SRI KRISHNA COLLEGE OF ENGINEERING AND TECHNOLOGY
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COURSE INFORMATION

1. **Academic Year** : 2025 - 2026
2. **Name of faculty** : G.S.Pugalendhi
3. **Department** : Artificial Intelligence and Data Science
4. **Programme** : B.Tech
5. **Class and semester** : III AI & DS A & B / V Semester
6. **Course code and title** : 22AD501 - Virtual Reality and Augmented Reality
7. **Regulations** : R2022 (2023-27)
8. **Core/Elective** : Core
9. **Contact hours** : 45
10. **Type of course** : C (Theory Concept)
11. **Number of credits** : 3
12. **Course pre-requisites** : Nil
13. **Course learning objectives**:

1. Understand the evolution, key components, and paradigms of Virtual Reality systems.
2. Identify input/output devices and user interaction methods used in immersive VR environments.
3. Apply concepts of visual rendering, depth and motion perception, and AR techniques in real time scenarios.
4. Analyse interactive techniques and distinguish between Augmented and Virtual Reality systems.
5. Design engaging 3D experiences using Unity and AR/VR toolkits for real-world applications.

14. **Course Contents**:

Module 1: Introduction To Virtual Reality **15 Hrs**

History of VR – Key Elements of VR - VR Paradigms - Input: User Monitoring – World Monitoring - Output devices: Visual Displays – Visual Representation in VR (Aural and Haptic) – Navigation. Case Study: Virtual Reality in Architecture and Design.

Module 2: Visual Rendering, Perception and Interactive Technique **15 Hrs**

Visual Rendering - Depth perception - Motion perception - Stroboscopic Apparent Motion - Color perception – 3D Manipulation task and technique - Interactive Techniques in Virtual Reality: Body Track - Hand Gesture - 3D Manus - Object Grasp - Features of augmented reality, Difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, Visualization techniques for augmented reality. Case study: Augmented Reality for Remote Collaboration in Manufacturing.

Module 3: Design and 3d Interfaces **15 Hrs**

Experience Designs - The Process for Designing User Experience for Virtual Reality -

Three I's of VR - Immersion, Interaction, Imagination - Emotional Experience - Social Experience - Evaluation of VR - 3D Unity Architecture - Graphics - VR interfaces and AR Kit support - Application of AR and VR. Case study: Enhancing Museum Experiences through Augmented Reality and Virtual Reality.

15.Text book and Reference book:

Text book

1. Vilar, Elisângela, "Virtual and Augmented Reality for Architecture and Design", 1st edition, Taylor and Francis Ltd, June 2022.
2. Erin Pangilinan, Steve Lukas, Vasanth Mohan, "Creating Augmented and Virtual Realities: Theory and Practice for Next-Generation Spatial Computing", Paperback, March 2019.
3. Shmalstieg / Hollerer "Augmented Reality: Principles & Practice", Pearson Education India; First edition October 2016.

Reference Books:

1 Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.

2 Alan B Craig, William R Sherman, Jeffrey D Will, "Developing Virtual Reality Applications: Foundations of Effective Design", Morgan Kaufmann Publishers, 2009.

3 Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, "3D User Interfaces, Theory and Practice", Addison Wesley, USA, 2005.

4 Oliver Bimber and Ramesh Raskar, "Spatial Augmented Reality: Merging Real and Virtual Worlds", 2005.

16.Web References:

1. http://lavalle.pl/vr/book.html
2. https://www.coursera.org/learn/introduction-virtual-reality
3. https://uxplanet.org/designing-user-experience-for-virtual-reality-vr-applications fc8e4faadd96
4. https://virsabi.com/virtual-reality-experience-design/

17.Course plan:

S.No	Name of the topic	No of Hours	Cumulative Hours	Text/ Reference books
Introduction To Virtual Reality				
1.	Introduction to Virtual Reality	1	1	T1
2.	History of VR	1	2	T1, R1
3.	Key Elements of VR	1	3	T1
4.	VR Paradigms	1	4	T1

