SHIVAJI UNIVERSITY, KOLHAPUR - 416004,
MAHARASHTRA
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शिवाजी विद्यापीठ, कोल्हापूर -४१६००४,महाराष्ट्र
दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्यासमंडळे विभाग दुरध्वनी ०२३१—२६०९०९४
०२३१—२६०९४८७

Estd. 1962
"A++" Accredited by
NAAC (2021)
With CGPA 3.52

Ref.No.SU/BOS/Science/146 **Date: 26/05/2026**

The Principal,
All Concerned Affiliated Colleges/Institutions
Shivaji University, Kolhapur.

Subject: Regarding revised syllabi of B.Sc. Part-III (Sem.V & VI) degree programme under the Faculty of Science and Technology as per NEP-2020 (2.0).

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the syllabi, nature of question paper B.Sc. Part-III (Sem.V & VI) degree programme under the Faculty of Science and Technology as per NEP-2020 (2.0).

B.Sc.Part-III (Sem. V & VI) as per NEP-2020 (2.0)			
1.	Animation (Entire)	6.	Food Science and Technology (Entire)
2.	Food Science (Entire)	7.	Food Technology & Management (Entire)
3.	Biotechnology (Entire)	8.	Environmental Science (Entire)
4.	Computer Science (Entire)	9.	Sugar Technology (Entire)
5.	Information Technology (Entire)		

This syllabus, nature of question and equivalence shall be implemented from the academic year 2026-2027 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website **www.unishivaji.ac.in>Syllabus>Syllabus as per NEP2020.**

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2026 & March/April 2027. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,

Dy Registrar

Encl: as above

for information and necessary action

Copy to:

1	Dean, Faculty of Science & Technology	6	Appointment Section A & B
2	Director, Board of Examinations and Evaluation	7	I.T.Cell /Computer Centre
3	Chairman, Respective Board of Studies	8	Eligibility Section
4	B.Sc.-M.Sc. Exam Section	9	Affiliation Section (T.1) (T.2)
5	Internal Quality Assurance Cell (IQAC Cell)	10	P.G. Seminar Section

SHIVAJI UNIVERSITY, KOLHAPUR

NAAC A++ Grade with CGPA 3.52

As per

National Education Policy (NEP-2020)

Syllabus for
Bachelor of Science (B.Sc.)
Animation
(Under Faculty of Science and Technology)

PART-III SEMESTER V & VI

(Syllabus to be implemented from Academic Year 2026-27)

B.Sc. (Animation) Part III Semester V & VI

Syllabus to be implemented from Academic year 2026-27

Semester V

B.Sc. (Animation) Part - III SEMESTER-V (Duration- Six Month)										
Sr. No.	Course Code	Teaching Scheme			Examination Scheme					
		Theory and Practical			University Assessment (UA)			Internal Assessment (IA)		
		Lectures Per week	Practical Per week	Credit	Maximum Marks	Minimum Marks	Exam minute	Maximum Marks	Minimum Marks	Exam Hours
1	Major IX: 3D Maya with Rigging and Lighting	2	-	2	40	16	90	10	04	20
2	Major X: VFX	2	-	2	40	16	90	10	04	20
3	Major Practical V (a): 3D Maya with Rigging and Lighting Lab	-	4	2	40	16	90	10	04	20
4	Major Practical V (b): VFX Lab	-	4	2	40	16	90	10	04	20
5	Major Elective I ✓ Advanced Animation Techniques ✓ Graphics Designing	2	-	2	40	16	90	10	04	20
6	Major Practical I ✓ Advanced Animation Techniques Lab ✓ Graphics Designing Lab	-	4	2	40	16	90	10	04	20
7	Open Elective V: From OE Basket	2	-	2	40	16	90	10	04	20
8	VSC II (Major Specific): Artificial Intelligence	-	4	2	40	16	90	10	04	20
9	AEC III: Corporate Culture & Communication	2	-	2	40	16	90	10	04	20
10	OJT: On Job Training	-	-	4	80	32	180	20	08	40
	Total (A)			**22**	**440**			**110**		

B.Sc. (Animation) Part - III SEMESTER-VI (Duration- Six Month)										
Sr. No.	**Course Code**	**Teaching Scheme**			**Examination Scheme**					
		Theory and Practical			University Assessment (UA)			Internal Assessment (IA)		
		Lectures Per week	Practical Per week	Credit	Maximum Marks	Minimum Marks	Exam minute	Maximum Marks	Minimum Marks	Exam Hours
1	Major XI: 3D Design and Animation Techniques	2	-	2	40	16	90	10	04	20
2	Major XII: Game Design	2	-	2	40	16	90	10	04	20
3	Major Practical VI (a): Design and Animation Techniques Lab	-	4	2	40	16	90	10	04	20
4	Major Practical VI (b): Game Design Lab	-	4	2	40	16	90	10	04	20
5	Major Elective II ✓ Entrepreneurship Development ✓ Augmented Reality	2	-	2	40	16	90	10	04	20
6	Major Practical II ✓ Entrepreneurship Development Lab ✓ Augmented Reality Lab	-	4	2	40	16	90	10	04	20
7	VSC III (Major Specific) Linux Utilities and Shell Programming	-	4	2	40	16	90	10	04	20
8	SEC III: Software Engineering	2	-	2	40	16	90	10	04	20
9	AEC IV: Professional Ethics	2	-	2	40	16	90	10	04	20
10	IKS: IKS for Computer Science	2	-	2	40	16	90	10	04	20
11	FP: Field Project	-	-	2	40	16	90	10	04	20
	Total (B)			**22**	**440**			**110**		

Exit option after Level 6: Students can exit with Bachelor of Science in Animation

Bachelor of Science in Animation
Multiple Entry and Multiple Exit Option (NEP-2020)
B.Sc. Animation PART III SEM V
3D Maya with Rigging and Lighting

Course Objectives:

After completion of this course students will able to;

1. Understand the technical skills needed to setup, rig, alter and support character animations effectively for all 3D Animation classes.
2. Learn skills in this class in other areas including game art, motion graphics and 3D animation.

UNIT I **(15 Hours)**

Basic study Elements of Riggingtools, constrains and types ,Understanding Rigging, Creating and Organizing Joint Hierarchies, Orienting Joints, Naming Joints, Mirroring Joints, Rigging the Giraffe, IK Legs, FK Blending, Rotate Plane Solvers, Creating Custom Attributes, Spline IK, Full Body Inverse Kinematics, Skinning Geometry, Interactive/Smooth Binding, Painting Skin Weights

3D Animation: Introduction to Animation tools – Principles of Animation, Using Joints and Constraints, Inverse Kinematics, Key frame Animation, Graph Editor, Play blast and F-Check, Driven Keys, Animation Using Expressions, Motion Path Animation, Animating Constraints, Animation Layers, Creating an Animation Layer, Animating Facial Expressions Using Blend Shapes, Animating Blend Shapes Sequentially, Animating with Lattices, Animating Object Components with Clusters, Animating a Scene Using Nonlinear Deformer

UNIT II **(15 Hours)**

Introduction to light, Principle of light Types of light –Shadows – Types of Shadows – Understanding material &lights – Software Lighting– Mental ray lighting–Final Gather– Global illumination – Caustics -- Vray lighting – HDRI – SSS Shader

3D Rendering: Introduction to Rendering– Renderlayers- Software Rendering– Mental ray Rendering– Types of Render passes – Diffuse Passes – Specular passes – Shadow passes – Occlusion passes, Use Background matting

Reference Books

1. 3DsMaya Bible–by KellyL.Murdock
2. Mastering Autodesk 3 ds Maya-byJeffrey M.Harper
3. 3Ds Maya Lighting-by Boughen, Nicholas
4. Autodesk Maya 2018 Basics Guide(English, Paperback, Murdoch Kelly)
5. Autodesk Maya 2018 :A Comprehensive Guide(English, Paperback, Tickoo Sham)
6. Introducing Autodesk Maya 2014 (Derakhshani)

Bachelor of Science in Animation
Multiple Entry and Multiple Exit Option (NEP-2020)
B.Sc. Animation PART III SEM V
VFX

Course Objectives: Students should:

1. Learn the Primary objective of using VFX isto give rise to a Scene or images that is very close to resembling reality but may be an impossibility to capture in the camera.
2. Work as a VFXand Stereoroto Artist.
3. Developing advanced compositing skills with a focus on various pipeline workflows and shot finishing.
4. Practice advanced compositing techniques using plates from a ctual film projects.

