optimization ✓ File Format  FBX  OBJ  GLB  .max  .ma  .blend ✓ Export option  geometry  Textures and materials ✓ Export the model	
Resources required for the indicative content	

Equipment	Computer and Multiple High-Resolution Monitors
Materials	Software License, Internet.
Tools	3D Modelling Software , Texturing and Baking Software, Rendering Software, Graphics Tablet, Drawing Tablet, External Storage.
Facilitation techniques	Brainstorming, Trainer guide and Practical exercises • Brainstorming 1. Trainer help trainee to form small group 2. Trainer asks trainee to brainstorm on models basing on Technical Quality 3. Trainer supervises discussion and provide support where it is needed 4. Trainee present their work 5. Trainer provides expert view for recovering gaps in trainees understanding 6. The trainer wraps up with question-and-answer session. • Trainer Guide 1. Referring to previous activities, trainer demonstrate all steps needed to export texture maps, and export model. 2. Trainee follows the steps 3. Trainer asks trainee to repeat those steps of export texture maps, and export model. Trainee 4. Trainer supervises the activity and provide clarification where it is needed • Practical exercises on exporting works 1. Trainer asks trainees to export given work. 2. Trainer checks if the environmental, social, health and safety plans were followed/implemented by Students while export the given work. 3. Trainer provides inputs and clarification / answer any questions they might have. 4. Trainer assesses all trainee's work and provides them with feedbacks

Formative assessment methods	• Written based assessment • Oral Presentation • Performance assessment • Product assessment
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Integrated situation

Chatterbox is a fast-growing social media platform located at Kigali city. Chatterbox designed to foster meaningful conversations and community building. The platform offers the option to share directly convey emotions through various Emoji characters like Informational Emojis (thumbs up for agreement, thumbs down for disagreement), Action Emojis (clapping, waving, pointing, hugging, or dancing) but are missing Emotional Emoji like happiness, sadness, anger, surprise, or fear. According to missed emotion character emojis, Chatterbox wishes to hire you as multimedia technician to model 3D happy character emoji.

Task: **Model 3D happy character emoji.**

Instructions:

- ✓ Create a reference sheet with concept sketches of your happy character design from different angles:
 - Front
 - Side
 - $\frac{3}{4}$ view
- ✓ Decide on the pose and facial expression details that convey happiness.
- ✓ Select appropriate 3D modeling software you're comfortable with:
 - Blender
 - Maya
 - Cinema 4D).
- ✓ Create a basic 3D model of the character based on your sketches
- ✓ Refine the shapes and achieve the desired happy expression based on your reference sheet.
- ✓ Add textures to the model to give it color and surface detail.
- ✓ Consider the material properties of the emoji, such as smoothness and reflectivity.
- ✓ Add details like eyes, eyebrows, and a smiling mouth.
- ✓ Add fine details like highlights and shadows
- ✓ Set up lighting and background to showcase your happy character emoji in a visually appealing way
- ✓ Save your work in the folder within your names

- ✓ Export the final model in a format compatible with Chatterbox's platform
 - FBX
 - OBJ
- ✓ Submit your reference sheet with concept sketches to the Assessors Panel.
- ✓ Zip and send your work to provide email

NB: Maximum duration time is 8 hours.

Resources

Tools	3D Modelling Software , Graphic Software ,Graphics Tablet, Drawing Tablet, External Storage
Equipment	Computer and Multiple High-Resolution Monitors
Materials/ Consumables	Internet, Paper, Pen, Pencil and Sketchpads

Assessable outcomes	Assessment criteria (Based on performance criteria)	Indicator	Observation		Marks allocation
Learning outcome 1: Make concept (10%)	1.1. Project parameters are defined	Model type			1
		Level of details			1
	1.2. Workflow is set	Front view			1
		Side view			1
		¾ view			1
		Colors are picked			1
	1.3. Concept is produced	Purpose are defined			1
		Deliverables are Determined			1
		Deadline and milestones are set			2
Learning outcome 2: Make models (40%)	2.1 Primitive shapes are arranged	Primitive shapes are created			3
		Form is defined			2
		Style is defined			2
	2.2. Forms are produced	Primitive shapes are Shape			3
		Primitive shapes are Inserted			3
		Forms are Manipulated			3
		Forms are Refined and detailed			3
		Vertices			2

	2.3.Mesh are edited	Polygons are counted			2
		Mesh is retopoligized			2
	2.4. Mesh are optimized	Mesh Complexity			2
		Topology is cleaned			2
		Texture Quality			3
	2.5. Model are created	Planning			2
		Modeling			3
		Texture			3
Learning outcome 3: Apply UV Maps (20%)	3.1. textures are projected	Mesh is unwrapped			4
		Seam are Considered			3
		Texture size are considered			3
	3.2. UV Shells are applied	Materials are assigned			3
		Seam and shell borders			3
	3.3. UV Maps are applied	Textures are projected			4
Learning outcome 4: Make baking (10%)	4.1. Mesh are analyzed	Quad dominance			2
		Flow is organized			2
	4.2. Low poly are created	Low poly model			2
	4.3. Mesh details are transferred	Baking options			2
	4.3. Baking is done	Baking techniques			1
		Baking Setting			1
Learning outcome: 5 Export works (20%)	5.1. Model is analyzed	Composition			2
		Lighting and Shading			2
		Textures			2
		Materials			1
		Modeling			1
	5.2. Texture maps are exported	Texture File Format			2
		Texture Resolution			2

		Texture compression			2
	5.3. Models are exported	Model is prepared			2
		File format is selected			2
		Export options			1
		Model is exported			1
Total marks					
Percentage Weightage		100/100%			
Minimum Passing line % (Aggregate): 70%					

References:

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