5.	Input devices	1	5	T1, R2
6.	User Monitoring	1	6	T1
7.	World Monitoring	1	7	T1, R2
8.	Output devices	1	8	T1
9.	Visual Displays	1	9	T1, R1
10.	Visual Representation in VR	1	10	T1, R1
11.	Aural display	1	11	T1
12.	Haptic display	1	12	T1, R1
13.	Navigation	1	13	T1, R2
14.	Virtual Reality in Architecture	1	14	T1
15.	Virtual Reality Design.	1	15	T1
Visual Rendering, Perception and Interactive Technique				
16.	Visual Rendering	1	16	T2, R2
17.	Depth and Motion perception	1	17	T2
18.	Stroboscopic Apparent Motion	1	18	T2, R2
19.	Color perception	1	19	T2
20.	3D Manipulation task and technique	1	20	T1
21.	Interactive Techniques in Virtual Reality: Body Track, - Hand Gesture	1	21	T1
22.	3D Manus	1	22	T2, R3
23.	Object Grasp	1	23	T1
24.	Features of augmented reality	1	24	T2, R2
25.	Difference between AR and VR	1	25	T1
26.	Challenges with AR	1	26	T2, R3
27.	AR systems and functionality	1	27	T2
28.	Augmented reality methods	1	28	T2, R2
29.	Visualization techniques for augmented reality	1	29	T2
30.	Augmented Reality for Remote Collaboration in Manufacturing.	1	30	T2
Design and 3d Interfaces				
31.	Experience Designs	1	31	T3
32.	The Process for Designing User Experience for Virtual Reality	1	32	T3
33.	Three I's of VR	1	33	T2, R3
34.	Immersion	1	34	T2
35.	Interaction	1	35	T2
36.	Imagination	1	36	T2, R1
37.	Emotional Experience	1	37	T2
38.	Social Experience	1	38	T2, R1
39.	Evaluation of VR	1	39	T3
40.	3D Unity Architecture	1	40	T3
41.	Graphics	1	41	T3
42.	VR interfaces	1	42	T3, R1
43.	AR Kit support	1	43	T2, R1
44.	Application of AR & VR	1	43	T3, R1
45.	Enhancing Museum Experiences through Augmented Reality and Virtual Reality.	1	45	T3, R1

18. Weightage of unit contents:

Factors considered

F1 Number of hours allotted for the units

F2 Usefulness of content with respect to student's work [0-5 scale: 0-not useful and 5-highly important]

F3 Usefulness of content with respect to other units of same subject [0-5 scale: 0-not useful and 5-highly important]

F4 Usefulness of content with respect to other subjects for the same programme [0-5 scale:0-not useful and 5-highly important]

Topic	F1	F2	F3	F4	A1	A2(%)
Introduction To Virtual Reality						
History of VR, Key Elements of VR, VR Paradigms	15	5	4	3	**57**	**30.81**
Input: User Monitoring, World Monitoring, Output devices: Visual Displays		5	3	3		
Visual Representation in VR (Aural and Haptic), Navigation.		4	3	3		
Virtual Reality in Architecture and Design.		3	2	4		
Visual Rendering, Perception and Interactive Technique						
Visual Rendering, Depth perception, Motion perception	15	5	4	2	**62**	**33.51**
Stroboscopic Apparent Motion, Color perception, 3D Manipulation task and technique		5	3	3		
Interactive Techniques in Virtual Reality: Body Track, Hand Gesture, 3D Manus, Object Grasp		4	3	2		
Features of augmented reality, Difference between AR and VR, Challenges with AR, AR systems and functionality		3	1	2		
Augmented reality methods, Visualization techniques for augmented reality. Augmented Reality for Remote Collaboration in Manufacturing.		5	4	1		
Design and 3d Interfaces						
Experience Designs, The Process for Designing User Experience for Virtual Reality	15	4	3	4	**66**	**35.67**
Three I's of VR, Immersion, Interaction, Imagination, Emotional Experience, Social Experience		4	2	3		
Evaluation of VR, 3D Unity Architecture, Graphics.		5	4	1		
VR interfaces and AR Kit support, Application of AR and VR.		4	3	2		
Enhancing Museum Experiences through Augmented Reality and Virtual Reality.		5	4	3		
Total					**185**	**100**
A_1–Number of Boxes Filled with numbers						
A_2–Weightage Assigned to Each Units in terms of Percentage						