UNIT I **(15 Hours)**

Introduction, Silhouette feature, Installation and Licensing, Interface of Silhouette, Sequence editor, Roto Node, Motion Blur, Time line, Tracker, Paint Node, Power matte Node, Composite node, Morphing, Z Matte, Depth, ROI (Region of Interest), All Nodes, and Render, Color Theory for VFX (Color Psychology and Its Impact on Storytelling, How Color Grading Enhances the Mood of VFX Shots, Real-World Examples of Color Grading in VFX Films)

UNIT II **(15 Hours)**

Introduction of Mocha pro, Mocha pro Feature, Interface of Mocha pro,Stereo Interface, Using mocha pro plugins, Starting new project, Merging and importing projects, Tracking Basics, Stereo Tracking, Adjust track, Roto scoping Basics, Roto scoping with Magnetic and Freehand tools.
Painting Splines with the area brush tool, Stereo Rotoscoping, Exporting Tracks, Exporting Mattes and clip, The camera Solve Module, the insert module, the mega clean plates in the Remove module, the Remove Module, The stabilize Module, the lens Module, Using Mocha Pro for 360Vr Workflow, The reorient Module, The Dope Sheet And Curve Editor, The Clip tab, Preferences, File format

Reference Books:-

1. Silhouette 5.2 User Guide
2. Silhouettev 7.5 User Guide
3. Mochapro 2020 User guide
4. Digital Visual Effects & Compositing Book

Bachelor of Science in Animation
Multiple Entry and Multiple Exit Option (NEP-2020)
B.Sc. Animation PART III SEM V
Major Practical V (a)
3D Maya with Rigging and Lighting Lab

Course Objectives: After successful completion of this course, students will able to:

1. Demonstrate the ability to create and organize joint hierarchies, apply rigging tools and constraints, and set up IK/FK systems including Spline IK and Rotate Plane Solvers to rig characters effectively in a 3D environment.
2. Apply skinning techniques such as Smooth Binding and Paint Skin Weights to bind geometry to rigs
3. Analyze and implement various lighting techniques including standard Maya lights, Mental Ray lighting to achieve realistic lighting and material interaction in 3D scenes.
4. Design and execute a multi-pass rendering pipeline using Software and Mental Ray renderers to produce professional-quality final output.

List of programs to be conducted

1. Identify and demonstrate the use of any five rigging tools available in Maya. Explain the purpose of each tool with a screenshot of the tool interface.
2. Create a scene in Maya and apply at least three types of constraints (Point, Orient, and Parent). Document the steps and explain the difference between each type.
3. Create a simple joint chain of 5 joints for a character arm. Demonstrate how to create and organize the joint hierarchy properly using the Outliner.
4. Set up a joint chain and practice orienting joints using the Orient Joint tool. Document before and after screenshots showing the joint axis orientations.
5. Create a left-side arm joint chain and mirror it to the right side using the Mirror Joint tool. Document all settings used and the result in the Outliner.
6. Add at least three custom attributes to a control object in Maya (e.g., Stretch, Squash, Visibility). Connect these attributes to relevant nodes using Set Driven Key or expressions.
7. Set up a Spline IK handle for a character's spine or neck using a NURBS curve. Demonstrate the cluster controls and document the workflow.
8. Animate a bouncing ball using keyframe animation. Set at least 10 keyframes demonstrating squash and stretch, anticipation, and follow-through principles. Preview using Playblast.
9. Create a simple walk cycle animation and use the Graph Editor to adjust the animation curves. Demonstrate tangent editing to achieve smooth or stepped transitions.

10. Set up a Driven Key relationship where rotating a wheel object automatically triggers the opening of a door. Document the driver and driven attributes used.

11. Create a scene and apply all five standard Maya light types (Ambient, Directional, Point, Spot, Area). Render the scene individually with each light and compare the results.

12. Set up a scene with both Depth Map Shadows and Ray Traced Shadows. Compare the render results and document the settings used for shadow softness and resolution.

13. Enable Global Illumination in Mental Ray or Arnold renderer. Set up a simple interior scene and render it with GI. Document the FG rays and GI settings used.

14. Set up an HDRI lighting environment using an .hdr or .exr image. Render a reflective object and document the image-based lighting workflow and exposure settings.

15. Apply a Sub-Surface Scattering (SSS) shader to a skin or wax-like object. Render the result and document the scatter color, depth, and radius settings used.

16. Set up at least three render layers (beauty, shadow, occlusion) for a scene with multiple objects. Render each layer separately and document the layer membership and overrides.

17. Render a scene with separate Diffuse and Specular render passes. Composite them in Photoshop or Nuke and compare the result to a combined beauty render.

18. Create and render an Ambient Occlusion (Occlusion) pass for a scene. Demonstrate how to apply it as a multiply layer over the beauty pass in compositing.

19. Render a Shadow pass using Use Background material and a shadow-catching plane. Composite the shadow onto a background image to create a real-world integration effect.

20. Render the same scene using Maya Software Renderer and Mental Ray (or Arnold). Compare render times, quality, and shadow accuracy. Document the key differences in settings.

Bachelor of Science in Animation
Multiple Entry and Multiple Exit Option (NEP-2020)
B.Sc. Animation PART III SEM V
Major Practical V (b)
VFX Lab

Course Objectives: After successful completion of this course, students will able to:

1. Utilize the Silhouette software interface proficiently
2. Apply Mocha Pro's planar tracking and rotoscoping tools
3. Analyze and implement advanced Mocha Pro modules
4. Design and execute complete VFX workflows

List of Programmes

1. Launch Silhouette and take a screenshot of the complete interface. Label and explain each major panel: Viewer, Trees, Parameters, Footage, and Output windows. Describe the workflow pipeline of Silhouette for a typical VFX shot.
2. Document the complete installation and licensing process of Silhouette on your system. Include screenshots of each step — installer, license activation, and the startup splash screen. Note the system requirements and license type used.
3. Import a footage sequence into Silhouette using the Sequence Editor. Demonstrate how to set frame range, frame rate, and proxy settings. Document all steps with screenshots and explain the role of the Sequence Editor in a VFX workflow.
4. Use the Roto node in Silhouette to isolate a moving subject from at least 30 frames of footage. Create B-Spline or Bezier shapes, animate the control points across the timeline, and render the matte output. Document the complete process.
5. Apply Motion Blur settings to a rotoscoped matte in Silhouette. Render the output with and without motion blur enabled and compare the results. Document the shutter angle and sample settings used.
6. Use Silhouette's timeline to keyframe roto shapes across a sequence. Demonstrate how to add, delete, and adjust keyframes using the timeline scrubber. Show at least one shape tracked across 20 frames.
7. Apply Silhouette's Tracker to lock a roto shape onto a moving object in a video clip. Compare the result with and without tracking applied. Document the tracker parameters: search area, channel, and reference frame settings.
8. Set up a Composite node tree in Silhouette to combine a foreground layer (with matte) over a background plate. Apply at least one color correction node in the tree and render the final output. Document the node graph.
9. Build a multi-node composite tree using at least 5 different Silhouette nodes (e.g., Roto, Paint, Composite, Color Correct, Grain). Render the final output and document the complete node graph and render settings used.
10. Select a VFX film scene (e.g., Blade Runner 2049, Mad Max: Fury Road) and analyze its color grading. Identify the color palette, color psychology used, and how the grading supports the storytelling. Recreate a similar grade in Silhouette or a color grading tool and document the result.
11. Launch Mocha Pro and document the complete interface layout. Label the Viewer, Workspace, Layer Panel, Track Controls, and AdjustTrack panels. Describe how Mocha Pro differs from standard point trackers.

12. Create a new Mocha Pro project by importing a video clip. Set the correct frame rate, resolution, and color space. Document all project settings and describe the significance of each parameter for VFX tracking.
13. Perform basic rotoscoping in Mocha Pro on a moving subject. Create a spline shape, track it across 40 frames, and export the matte as an image sequence. Document all tool settings and the final exported result.
14. Use both the Magnetic edge-snapping tool and the Freehand tool in Mocha Pro to roto a complex shape (e.g., hair, fingers, or irregular object). Compare the results and document the advantages of each tool.
15. Export tracking data from Mocha Pro in at least two formats (e.g., After Effects corner pin, Nuke tracker data). Also export a roto matte as an image sequence. Document the export dialog settings for each format.
16. Use the Mocha Pro Camera Solve module on a hand-held camera shot to solve the 3D camera motion. Document the track layer setup, solve settings, and export the camera data. Verify accuracy by overlaying a 3D element.
17. Use the Mocha Pro Insert module to composite a screen replacement (e.g., phone screen or monitor). Track the surface, apply a new graphic insert, and document the mesh warp and blend settings used for a realistic result.
18. Use the Mocha Pro Remove module to remove an unwanted object (e.g., a crew member or prop) from a scene. Generate a Mega Clean Plate and document the layer setup, illumination model settings, and the final result.
19. Use the Mocha Pro Lens Module to calibrate and remove lens distortion from a GoPro or wide-angle shot. Document the calibration grid setup, distortion values, and render the undistorted output.
20. Open a tracked and roto-scoped Mocha Pro project and use the Dope Sheet to manage keyframes across layers. Adjust animation curves using the Curve Editor. Export the project in at least two file formats and document the differences between them.

