



Kadi Sarva Vishwavidyalaya

Faculty of Engineering & Technology

Fourth Year Bachelor of Engineering (IT)

(To be Proposed For: Academic Year 2020-21)

Subject Code: IT803D-N	Subject Title: Augmented and Virtual Reality
Pre-requisite	-

Teaching Scheme (Credits and Hours)

Teaching scheme				Total Credit	Evaluation Scheme					
L	T	P	Total		Theory		Mid Sem Exam	CIA	Pract.	Total
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
04	00	02	06	05	03	70	30	20	30	150

Course Objective:

- To gain the knowledge of historical and modern overviews and perspectives on virtual reality.
- To learn the fundamentals of sensation, perception, and perceptual training.
- To have the scientific, technical, and engineering aspects of augmented and virtual reality systems.
- To learn the Evaluation of virtual reality from the lens of design.
- To learn the technology of augmented reality and implement it to have practical knowledge.

Outline of the Course:

Sr. No	Title of the Unit	Minimum Hours
1	Introduction	8
2	VR Systems	9
3	Stereoscopic Vision & Haptic rendering	10
4	VR software development	10
5	3D interaction techniques	10
6	AR software development	8
7	Applications of AR and VR	9

Total hours (Theory): 64

Total hours (Lab): 32

Total hours: 96



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Detailed Syllabus

Sr. No	Topic	Lecture Hours	Weight age(%)
1	Introduction : Introduction to Augmented-Virtual and Mixed Reality, Taxonomy, technology and features of augmented reality, difference between AR ,VR and MR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality.	8	12
2	VR systems : VR as a discipline, Basic features of VR systems, Architecture of VR systems, VR hardware : VR input hardware: tracking systems, motion capture systems, data gloves, VR output hardware: visual displays.	9	14
3	Stereoscopic Vision & Haptic rendering : Fundamentals of the human visual system, Depth cues, Stereopsis, Retinal disparity, Haptic sense, Haptic devices, Algorithms for haptic rendering and parallax, Synthesis of stereo pairs, Pipeline for stereo images.	10	16
4	VR software development : Challenges in VR software development, Master/slave and Client/server architectures, Cluster rendering, Game Engines and available sdk to develop VR applications for different hardware (HTC VIVE, Oculus, Google VR).	10	16
5	3D interaction techniques: 3D Manipulation tasks, Manipulation Techniques and Input Devices, Interaction Techniques for 3D Manipulation.	10	16
6	AR software development : AR software, Camera parameters and camera calibration, Marker-based augmented reality, AR Toolkit.	8	12
7	Application of VR in Digital Entertainment: VR Technology in Film & TV Production. VR Technology in Physical Exercises and Games. Demonstration of Digital Entertainment by VR.	9	14
	Total	64	100

Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lecture and laboratory which carries 10 marks in overall evaluation.
- One internal exam will be conducted as a part of internal theory evaluation.
- Assignments based on the course content will be given to the students for each unit and will be evaluated at regular interval evaluation.
- Surprise tests/Quizzes/Seminar/tutorial will be conducted having a share of five marks in the overall internal evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments shall be performed in the laboratory related to course contents.



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Learning Outcome:

On successful completion of this course, the student should be able to:

- Identify, examine, and develop software that reflects fundamental techniques for the design and deployment of VR and AR experiences.
- Describe how VR and AR systems work.
- Choose, develop, explain, and defend the use of particular designs for AR and VR experiences.
- Evaluate the benefits and drawbacks of specific AR and VR techniques on the human body.
- Identify and examine state-of-the-art AR and VR design problems and solutions from the industry and academia.

e-Resources:

- <http://msl.cs.uiuc.edu/vr/>

Reference Books:

1. George Mather, Foundations of Sensation and Perception: Psychology Press; 2 edition, 2009.
2. The VR Book: Human-Centered Design for Virtual Reality, by Jason Jerald
3. Learning Virtual Reality by Tony Parisi, O' Reilly
4. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.
5. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.

REFERENCE BOOKS::

1. Alan Craig, William Sherman and Jeffrey Will, Developing Virtual Reality Applications, Foundations of Effective Design, Morgan Kaufmann, 2009.

List of experiments

No	Name of Experiment
1	Study of different game engines
2	Implementation on Video/ Feature Viewing
3	Implementation on Virtual tour
4	Implementation on material animation
5	Implementation to show portal planets
6	Explore projects in Unity 2D and 3D
7	Mini Project on Augmented Reality or Virtual Reality

Students will perform at least 6 programming exercises and implement one mini-project. The students can work in groups of 2 or 3.