19. Mapping syllabus with Bloom's Taxonomy LOT and HOT:

Lower Order Thinking (LOT)		
R	Remembering	Students are expected to Recall the information through Recognizing, listing, describing, retrieving, naming, finding
U	Understanding	Students are expected to Explain an ideas or concepts through Interpreting, summarizing, paraphrasing, classifying, explaining
AP	Applying	Students are expected to Use the information in another familiar situation through Implementing, carrying out, using, executing
Higher Order Thinking (HOT)		

A	Analyzing	Students are expected to Break the information into parts to explore understandings and relationships through Comparing, organizing, deconstructing, interrogating, finding
E	Evaluating	Students are expected to Evaluate the Justifying a decision or course of action through Checking, hypothesizing, experimenting, judging
C	Creating	Students are expected to Generate wide as, products, or ways of viewing things through Designing, constructing, planning, producing, inventing.

Introduction To Virtual Reality (Weightage **30.81**%**)**							
Sl.No	**Name of the Topic**					**Process verb**	**Types of thinking**
1	History of VR, Key Elements of VR, VR Paradigms					Define Interpret Organize	Remember Understand Analysis
2	Input: User Monitoring, World Monitoring, Output devices: Visual Displays					Explain Implement Compare	Understand Apply Analysis
3	Visual Representation in VR (Aural and Haptic), Navigation.					Execute Organize	Apply Analysis
4	Virtual Reality in Architecture and Design.					Explain Retrieve	Understand Remember
	R	**U**	**AP**	**A**	**E**	**C**	**Total No. of Topics**
Type of thinking in Nos	2	3	2	3	0	0	10
Weightage %	**6.16**	**9.24**	**6.16**	**9.24**	**0**	**0**	**30.81**

$$\textbf{Weightage,\%} = \frac{\textbf{Number of thinking level}}{\textit{Total number of Topics}} \textbf{ X Weightage Assigned to Each Units interms of Percentage}$$

Visual Rendering, Perception and Interactive Technique (Weightage **33.51**%**)**							
5	Visual Rendering, Depth perception, Motion perception					Define Interpret Implement	Remember Understand Apply
6	Stroboscopic Apparent Motion, Color perception, 3D Manipulation task and technique					Examine Implement	Analysis Apply
7	Interactive Techniques in Virtual Reality: Body Track, Hand Gesture, 3D Manus, Object Grasp					Retrieve Examine	Remember Analysis
8	Features of augmented reality, Difference between AR and VR, Challenges with AR, AR systems and functionality					Interpret Implement	Understand Apply
9	Augmented reality methods, Visualization techniques for augmented reality. Augmented Reality for Remote Collaboration in Manufacturing.					Examine Execute	Analysis Apply
	R	**U**	**AP**	**A**	**E**	**C**	**Total No. of Topics**
Type of thinking in Nos	2	2	4	3	0	0	11
Weightage %	**6.09**	**6.09**	**12.19**	**9.14**	**0**	**0**	**33.51**
Design and 3d Interfaces (Weightage **35.67**%**)**							
10	Experience Designs, The Process for Designing User Experience for Virtual Reality					Interpret Implement	Understand Apply
11	Three I's of VR, Immersion, Interaction, Imagination, Emotional Experience, Social Experience					Implement Determine	Apply Analysis
12	Evaluation of VR, 3D Unity Architecture, Graphics.					Retrieve Implementing	Remember Apply
13	VR interfaces and AR Kit support, Application of AR and VR.					Explain Examine	Understand Analysis
14	Enhancing Museum Experiences through					Explain	Analysis

	Augmented Reality and Virtual Reality.						
	R	**U**	**AP**	**A**	**E**	**C**	**Total No. of Topics**
Type of thinking in Nos	1	2	3	3	0	0	9
Weightage, %	**3.96**	**7.93**	**11.89**	**11.89**	**0**	**0**	**35.67**