Bachelor of Science in Animation
Multiple Entry and Multiple Exit Option (NEP-2020)
B.Sc. Animation PART III SEM V
Advanced Animation Techniques

Course Outcomes:

1. Apply principles of motion graphics, motion paths, infographics, logo animation
2. Demonstrate advanced animation techniques including character animation
3. Execute chroma keying, green screen removal, and advanced keying techniques
4. Apply special effects simulations

UNIT I **(15 Hours)**

Principles of Motion Graphics, Using Motion Paths, Creating Infographics, Animating Logos, Basic Motion Tracking, Advanced Motion Tracking Techniques, Plugins for effective motion graphics, Effects and Presets, Advanced Animation Techniques (Morphing Objects and Shapes, Character Animation Basics, Puppet Tool and Mesh Deformation, Using the Graph Editor for Advanced Animations) , Introduction to Chroma keying, Basics of Compositing (Proportion and perspective, Pre-composing), Working with Multiple Compositions, Rotoscoping Basics, Advanced Rotoscoping Techniques, Linear Keying(Advance Spill suppressor), Keylight for chroma screen (Luma Key, Screen matte)

UNIT II **(15 Hours)**

Introduction to Green Screen Keying, Using Keylight for Keying, Advanced Keying Techniques, Creating and Using Matte Paintings, Digital Set Extension Techniques, Introduction to Special Effects, Creating Fire, Smoke, and Explosions, Simulating Rain and Snow, Advanced Keying Techniques mask (Light wrap, Adding grains), Color Grading and Correction (Creating and Using Adjustment Layers, Introduction to Color Correction, Using Curves and Levels), Color Grading Techniques (Day to night)

Reference Books

1. Creative Motion Mastery with Adobe After Effects Vishu Aggarwal — *Packt Publishing, 2024 | ISBN: 9781804617281*
2. Compositing Visual Effects in After Effects: Essential Techniques Lee Lanier — *Focal Press / Routledge | ISBN: 9781138803282*
3. The Art and Science of Digital Compositing Ron Brinkmann — *Morgan Kaufmann / Focal Press | 2nd Edition*
4. Adobe After Effects 2026 Handbook Precious James — *2025 | ISBN: 9798278096078*

Bachelor of Science in Animation
Multiple Entry and Multiple Exit Option (NEP-2020)
B.Sc. Animation PART III SEM V
Graphics Designing

Course Outcome:

1. Demonstrate understanding of fundamental concepts of graphic design, including raster and vector graphics, color formats, and various media types.
2. Apply image editing and design techniques using Adobe Photoshop, including photo manipulation, color correction, filters, and basic animation.
3. Create professional graphic designs using tools, layers, text, and effects in CorelDRAW.
4. Develop vector-based illustrations and designs using Adobe Illustrator, utilizing shapes, paths, colors, and transformations.

UNIT I **(15 Hours)**

Introduction to Graphic Design What is Graphic Design, What is Raster Graphic & Vector Graphic, Uses & Difference between Raster Graphic & Vector Graphic, Media, Types of Media, Color Formats, different types of Medias

Photoshop: Using Tool Box What is Pallet and Knowing about Color Pallet 2 Layers Pallet and sub pallets in these pallets Using Menus 2 Knowing the Shortcut keys Modifying the Photos 1 Converting B&W Photo to Color Understanding Filters menu 1 Creating Designs using Tools Working with Color & Gradient Color Crop, Brush, Pen, Blur, Text etc., Tools and Filter Menu Doing Action & Animation in Photoshop

UNIT II **(15 Hours)**

Corel Draw Working with Tool Box Property Bar options Menu options, Working with Color, Working with Paragraph Text Special Effects, Layouts and Layers Special Page Layouts Arranging Objects, Adding Pages Working With Transforming Objects Styles and Templates Advanced Effects

Illustrator Understanding the UI of the Illustrator Understanding Tool Box , Using menus Drawing Basic Shapes Drawing with Pencil Tool 2 Drawing with Pen Tool Using Brushes Creating Compound Paths , Working with Color and Strokes Editing Objects Layers & Groups Transparency & Graphic Styles Transforming & Moving Objects Basic Text Blending Shapes & Colors.

References

1. Adobe Photoshop 2025-2026 for Beginners, by Casey R. Sterling
2. CorelDRAW Training Guide by Satish Jain
3. Adobe Illustrator User Guide Made Simple by Eric Red

Bachelor of Science in Animation
Multiple Entry and Multiple Exit Option (NEP-2020)
B.Sc. Animation PART III SEM V
Advanced Animation Techniques Lab

Course Objectives: After successful completion of this course, students will able to:

1. Motion graphics principles, paths, infographics, logo animation, plugins
2. Character animation, puppet tool, graph editor, rotoscoping, compositing
3. Chroma keying, Keylight, spill suppressor, luma key, screen matte
4. Fire/smoke/rain/snow simulations, matte painting, color grading

List of Programmes

1. Create a 15-second composition in Adobe After Effects. Apply at least four principles of motion graphics — anticipation, easing, staging, and follow-through — to animating a simple shape or text element. Set appropriate keyframes for each principle and preview the result.
2. Import or create a logo/icon in After Effects. Use the Position property to set keyframes and convert the linear path to a Bezier curve. Apply Easy Ease to entry and exit keyframes. Adjust the path handles for smooth curvature.
3. Design a bar chart or pie chart using After Effects shape layers. Use the Trim Paths animator to reveal chart segments progressively. Add animated counter text using expression: time * value. Pre-compose each chart element for clean structure.
4. Import a vector logo (AI or PNG) into After Effects. Use Mask Path animation or Shape Layer Trim Paths to reveal the logo outline. Add a fade-in for fill colour and apply motion blur. Time the complete reveal to 5–8 seconds.
5. Import a video clip with a moving subject. Open the Tracker panel and apply single-point tracking on a high-contrast feature of the subject. After a successful track, attach a text layer or graphic to the track point using 'Apply Motion to Layer'.
6. Import a real-world camera-move shot into After Effects. Apply the 3D Camera Tracker effect. Allow the solve to complete. Right-click on a cluster of track points on a flat surface and create a Camera and Null object. Parent a 3D text or solid layer to the Null.
7. Open or create a motion graphics composition. Apply at least three effects or presets: (a) Trapcode Particular or CC Particle World for particles, (b) Optical Flares or Lens Flare for light effects, (c) an Animation Preset from the Effects & Presets panel for text. Adjust parameters for each and preview.
8. Create two shape layers (e.g., circle and star) using the Pen or Shape tools. Copy the path of one shape as a keyframe onto the other at frame 0. At frame 60 paste the second shape's path as another keyframe. Apply Easy Ease. Preview the morph.
9. Import a character PNG or illustration. Select the layer and activate the Puppet Pin tool. Place

at least 5 pins at strategic joints (shoulder, elbow, wrist, hip, knee). Set keyframes for each pin position to animate a bending or stretching motion over 3 seconds. Set mesh density to 150.

10. Create a bouncing ball animation with squash and stretch using at least 8 keyframes. Open the Graph Editor and switch to the Speed Graph. Convert all keyframes to Bezier. Manually pull the speed handles to create acceleration going down and deceleration at the bounce peak. Compare playback before and after Graph Editor edits.
11. Assemble a multi-layer scene with at least three depth layers (background, midground, foreground). Scale each layer to reflect correct perspective proportion. Select related layers, right-click and Pre-compose them into separate compositions (e.g., BG_comp, MG_comp, FG_comp). Apply Depth of Field blur to background layers.
12. Create three individual compositions: an intro (5 sec), main content (10 sec), and outro (5 sec). Build a Master_Comp and drag all three into it sequentially. Adjust the work area to match the total duration. Modify content inside a nested comp and observe the automatic update in the Master_Comp.
13. Import a 5-second live-action footage clip. Select the layer and double-click to enter Layer view. Activate the Roto Brush tool (Alt+W). Paint over the subject to define the foreground matte. Use the Refine Edge tool for hair or soft edges. Propagate the matte across all frames. Place a new background beneath.
14. Apply Keylight (1.2) to a green-screen clip and achieve a clean key. Then apply the Advanced Spill Suppressor effect (Effect > Keying > Advanced Spill Suppressor). Set Method to Ultra and adjust Spill Range and Luma Range sliders to remove green tint from skin tones and clothing edges. Compare before/after using the A/B split view.
15. Import a well-lit green-screen clip. Apply Keylight (1.2). Sample Screen Colour. Set Screen Gain to 100, Screen Balance to 50. Switch view to Combined Matte and refine using Screen Pre-blur (1–2), Screen Shrink/Grow, and Screen Softness. Apply Despill Bias to correct colour fringing. Composite over a background and render.
16. Duplicate the green-screen layer twice. On the first copy extract the well-lit areas using Keylight. On the second copy use the Linear Color Key or Color Range effect to target the poorly lit shadow areas. Use a Track Matte to combine both mattes. Adjust layer blending modes for the final composite.
17. Take a live-action plate. In Photoshop, paint a background extension (sky, landscape, or cityscape) that matches the plate's perspective and lighting. Import both into After Effects. Use a Garbage Matte mask on the plate to reveal the painted extension in the upper portion. Colour-match both using Curves.
18. Create a new composition. Add a black solid and apply CC Particle World (or Trapcode Particular). For fire: set Birth Rate to 3, Longevity to 1.0, Gravity to –0.3, set particle type to Lens Convex, colour from orange to red. Duplicate and modify for smoke: lower birth rate, increase size, grey colour. Create explosion by keyframing a burst of Birth Rate from 0 to 50

