INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

VISUALIZATION AND ANIMATION								
VIII Semester: IT								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
AITD32	**Core**	3	0	0	3	40	60	100
Contact Classes: 48	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 48**		
Prerequisite: Basics of computer graphics, programming, and mathematics (linear algebra, geometry).								

I. COURSE OVERVIEW:

This course introduces the principles, tools, and techniques for creating effective visualizations and animations. It covers data visualization frameworks, graphical rendering techniques, and animation principles, with hands-on exposure to popular tools and libraries. The course emphasizes real-time applications in domains like data analysis, entertainment, and interactive media.

II. COURSES OBJECTIVES:

The students will try to learn

I. The fundamentals of visualization and animation.
II. The techniques for creating 2D and 3D graphics and animations.
III. How to use tools and libraries for data visualization and rendering.
IV. The principles of storytelling and interactivity in visualizations and animations.

III. COURSE OUTCOMES:

At the end of the course students should be able to:

CO1 Describe the principles and applications of visualization and animation.
CO2 Use tools and libraries like Matplotlib, D3.js, and Blender to create visualizations and animations.
CO3 Implement real-time rendering techniques for 2D and 3D data.
CO4 Create effective visualizations for data analysis and decision-making.
CO5 Develop interactive applications incorporating animations.
CO6 Analyze and evaluate the aesthetic and functional aspects of visualizations and animations.

IV. COURSE CONTENT:

MODULE – I: INTRODUCTION TO VISUALIZATION AND ANIMATION (10)

Basics of visualization: Types, importance, and applications, Data visualization process: Data preparation, design principles, and evaluation, Overview of animation: History, types, and key concepts, Tools for visualization and animation (e.g., Matplotlib, D3.js, Blender).

MODULE – II: ANIMATION TECHNIQUES AND ADVANCEMENTS (09)

Animation techniques (Time lapse, stop motion, Cut-out, Silhouette, Cel), Technical advancements (Layer, Cel, Peg bar, Combining live action with cartoon characters, Synchronized sound, Technicolor process, Multi-plane camera etc.)

MODULE – III: ANIMATION PRINCIPLES AND TECHNIQUES (09)

The 12 principles of animation (e.g., squash and stretch, timing, anticipation), Frame-by-frame and procedural animation techniques.

Scripting animations in libraries like D3.js and p5.js, Real-time animations for interactive applications.

MODULE –IV: VISUAL EFFECTS (09))

Use of miniatures in early films, Use of makeup, Rear projections, Pyrotechnics and matte paintings before the CGI era, Stereoscopic 3D, Realistic puppets and stop motion photography, Split screen technology, Space vision 3D, Stereovision 3D, Motion controlled camera, CGI Effects, Digital compositing, Animatronics, Motion capture, High speed cameras, The fusion camera system, Visual effects studios.

MODULE –V: ANIMATION & VFX (09)

Animation & VFX Around the World: American, Canadian, European, Indian, Japanese Studios.

V. TEXT BOOKS:

1. Colin Ware, Information Visualization: Perception for Design.
2. Tony Mullen, Mastering Blender.

VI. REFERENCE BOOKS:

1. Edward R. Tufte, The Visual Display of Quantitative Information.
2. Online courses and tutorials on Blender and Tableau.
3. Jason Osipa, Stop Staring: Facial Modeling and Animation Done Right.

VII. ELECTRONICS RESOURCES:

1. Official documentation of visualization libraries (Matplotlib, D3.js, Plotly, etc.)
2. Online courses and tutorials on Blender and Tableau.
3. GitHub repositories for visualization and animation projects.

VIII. MATERIALS ONLINE

1. Course template
2. Tutorial question bank
3. Tech-talk topics
4. Open-ended experiments
5. Definitions and terminology
6. Assignments

7. Model question paper – I
8. Model question paper – II
9. Lecture notes
10. PowerPoint presentation
11. E-Learning Readiness Videos (ELRV)