	R	**U**	**AP**	**A**	**E**	**C**	**TOTAL**
Introduction to virtual reality	6.16	9.24	6.16	9.24	0	0	**30.81**
Visual Rendering, Perception and Interactive Technique	6.09	6.09	12.19	9.14	0	0	**33.51**
Design and 3d Interfaces	3.96	7.93	11.89	11.89	0	0	**35.67**
TOTAL	16.21	23.25	30.24	30.27	0	0	**100**
Lower Order Thinking				**69.7%**			
Higher Order Thinking				**30.27%**			

20. Expected outcome of the course:

Upon successful completion of this course, the student will be able to:

C501.1	Understand the requirements of virtual and augmented reality.	[U]
C502.2	Know the usage of hardware and software in VR.	[R]
C503.3	Discover the various manipulation and interactive techniques.	[AP]
C504.4	Resize the working of augmented and virtual reality.	[AP]
C505.5	Implement Virtual/Augmented Reality Applications.	[A]

21. Mapping course outcome with Bloom's Taxonomy LOT and HOT:

	R	**U**	**AP**	**A**	**E**	**C**
C501.1						
C502.2						
C503.3						
C504.4						
C505.5						

22. Mapping course outcome with programme outcomes: Programme outcomes

Graduates will demonstrate

1.	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2.	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3.	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4.	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5.	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6.	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7.	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8.	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9.	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes (PSO's)

[1] **PSO1:** Analyze basic scientific concepts and provide solutions to Electrical and Electronics Engineering problems with a specific focus on emerging energy challenges.

[2] **PSO2:** Use relevant software; apply current techniques for data processing problems in the field of modern electronic systems for sustainable development.

[3] **PSO3:** Develop products/software to cater to the societal & Industrial needs and adapt ethical values so as to become successful electrical engineering professionals.

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C501.1	2	1	3		3								3	3	3
C501.2	3	3	2	3	2								3	2	3
C501.3	3	3	2										3		3
C501.4	2	1	2										2		2
C501.5	2	1	2	3				1	1	1	1	1	3	3	3

3	Strongly agreed	2	Moderately agreed	1	Weakly agreed

23. Mapping with programme educational objectives:

Programme educational objectives:

PEO 1: Graduates will have successful career in industry that meets the needs of Indian and Multinational companies.

PEO 2: Graduates will have the ability to synthesize data and develop technical concepts for application to product design and to solve contemporary problems.

PEO 3: Graduates will work as part of teams on multidisciplinary projects with good technical, communication and interpersonal skills.

PEO 4: Graduates will fulfill the roles and responsibilities of professional electrical engineers in their chosen career with an attitude to serve the industry and society.

PEO 5: Graduates will undertake research, pursuing higher studies, thereby adopting extended learning, keeping pace with the technological developments and codes of professional practice.

COURSE NAME	PEO1	PEO2	PEO3	PEO4	PEO5
PE	3	2	2	2	3

3	Strongly agreed	2	Moderately agreed	1	Weakly agreed

24. Course assessment methods:

Tentative Assessment Methods & Levels (based on Bloom's Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	**Bloom's Level**	**Assessment Component**	**FA (16%) [80 Marks]**
C501.1	Understand	Quiz	20
C501.2	Remember	Tutorial	20
C501.3	Apply	Assignment	20
C501.4	Apply		
C501.5	Analyze	Presentation	20

Assessment based on Summative and End Semester Examination			
Bloom's Level	**Summative Assessment (24%) [120 Marks]**		**End Semester Examination (60%) [100 Marks]**
	CIA1: [60 Marks]	**CIA2: [60 Marks]**	
Remember	10	10	10
Understand	20	20	20
Apply	40	40	40
Analyse	30	30	30
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%) [200 Marks]						**End Semester Examination (60%) [100 Marks]**
CA 1: 100 Marks			**CA 2: 100 Marks**			
SA 1 (60 Marks)	**FA 1 (40 Marks)**		**SA 2 (60 Marks)**	**FA 2 (40 Marks)**		
	Component - I (20 Marks)	**Component - II (20 Marks)**		**Component - I (20 Marks)**	**Component - II (20 Marks)**	

Faculty in-charge **HOD** **Principal**