to 0 over 10 frames. Composite over footage using Add blending mode.

19. Create two solids for foreground and background rain layers. Apply CC Particle World to each. For rain: set particle type to Line, velocity to 3.0, direction to 180°+15° spread, foreground layer larger and faster for depth. For snow: set particle type to Sphere, velocity to 0.5, add slight X drift using wind expression. Apply Motion Blur to both layers.
20. After completing a Keylight key, pre-compose the background layer. Apply the RE:Vision Light Wrap or set up a manual Light Wrap: duplicate background, apply Fast Box Blur (100), set blending mode to Screen over the subject. Then apply the Add Grain effect (Effect > Noise & Grain > Add Grain) to the keyed subject. Match grain Size and Softness to the background plate by sampling a reference frame.

Bachelor of Science in Animation
Multiple Entry and Multiple Exit Option (NEP-2020)
B.Sc. Animation PART III SEM V
Graphic Designing Lab

Course Objectives: After successful completion of this course, students will able to:

1. Utilize Adobe Photoshop tools and techniques to design print and digital media
2. Apply CorelDraw design principles to create corporate and print media materials
3. Employ Adobe Illustrator's vector-based tools to design logos, comic characters & pamphlets
4. Integrate design principles including color theory, typography and layout composition

List of Programmes

1. Design a Poster in Photoshop; Design a Banner in Photoshop.
2. Design a Website Front Page using Photoshop.
3. Convert Black & White Photograph to Color using Photoshop.
4. Create Animation using Photoshop.
5. Design an Invitation using Photoshop.
6. Design a Cover Page using CorelDraw.
7. Design a Company Logo using CorelDraw.
8. Design a Newsletter using CorelDraw.
9. Design a Pamphlet using Illustrator.
10. Design a Comic Character using Illustrator.
11. Design a Company Logo using Illustrator.
12. Design a Cover Page using Illustrator.
13. Design a Business Card using Photoshop.
14. Create a Social Media Post using Photoshop.
15. Design a Brochure using CorelDraw.
16. Create a Flyer using CorelDraw.
17. Design a Magazine Cover using CorelDraw.
18. Create a Vector Illustration using Illustrator.
19. Design an Infographic using Illustrator.
20. Create a Product Packaging Design using Illustrator.
21. Design a Typography Poster using Illustrator.
22. Create a Photo Collage using Photoshop.
23. Design a Certificate using CorelDraw.
24. Create a Web Banner using Illustrator.
25. Design an E-book Cover using Photoshop.

Bachelor of Science in Animation
Multiple Entry and Multiple Exit Option (NEP-2020)
B.Sc. Animation PART III SEM V
Artificial Intelligence

Course Objectives: After successful completion of this course, students will able to:

1. Describe the nature of AI problems and techniques of AI.
2. Understanding space search Problem and their applications
3. Apply the appropriate Heuristic Search techniques to solve the problems by using various algorithms
4. Understand various knowledge representation techniques

UNIT I: **(15 Lectures)**

Introduction of AI and Problem Solving: Artificial Intelligence, AI Problems, AI Techniques, Defining the Problem as a State Space Search, uninformed search and informed search, heuristic search,

UNIT II: **(15 Lectures)**

Hill climbing, Best first search, A* algorithm, AO* algorithm, constraint satisfaction, Knowledge Representation**:** Introduction**,** Propositional Logic, Basic Concepts of Propositional Logic, Properties of Operators, Propositional Logic examples, Applications of Propositional Logic in, Limitations of Propositional Logic, inference rules.

Reference Books:

1. Elaine Rich and Kelvin Knight, Artificial Intelligence, Tata McGraw Hill
2. Nils J Nilson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann Publishers , Inc., San Francisco, California, 2000

Bachelor of Science in Animation
Multiple Entry and Multiple Exit Option (NEP-2020)
B.Sc. Animation PART III SEM V
Corporate Culture & Communication

Course Objectives: After successful completion of this course, students will able to:

1. To develop effective professional communication skills
2. To understand organizational and cross-cultural workplace behavior
3. To enhance ethical, digital, and AI-era communication competence.
4. To prepare students for corporate and global work environments.

UNIT I: Introduction to Business Communication (15 Lectures)

Introduction- Meaning and definition of business communication, Objectives and importance in organizations, Types - Internal and External communication, Role of communication in AI-driven businesses. Communication Process and Models- Elements of communication process, Models of Communication Cycle, Characteristics of Professional communication, Barriers to communication, Overcoming communication barriers, Verbal and Non-Verbal Communication - Verbal communication - oral and written Non- verbal communication- body language, kinesics, proxemics, Paralanguage and visual communication -Impact of non-verbal cues in professional settings, Written Business Communication - Principles of effective business writing, Business letters - inquiry, complaint, adjustment, Emails, memos, notices, Report writing - short reports and summaries, AI tools in business writing (email drafting, grammar tools), Oral Communication & Presentation Skills – Meetings- types and conduct, Interviews- preparation and participation, Public speaking and presentation skills, Use of visual aids and AI presentation tools

UNIT II: Concept of Culture in Business (15 Lectures)

Introduction - Meaning and elements of culture Organizational culture -types and significance, Corporate culture in technology-based organizations, Cultural diversity in the workplace, Cross Cultural Communication- High-context and low-context cultures, Hofstede's cultural dimensions Cross-cultural challenges in global business, Communication in multicultural teams ,AI and globalization of workplace communication, Professional Ethics- Meaning and importance of business ethics, Ethical issues in communication, Corporate Etiquette - Workplace behavior, dress code, Email, meeting, and virtual etiquette, Ethics in AI communication and data usage, Digital Communication and AI Workplace Culture: Digital communication tools and platforms, Social media communication for business, Remote work culture and virtual collaboration ,Impact of AI on organizational communication, Future trends in business communication.

Reference Books:

1. Bovee, C. L. & Thill, J. V. Business Communication Today
2. Lesikar, R. V. Business Communication: Theory and Application
3. Hofstede, G. Cultures and Organizations
4. Guffey, M. E. Business Communication: Process and Product

Bachelor of Science in Animation
Multiple Entry and Multiple Exit Option (NEP-2020)
B.Sc. Animation PART III SEM V
On Job Training (OJT)

Course Outcomes:
After completion of this course students will be able to:

1. Apply theoretical knowledge gained during the academic program to real-world industrial or organizational tasks.
2. Demonstrate professional work ethics, discipline, time management, and responsibility in a workplace environment.
3. Develop technical and practical skills relevant to the specific industry or domain of training.
4. Exhibit effective communication, teamwork, and interpersonal skills while working with professionals.
5. Analyze workplace problems and propose practical solutions using appropriate tools and methodologies.
6. Prepare a comprehensive training report and present learning outcomes, reflecting on professional growth and career readiness.

Guidelines provided by Shivaji University will be followed.

Bachelor of Science in Animation
Multiple Entry and Multiple Exit Option (NEP-2020)
B.Sc. Animation PART III SEM VI
3D Design and Animation Techniques

Course Outcomes

After completion, learners will be able to:

1. Understand 3D design concepts and workflows.
2. Create 3D models using polygon and NURBS techniques.
3. Apply materials, textures, and lighting effectively.
4. Perform basic animation using keyframes and timeline tools.
5. Render high-quality images and animations.

UNIT I: (15 Lectures)

Basics of 3D Graphics: Concepts of 3D space, coordinates, and transformations, Overview of Autodesk Maya, User Interface: Panels, menus, shelves, toolboxes, Navigation controls and viewport management, Object creation and transformation (Move, Rotate, Scale), Polygon Modeling: Primitives, extrusion, bevel, bridge, NURBS Modeling basics, Component editing: vertices, edges, faces, Modeling tools: sculpting, deformation tools, Creating complex objects and scene composition

UNIT II: (15 Lectures)

Introduction to materials and shaders, Applying textures and UV mapping, Texture editing and image-based textures, Working with Hypershade, Creating realistic surface effects, Types of lights: Ambient, Directional, Point, Spot, Area, Lighting techniques and shadows, Camera setup and composition, Rendering engines and settings, Output formats and render optimization

Reference Books

1. Autodesk Maya Basics Guide – Autodesk Documentation
2. Mastering Autodesk Maya – Todd Palamar
3. Introducing Autodesk Maya – Dariush Derakhshani

Bachelor of Science in Animation
Multiple Entry and Multiple Exit Option (NEP-2020)
B.Sc. Animation PART III SEM VI
Game Design

Course Outcomes

After completion, learners will be able to:

1. Explain the history, genres, core mechanics, and foundational principles of game design
2. Apply narrative design, level design, and character/UI design principles
3. Analyse and evaluate game mechanics, interaction design, and physics systems
4. Design, prototype, playtest, and iteratively refine an original game concept

UNIT I: **(15 Lectures)**

History and evolution of games; Types of games (board, card, video, mobile, VR/AR); The game design pipeline; Role of a game designer in the production team, Core elements of a game: goals, rules, conflict, and outcome; MDA Framework (Mechanics, Dynamics, Aesthetics); Player experience and motivation; Flow theory in games. Overview of game genres: Action, Adventure, RPG, Puzzle, Strategy, Simulation, Sports; Core mechanics per genre; Gameplay loops (core loop and meta loop); Balancing challenge and skill.

UNIT II: **(15 Lectures)**

Paper prototyping methodology; Digital rapid prototyping; Playtesting methods: internal, external, A/B testing; Collecting and analysing player feedback; Iterative design cycles. Overview of Unity and Unreal Engine; Interface navigation and project setup; Asset pipeline: importing 2D/3D assets, audio, and animations; Scripting fundamentals (C# for Unity / Blueprints for Unreal); Building and exporting a simple game scene. Rigid body physics and collision detection; Gravity, forces, and constraints in game engines; Triggers and events; Player controller design; Camera systems (first-person, third-person, isometric). 2D game asset creation principles; Sprite sheets and tile maps; 2D platformer and top-down game design; Animation states and transitions; Parallax scrolling and 2D lighting.

Reference Books

1. Jesse Schell The Art of Game Design: A Book of Lenses CRC Press / Taylor & Francis 3rd Ed., 2019
2. Ernest Adams Fundamentals of Game Design New Riders / Pearson Education 3rd Ed., 2014
3. Scott Rogers Level Up! The Guide to Great Video Game Design John Wiley & Sons 2nd Ed., 2014
4. Mike Stout, A Practical Guide to Level Design, CRC Press 2020

Bachelor of Science in Animation
Multiple Entry and Multiple Exit Option (NEP-2020)
B.Sc. Animation PART III SEM VI
Major Practical VI(a)
3D Design and Animation Techniques Lab

Course Outcomes

After completion, learners will be able to:

1. Demonstrate understanding of 3D space concepts, coordinate systems, and basic transformations in Autodesk Maya's interface and viewport environment.
2. Apply polygon and NURBS modeling techniques — including primitives, extrusion, bevel, and component editing — to construct complex 3D objects and scenes.
3. Create and manage realistic surface appearances using materials, shaders, UV mapping, texture painting, and the Hypershade workflow in Maya.
4. Set up production-ready lighting rigs, configure cameras for composition, choose appropriate rendering engines, and optimize outputs for quality and performance.

List of Programmes

1. Define the three primary axes (X, Y, Z) in a 3D coordinate system. Sketch or label how each axis is oriented in Maya's default perspective viewport.
2. Identify and describe the function of the following Maya UI elements: the Channel Box, the Outliner panel, the Tool Box, and the Shelf toolbar.
3. List the keyboard shortcuts used to tumble, track, and dolly (zoom) the camera in Maya's viewport. Explain what each action does to the view.
4. Create a cube, sphere, cylinder, and cone using polygon primitives in Maya. For each, state one real-world object it could be used as a starting point to model.
5. Place a polygon cube in the scene. Use Move, Rotate, and Scale tools to position it at coordinates (3, 1, –2), rotate it 45° on the Y-axis, and scale it to (2, 0.5, 2). Record the resulting Channel Box values.
6. Define the term "render resolution." What is the difference between rendering at 720p vs. 4K? How does resolution affect render time?
7. Explain the difference between World Space and Object Space in Maya. Why does it matter which space is active when performing transformations?
8. Starting from a polygon plane, use the Extrude tool to model a simple staircase with 5 steps. Describe the component editing steps (selecting faces, extruding, adjusting) you took.
9. Model a door frame using a polygon cube. Apply the Bevel operation to its edges to add realistic chamfering. Then use the Bridge tool to connect two face loops. Explain why beveling improves the appearance when rendered.

10. Model a low-poly coffee mug using polygon primitives and component editing (vertex, edge, and face modes). Describe each modeling step and explain how you handled the handle geometry.
11. Compare NURBS modeling with polygon modeling. Create a simple vase shape using NURBS curves and a Revolve operation. In what scenarios would NURBS be preferred over polygons?
12. Apply an automatic UV map to a polygon box. Open the UV Editor and manually unfold the UVs so they lie flat with minimal distortion. Export the UV layout as an image and describe each correction you made.
13. Using the Hypershade editor, create a layered shader that blends a rust texture on a metallic base. Connect a bump map node to simulate surface roughness. Describe the node network you built.
14. Download or create a 1024×1024 wood grain texture image. Apply it as a File Texture node to a Blinn shader on a polygon plane. Adjust UV scale so the grain pattern tiles realistically. Describe the workflow.
15. Create a classic three-point lighting setup (key light, fill light, rim/back light) for a simple character bust. Specify the light type, intensity, and color temperature you chose for each light, and explain the role of each.
16. Set up a camera in Maya for a product shot of a modeled object. Apply the rule of thirds, set a focal length of 85mm, and enable depth of field. Describe the composition choices you made and how DOF enhances the shot.
17. Create a photorealistic wet stone material using the Hypershade. The shader must combine a diffuse texture, a specular map, a normal map, and a displacement map. Explain how each map contributes to the final look and how you balanced specularity and roughness values.
18. Using a PBR (Physically Based Rendering) workflow in Arnold or another Maya renderer, shade a metal canteen model with base color, metalness, roughness, AO, and emissive maps. Discuss the differences between metalness and specular workflows and justify which PBR approach you chose.

Bachelor of Science in Animation
Multiple Entry and Multiple Exit Option (NEP-2020)
B.Sc. Animation PART III SEM VI
Major Practical VI(b)
Game Design Lab

Course Outcomes

After completion, learners will be able to:

1. Explain the history, genres, core mechanics, and foundational principles of game design including the MDA framework, gameplay loops, and player motivation theory.
2. Apply narrative design, level design, and character/UI design principles using paper prototyping, digital tools (Unity/Unreal), and 2D asset creation workflows.
3. Analyse and evaluate game mechanics, interaction design, physics systems, player controller design, and camera systems within a game engine environment.
4. Design, prototype, playtest, and iteratively refine an original game concept through structured design cycles, player feedback analysis, and documented iteration.

List of Programmes

1. Trace the evolution of video games from arcade machines (1970s) to modern VR/AR titles. Name three landmark games from different eras and describe how each shifted the direction of the industry.
2. Classify the following titles into their game type (board, card, video, mobile, VR/AR) and justify your classification: Chess, Hearthstone, Super Mario Bros., Pokémon GO, Beat Saber.
3. Define the four core elements of a game — goals, rules, conflict, and outcome — using Pac-Man as your example. For each element, write one sentence that maps it precisely to the game.
4. Explain the MDA Framework (Mechanics, Dynamics, Aesthetics). For any game of your choice, identify one concrete example of each layer and describe how they connect to each other.
5. List six game genres (Action, Adventure, RPG, Puzzle, Strategy, Simulation). For each genre, name one defining core mechanic and one popular title that exemplifies it.
6. Design a core loop and a meta loop for an original mobile RPG game of your choice. Present both loops as a labelled flow diagram and explain how the meta loop provides long-term player retention beyond the moment-to-moment gameplay.
7. You are designing a puzzle game intended for general audiences. Describe a difficulty scaling system that balances challenge against player skill over 20 levels. Reference Flow Theory in your answer and propose two specific mechanics to keep players in the flow channel.

8. Create a paper prototype for a 2-player turn-based strategy game. Define the rules, goals, and win condition on paper. Describe how you would run an internal playtest session and what specific feedback you would collect to improve the prototype.
9. Compare three playtesting methods: internal testing, external testing, and A/B testing. For each method, describe the ideal stage in the design cycle to use it, the type of feedback it generates, and one limitation designers must account for.
10. Set up a new Unity project and build a scene containing a terrain, a directional light, a player capsule with a Rigid Body component, and a collectible item. Describe the asset pipeline steps for importing a 3D model and an audio clip into the project and assigning them to scene objects.
11. Write a C# script (Unity) that moves a player character using keyboard input (WASD), applies a jump force when the Space bar is pressed, and destroys a collectible object upon collision. Annotate each section of your code with a comment explaining what it does.
12. Design and implement three camera rigs in Unity: first-person (FPS), third-person follow, and isometric. For each rig, explain the camera positioning logic, describe what genre of game it best suits, and identify one common player experience problem associated with that camera type.
13. Create a sprite sheet for a character with four animation states: Idle (4 frames), Walk (6 frames), Jump (3 frames), and Attack (5 frames). Describe how you would slice and configure the sprite sheet in Unity's Sprite Editor, and set up an Animator Controller with transitions between all four states.
14. In a Unity game scene, design an event system where: entering a trigger zone plays a sound and displays UI text; collecting all five coins unlocks a door; and a timer event ends the level after 60 seconds. Write pseudocode or C# snippets for each event and explain the difference between a Collider and a Trigger Collider.
15. Conduct a full MDA analysis of two games from different genres (e.g., Dark Souls and Stardew Valley). For each game, deconstruct mechanics, emergent dynamics, and intended aesthetics. Then compare how each game uses challenge and pacing differently to sustain player engagement, using Flow Theory as the analytical lens.
16. Design and implement a complete physics-based player controller in Unity for a 2D platformer. The controller must include: smooth horizontal movement with acceleration and deceleration, variable jump height based on button hold duration, coyote time, and wall-sliding. Provide annotated C# code and explain the physics decisions behind each mechanic.
17. Design three levels for a 2D top-down action game — an introductory level (teach the core mechanic safely), a challenge level (combine mechanics under pressure), and a boss level (test full mastery). For each level, provide a layout map, annotate key design decisions, and explain how the level teaches through design rather than text.

Bachelor of Science in Animation
Multiple Entry and Multiple Exit Option (NEP-2020)
B.Sc. Animation PART III SEM VI
Entrepreneurship Development

Course Outcomes

After completion, learners will be able to:

1. Explain the concept, evolution, and ecosystem of entrepreneurship
2. Apply business planning tools — including the Business Model Canvas, SWOT analysis
3. Analyse financial concepts including startup capital, funding sources & break-even analysis
4. Design and present an original entrepreneurial venture in the animation or media sector

UNIT I: (15 Lectures)

Definition and concept of entrepreneurship; evolution and history; types of entrepreneurs (innovator, imitator, Fabian, drone); entrepreneurship vs. intrapreneurship; entrepreneurship in the creative and animation industry. Qualities of a successful entrepreneur: risk-taking, creativity, leadership, resilience; motivation theories (Maslow, McClelland's need theory); self-assessment of entrepreneurial potential; case studies of animation and media entrepreneurs. Sources of business ideas; opportunity vs. idea; market gap analysis; design thinking for entrepreneurs; brainstorming and mind-mapping techniques; identifying niches in animation, gaming, VFX, and digital content markets. What is a business model; Business Model Canvas (9 building blocks); value proposition design; revenue streams for creative businesses (project-based, retainer, licensing, IP monetisation); lean start-up methodology overview.

UNIT II: (15 Lectures)

Types of start-up capital: bootstrapping, friends and family, angel investors, venture capital, crowdfunding; understanding equity vs. debt; overview of government schemes: Startup India, MUDRA Yojana, MSME grants; creative industry-specific funding opportunities. Basics of financial statements: profit & loss, balance sheet, cash flow statement; break-even analysis; pricing strategies for creative services; invoicing, payment terms, and cash flow management; GST basics for freelancers and small studios. Types of business ownership: sole proprietorship, partnership, LLP, private limited company; registration process overview; importance of contracts and client agreements; intellectual property rights for animators: copyright, trademark, licensing; NDA and work-for-hire clauses. Types of business risk and mitigation strategies; failure analysis and pivot strategies; growth models for creative studios; the art of pitching: elevator pitch, investor deck, demo-day presentation; final venture pitch presentation by students — original business concept in animation/media.

Reference Books

1. Entrepreneurship Development S.S. Khanka · S. Chand Publications
2. The Lean Startup Eric Ries · Crown Business
3. Entrepreneurship: Theory, Process, Practice Donald F. Kuratko · Cengage Learning

Bachelor of Science in Animation
Multiple Entry and Multiple Exit Option (NEP-2020)
B.Sc. Animation PART III SEM VI
Augmented Reality

Course Outcomes

After completion, learners will be able to:

1. Explain the fundamental principles, historical development, and technology stack underlying Augmented Reality, distinguishing it from Virtual Reality and Mixed Reality environments.
2. Apply marker-based, markerless, and location-based AR techniques using industry-standard tools (Unity, Vuforia, ARCore/ARKit) to develop interactive AR experiences.
3. Analyse user interaction design principles, performance optimisation strategies, and ethical considerations specific to AR applications in animation, media, education, and industry.
4. Design, develop, and present an original AR project in the animation or media domain, demonstrating end-to-end production skills from concept to deployment.

UNIT I: (15 Lectures)

Definition, concept, and characteristics of Augmented Reality (AR); differences between AR, VR, and MR — the Reality-Virtuality Continuum (Milgram's model). History and evolution of AR: Sutherland's Head-Mounted Display (1968), ARToolKit, Pokémon GO, and current developments. Types of AR: Marker-based, Markerless (Surface, Face, Image), Location-based (GPS), Projection-based, and Superimposition-based AR. Applications of AR in animation, gaming, education, healthcare, retail, architecture, and military sectors. Hardware components: smartphones, smart glasses (HoloLens, Magic Leap), headsets, depth sensors, GPS, accelerometers, and gyroscopes. Software frameworks and SDKs overview: ARCore (Google), ARKit (Apple), Vuforia, Wikitude, 8th Wall, and Spark AR.

UNIT II: (15 Lectures)

Creating and optimising 3D models for AR: polygon reduction, UV unwrapping, and texture compression (ETC2, ASTC). Importing assets from Blender, Maya, and Cinema 4D into Unity; working with FBX and glTF/glb formats. Shader and material optimisation for mobile AR: Unlit shaders, PBR basics, and transparency handling. Working with animations in AR: importing skeletal animations, animation controllers, and runtime triggering. Creating image targets in Vuforia Target Manager; best practices for marker design (contrast, detail, uniqueness). Anchoring 3D objects on image targets; multi-target and cylinder target setups.

Reference Books

1. Augmented Reality: Principles and Practice Schmalstieg, D. & Höllerer, T.Addison-Wesley, 2016
2. Learning Augmented Reality with UnityBucher, J.Packt Publishing, 2022
3. Unity AR & VR by Tutorials raywenderlich.com Team Raywenderlich, 2021

Bachelor of Science in Animation
Multiple Entry and Multiple Exit Option (NEP-2020)
B.Sc. Animation PART III SEM VI
Entrepreneurship Development Lab

Course Outcomes

After completion, learners will be able to:

1. Explain the concept, evolution, and ecosystem of entrepreneurship.
2. Apply business planning tools — including the Business Model Canvas, SWOT analysis.
3. Analyse financial concepts including startup capital, funding sources & break-even analysis.
4. Design and present an original entrepreneurial venture in the animation or media sector.

List of Programmes

1. Define entrepreneurship. Differentiate between an entrepreneur and an intrapreneur with examples from the animation industry.

2. Identify and explain the four types of entrepreneurs (Innovator, Imitator, Fabian, Drone). Give one real-world example for each type.

3. Trace the evolution and history of entrepreneurship from the Industrial Revolution to the digital age. How has it impacted the creative sector?

4. Using Maslow's Hierarchy of Needs, analyse how the motivational needs of an animation studio founder may differ from a salaried animator.

5. Apply McClelland's Need Theory (nAch, nAff, nPow) to assess the entrepreneurial potential of a hypothetical media startup founder.

6. Conduct a self-assessment of your entrepreneurial potential by evaluating qualities such as risk-taking, creativity, leadership, and resilience. Prepare a reflective journal entry.

7. Write a brief case study on any one successful Indian animation or media entrepreneur highlighting their journey, challenges, and achievements.

8. Distinguish between a 'business idea' and a 'business opportunity'. Identify one untapped market gap in the Indian animation or VFX sector.

9. Apply the Design Thinking framework (Empathise, Define, Ideate, Prototype, Test) to develop a new product idea for a children's animation OTT platform.

10. Conduct a brainstorming and mind-mapping exercise to generate at least ten business ideas in the gaming, VFX, or digital content markets.

11. Prepare a complete Business Model Canvas (all 9 building blocks) for a hypothetical 2D animation studio targeting educational content for schools.

12. Compare and contrast four revenue streams for creative businesses: project-based, retainer, licensing, and IP monetisation. Provide an animation-sector example for each.

13. Describe the Lean Startup Methodology (Build-Measure-Learn loop). How can an indie game developer apply it to test a new mobile game concept?

14. Explain the key differences between equity financing and debt financing. Which would you recommend for an early-stage animation studio? Justify your answer.

15. Prepare a comparative table of startup funding sources: Bootstrapping, Angel Investors, Venture Capital, and Crowdfunding — covering risk, control, and suitability for creative businesses.

16. Research and summarise any two government schemes (Startup India, MUDRA Yojana, or MSME grants) relevant to a small animation studio.

17. Prepare a simplified Profit & Loss statement and Balance Sheet for a fictional freelance motion graphics designer for one financial year.

18. Perform a break-even analysis for a small animation studio that has fixed monthly costs of ₹1,50,000 and charges ₹5,000 per minute of animation produced.

19. Develop a pricing strategy for a VFX studio offering three service tiers. Consider cost-plus pricing, competitive pricing, and value-based pricing approaches.

20. Draft a sample client agreement for a freelance animator that includes clauses on payment terms, deliverable milestones, revision policy, and intellectual property rights.

21. Explain copyright, trademark, and licensing as they apply to an original animated character. Describe how an animator can protect and monetise their IP.

22. Compare the four business ownership structures (Sole Proprietorship, Partnership, LLP, Pvt. Ltd.) in terms of liability, taxation, and suitability for creative startups.

23. Identify five common risks faced by a new animation studio and propose a specific mitigation strategy for each. Include at least one pivot strategy scenario.

24. Write and present a 60-second elevator pitch for your original animation or media business idea. Include the problem, solution, target market, and revenue model.

Bachelor of Science in Animation
Multiple Entry and Multiple Exit Option (NEP-2020)
B.Sc. Animation PART III SEM VI
Augmented Reality Lab

Course Outcomes

After completion, learners will be able to:

1. Explain the fundamental principles, historical development, and technology stack underlying Augmented Reality, distinguishing it from VR and MR environments.
2. Apply marker-based, markerless, and location-based AR techniques using industry-standard tools (Unity, Vuforia, ARCore/ARKit) to develop interactive AR experiences.
3. Analyse user interaction design principles, performance optimisation strategies, and ethical considerations specific to AR applications in animation, media, education, and industry.
4. Design, develop, and present an original AR project in the animation or media domain, demonstrating end-to-end production skills from concept to deployment.

List of Programmes

1. Prepare a detailed illustrated comparison chart of Augmented Reality, Virtual Reality, and Mixed Reality using Milgram's Reality–Virtuality Continuum. Include at least three real-world applications for each.
2. Create a visual timeline tracing the key milestones in AR history — from Sutherland's Head-Mounted Display (1968) to present-day platforms (ARCore, ARKit, HoloLens, Pokémon GO). Include inventors, tools, and years.
3. Identify and document five types of AR (Marker-based, Markerless, Location-based, Projection-based, Superimposition-based). For each type, write a definition, describe the technology used, and provide two real-world examples with screenshots.
4. Survey and document at least six AR hardware devices (smartphones, HoloLens, Magic Leap, smart glasses, etc.). For each device list: manufacturer, display type, key sensors, target use-case, and approximate cost.
5. Compare ARCore, ARKit, Vuforia, Wikitude, and 8th Wall across the following parameters: supported platforms, tracking capabilities, licensing, ease of use, and best use-case. Present findings in a structured table.
6. Write a detailed note (minimum 500 words) explaining the following concepts as they apply to AR: Feature Detection, Image Recognition, SLAM (Simultaneous Localisation and Mapping), and Depth Estimation. Include diagrams where relevant.
7. Install Unity (LTS version), add the AR Foundation, ARCore XR Plugin, and ARKit XR Plugin packages. Configure the project settings for Android or iOS AR build. Document each step with screenshots in your journal.
8. Set up a Vuforia Developer account, create an image target in the Target Manager, and build an AR scene in Unity that overlays a 3D primitive (cube, sphere, or cylinder) on the printed image target. Record and attach a screen-captured demo.

9. Import a 3D model (FBX or glTF) into Unity from Blender or any free asset source. Optimise it for mobile AR by reducing polygon count (below 5,000 tris), applying texture compression (ETC2 or ASTC), and verifying it renders correctly in the AR scene.

10. Create or import a rigged, animated 3D character. Attach it to a Vuforia image target in Unity so the character appears and plays its idle animation when the marker is detected. Document the animation controller setup.

11. Using AR Foundation's AR Plane Manager, build a Unity scene where the user can tap a detected horizontal surface to place a 3D object. Implement tap-to-place using AR raycasting. Test on a physical Android or iOS device.

12. Configure two separate Vuforia image targets in Unity so that each target triggers a different 3D model or animation. Document the target setup, scene hierarchy, and attach screenshots of both targets active simultaneously.

13. Using Spark AR Studio (Meta) or ARKit Face Tracking in Unity, create a basic face filter that overlays a 3D mask, hat, or accessory on the user's face in real time. Record a short demo video and attach to the journal.

14. Research GPS-based AR. Design (on paper or in a tool like Figma) a location-based AR app concept for your college campus that shows AR labels on buildings. If possible, implement a basic prototype using Wikitude or 8th Wall.

15. Select two existing AR applications (e.g., IKEA Place, Google Lens, Snapchat Lens) and analyse their UI/UX against the following criteria: spatial UI design, contextual relevance, occlusion handling, lighting estimation, and user comfort. Write a 600-word comparative analysis.

16. Implement at least three touch gestures (tap, pinch-to-scale, drag-to-rotate) on a 3D object placed in an AR scene using AR Foundation and Unity's touch input system. Document the C# scripts and test results.

17. Research and write a report (minimum 500 words) on user comfort issues in AR: motion sickness, field-of-view limitations, vergence-accommodation conflict, and visual fatigue. Propose three design strategies to minimise discomfort in an AR animation app.

18. Build an AR scene with at least two 3D models and use Unity's Profiler to measure: CPU usage, GPU usage, draw calls, and target frame rate (30/60 fps). Document before-and-after results after applying at least two optimisation techniques (LOD, occlusion culling, or batching).

19. Research and document three real-world uses of AR in the animation or media industry (e.g., AR picture books, on-set AR previs, AR marketing campaigns). For each, describe the technology used, outcome, and what animation skills were involved.

20. Write a structured essay (minimum 600 words) on the ethical concerns raised by AR technology: facial recognition privacy, data collection, digital addiction, real-world distraction, and accessibility. Propose an ethical design checklist for AR app developers.

21. Build your Unity AR project as an APK (Android) or IPA (iOS). Document the complete build pipeline: player settings, XR plug-in configuration, signing, and installation on a physical device. Include screenshots of each build step.

22. Create a simple WebAR experience using 8th Wall or A-Frame + AR.js that overlays a 3D object on an image target and runs in a mobile browser without an app install. Share the hosted URL and document the development process.

23. Prepare a full concept document for your final AR project: project title, objective, target audience, platform (mobile/WebAR), AR tracking type, 3D assets required, interaction design, tools/software, and timeline. Include a wireframe or storyboard of the experience.

24. Develop a complete, original AR experience in the animation or media sector. The project must include: at least one 3D animated asset, one interactive element, and deployment on a physical device or browser. Submit the Unity project folder and a 1–2 minute demo video.

25. Prepare a written project report (minimum 800 words) covering: project concept, tools used, development challenges and solutions, screenshots/video stills, performance metrics, and future scope. Present the project live before the evaluation committee with a 5-minute demonstration.

Bachelor of Science in Animation
Multiple Entry and Multiple Exit Option (NEP-2020)
B.Sc. Animation PART III SEM VI
Linux Utilities and Shell Programming

Course Outcomes: After successful completion of this course, students will able to:

1. Learn architecture and basics of Linux Operating System.
2. Understand the working and use of NANO editor.
3. Learn Regular expressions using metacharacters.
4. Learn advanced BASH shell Programming.

List of Programmes

1. Demonstration of General-Purpose Utilities.
2. Implement file and directory operations: touch, cp, mv, rm, mkdir, rmdir, cd.
3. Write a shell script that prompts the user for a name of a file or directory and reports if it is a regular file, a directory, or another type of fil. Also perform an ls command against the file or directory with the long listing option.
4. Pattern matching with grep: Search files for patterns using basic regex (*, ?, ^, $, .) and options like -i, -v, -n.
5. Text processing with filters: Use head, tail, wc, and grep to extract and manipulate data files.
6. Advanced filtering: Apply sed for substitutions (s/pattern/replace/g).
7. Basic nano editing: Install nano ,Create, edit, save, and exit files using Ctrl+O, Ctrl+X; practice search (Ctrl+W) and replace. Multi-line operations: Cut (Ctrl+K), paste (Ctrl+U), undo (Alt+U) and create backups (-B).
8. Write a shell script which copies files from one directory to another during copy command.
9. Create a data file which contains given format and perform the given operations on that data file using sed.
10. Write a shell script using grep command to print prime numbers between 1 to 30.
11. Write a shell script to display given year is leap year or not.
12. Write a shell script using if statements to check file exists or not.
13. Write a shell script to calculate the grade of student.
14. Write a shell script to print the Fibonacci series.
15. Write a shell script that check number Armstrong or not.
16. Write a shell script to find out given word contains vowel and also the entered vowel is small case or capital.
17. Write a shell script to read name, sex and marital status and display the same.
18. Write a shell script that display “man”, “bear”,”pig”,”dog”, “cat”, and “sheep” on the screen with each appearing on a separate line. Try to do thins in as few lines as possible.
19. Write a shell script to greet message according to time.
20. Write a shell script that read 5 numbers; count and display total even/odd.

Bachelor of Science in Animation
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B.Sc. Animation PART III SEM VI
Software Engineering

Course Outcomes: After completion of this course students will be able to:

1. Understand life cycle models, requirement elicitation techniques, understand the concept of analysis and design of software.
2. Acquire a comprehensive understanding of the software development lifecycle and its application in contemporary software engineering practices.
3. Develop proficiency in project management methodologies and strategic decision-making for successful software project execution.
4. Apply software engineering concepts in software development to develop quality software

Unit- I: Introduction to System and System Design Tools (15 Hours)

Introduction to System - Definition, Elements of System, Characteristics of System, Types of System - Open, Closed, Deterministic, Probabilistic, Manual and Automated, System Development Life Cycle (SDLC), Design - Design Concepts, Design Process and Design Quality, Design Model System Design Tools - Data Flow Diagrams (DFD), Entity-Relationship Diagrams (ERD), Agile Software Development - Agility Principles, Agile methods, Plan-driven and agile development

Unit-II: Introduction to Software Engineering and Testing (15 Hours)

Software Engineering - Definition, importance, principles of software engineering, Software Process Models: Waterfall, Incremental, Prototyping and Spiral model, Software Design: SOLID Design Principles, Software Testing: Definition of Testing, Testing characteristics, Types of Testing, Black-Box Testing, White-Box Testing, Unit testing, Integration testing, Validation Testing and System Testing, Software Quality Assurance -Quality and its Attributes, Quality Control, Quality Assurance, Cost of Quality, SQA Activities, SQA Plan

References:

1. Software Engineering, N.S. Gill, Khanna Publishing House, 2023
2. Software Engineering, Ian Somerville, 9th edition, Pearson education.
3. Software Engineering a Practitioners Approach by S. Pressman & Roger, Seventh Edition, McGraw Hill International Edition.
4. Software Engineering by Sommerville,7th edition, Pearson Publication
5. Software Engineering by K.K. Aggarwal & Yogesh Singh, New Age International Publishers

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Professional Ethics

Course Outcomes: After completion of this course students will be able to

1. Analyze ethical dilemmas using structured ethical decision-making frameworks, considering bias, empathy, and conflicts of interest.
2. Apply philosophical and psychological approaches to evaluate ethical behavior, integrity, courage, and emotional intelligence in professional life.
3. Assess ethical issues related to research, academics, intellectual property, confidentiality, employee rights, and workplace diversity.
4. Evaluate professional responsibilities related to safety, risk management, environmental protection, and sustainable development.

UNIT-I **(15 Hours)**

Foundations of Ethics, Meaning and scope of ethics, Morals, values, and ethics: personal and professional, Individual vs professional ethics, Sense of professional and engineering ethics, Code of professional conduct (with reference to National Society of Professional Engineers), Ethical Decision Making, Ethical dilemmas and moral reasoning, Ethical decision-making models and roadmap, Bias, empathy, and internal obstacles, Conflict of interest and cultural relativism

UNIT-II **(15 Hours)**

Business Ethics and Corporate Behavior, Philosophical approaches to business ethics, Ethical issues in business and organizations, Ethical leadership and corporate governance, Resisting unethical authority and domination, Global business ethics, Psychological and Professional Perspectives, Psychological and philosophical approaches to ethics, Myths about morality, Courage, integrity, emotional intelligence, Ethics in research and academics: academic integrity and intellectual honesty, Ethics in the Workplace, Ethical issues in diverse workplaces, Employee rights, confidentiality, and discrimination, Sustainability and Corporate Skills, Ecology, engineering, and economy, Risk–benefit analysis and risk reduction, Corporate Social Responsibility (CSR), CSR in India and corporate sustainability

References:

1. Subramanian.R. Professional Ethics, Oxford Publication, 2013.
2. Nagarasan. R.S. Professional Ethics and Human Values. New Age International Publications, 2006.
3. Mike W Martin and Roland Schinzinger, Ethics in Engineering,4th edition, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi,2014

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IKS for Computer Science

Course Outcomes After completing the course, students will be able to:

1. Explain core concepts and philosophy of Indian Knowledge Systems
2. Relate ancient Indian logic and mathematics to modern computer science
3. Apply IKS-inspired algorithms in computational problem-solving
4. Analyze the role of Sanskrit grammar in NLP and AI
5. Design ethical and sustainable AI systems using IKS principles
6. Evaluate real-world case studies integrating IKS with modern technology

UNIT I **(15 Hours)**

Definition and scope of Indian Knowledge Systems, Importance of ancient knowledge in contemporary science and technology, The IKS corpus: Vedas, Upanishads, Smritis, Sutras, Shastras, Objectives, nature, scope, and unique characteristics of IKS, Unique number representation systems: Bhūta Saṃkhya System, Kaṭapayādi System, Pingala's binary system (Laghu–Guru) and its importance in computing, Sanskrit phonetics and linguistics, Panini's Ashtadhyayi**,** Algorithmic nature of Paninian grammar, Role of Sanskrit in computational linguistics, Morphological analysis and syntax parsing,

UNIT II **(15 Hours)**

Applications: POS tagging, Machine translation, AI-driven language models for Indian languages, Knowledge pyramid and epistemology in IKS, Nyaya logic in knowledge representation, Pramana, Prameya, Samsasya as AI reasoning models, Ethical AI inspired by Indian philosophy, Sustainable and socially responsible AI systems

Case Studies: Compiler Design, Recursion, Encryption Decryption, Computer Graphics, Algorithm Time Complexity, Binary Combinations, Vedic Mathematics for Signal Processing, Paninian Grammar for NLP and AI language models, Machine Learning inspired by Nyaya Logic

References

1. Textbook on IKS by Prof. B Mahadevan, IIM Bengaluru.
2. Bhartiya Knowledge Systems by M.C. Bora, Khanna Publishing House
3. Kautilya The Arthashastra. Translated by R. Shamasastry
4. Kapoor, Kapil, and Singh Avadesh Kumar, Indian Knowledge System Vol.1, DK Print World, Ltd., 2005.
5. Mahadevan B., Bhat V R, Nagendra Pavana R.N., Indian Knowledge System Concepts and Application, PHI Learning Pvt. Ltd., 2022

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Field Project (FP)

Course Outcomes:
After completion of this course students will be able to:

1. Identify real-world problems in industry, community, or research environments and define clear project objectives.
2. Apply theoretical knowledge and practical skills acquired during the program to solve field-based problems.
3. Collect, analyze, and interpret data using appropriate tools, techniques, and methodologies.
4. Demonstrate teamwork, leadership, communication, and professional ethics while working in real-time project environments.
5. Prepare structured project reports and deliver effective presentations showcasing findings, outcomes, and recommendations.
6. Evaluate project outcomes critically and suggest improvements or future enhancements based on practical experience.

Common Guidelines will be provided by Shivaji University, Kolhapur