University of Oklahoma
School of Computer Science
CS 5970: Virtual Reality
Fall 2025

Instructor Information

Instructor:	Dr. Doga Demirel
Office Location:	Devon Energy Hall 241
Student Support / Office Hours:	Wednesday 4–5 pm and Thursday 3–4 pm or by appointment
Email Address:	doga@ou.edu

Course Information

Class Time:	Wednesday 5–7:40 pm
Class Location:	Carson Engineering Center 0438
Modality:	In-person
Learning Management System / Website:	canvas.ou.edu/courses/444916
Pre-requisites:	C S 2414 or C S 5005 or DSA 5005; C S 2813 or MATH 2513; MATH 3333.

Course Description

This course introduces students to the fundamentals of Virtual Reality, providing a solid understanding of both the technical and experiential aspects of immersive environments. Students will explore key topics such as lights, optics, and human visual perception. The course covers a wide range of immersive technologies, including augmented and mixed reality, focusing on motion tracking, interactive 3D graphics, and multimodal sensory integration.

Course Goals

- Develop a comprehensive understanding of immersive technologies
- Enhance understanding of human perception in virtual environments
- Prepare students for multidisciplinary collaborations
- Learn state of the art immersion technologies and their applications

Learning Outcomes

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

- **Analyze** the graphics pipeline and physical modeling
- **Design** user experiences for immersive environments
- **Develop** immersive virtual reality applications

Texts and Materials

Reference Books

- Kelly S. Hale (Ed.), Kay M. Stanney (Ed.). *Handbook of Virtual Environments: Design, Implementation, and Applications, Second Edition* (2014). ISBN-13: 978-1466511842.
- Steve Aukstakalnis. *Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR* (2017). ISBN-13: 978-0134094236.

Suggested Readings & Other Resources

- Sutherland, Ivan E. "A head-mounted three dimensional display." *Proceedings of the December 9–11, 1968, Fall Joint Computer Conference, Part I* (1968).
- Anthes, C., García-Hernández, R. J., Wiedemann, M., & Kranzlmüller, D. "State of the art of virtual reality technology." *2016 IEEE Aerospace Conference*, 1–19 (2016).
- Parisi, Tony. *Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile*. O'Reilly Media (2015). ISBN-13: 978-1491922835.
- Jerald, J. *The VR Book: Human-Centered Design for Virtual Reality*. Morgan & Claypool (2015). ISBN-13: 978-1970001129.

Learning Activities, Assignments, and Assessments

Individual Assignments: Discussions (online and in-person), reading peer-reviewed articles, and presenting ideas.
Team Project: One collaborative team project spans the full semester with staged activities and deliverables. Details appear in the grading section.

Evaluation Methods / Grading Overview

Assignment	**Percent**
Quizzes (5 total)	10%
Individual Assignments & Presentations (3 total)	30%
Team Project	60%

Team Project Breakdown (60% Total)

Proposal, plan, and proposal presentation	5%
Personal Logs & Progress Report	5%
Peer evaluation	15%
Project deliverables – Final Report & Application	20%
Final Project Presentation & Demonstration	15%

Final Report will be in IEEE format. The template will be provided.

Grading Scale

Letter	Percentage
A	90–100%
B	80–89%
C	70–79%
D	60–69%
F	0–59%

Additional Support for Learning

Writing centers are a place where individuals can come together to talk about writing. Here at OU, the Writing Center exists to help all levels of writers at any stage of their writing process. Trained writing consultants can offer feedback and serve as a sounding board for any writing (academic or personal) in any discipline or genre. Receiving feedback is a vital way for all writers to improve the clarity of their work to suit their purpose. The Writing Center offers both in-person and remote/online appointments, as well as workshops, retreats, and other services. You can find out about their events on OU Engage or schedule an appointment on their website.

Course Policies

Academic Integrity and Plagiarism

The overall goal of this course is your learning. In order to demonstrate that you have reached this goal, the work you turn in needs to be your own. This includes putting written work into your own words and citing your sources, as appropriate to avoid plagiarism. If you work in a group, seek assistance from a tutor, use a resource on campus, and/or use online resources (including AI software), the work you turn in must be your own, demonstrating your own understanding of the material that you have gained through the learning process. If you have questions about academic integrity or plagiarism, please ask: my aim is to foster an environment where you can learn and grow, while also maintaining academic honesty and a clear representation of your learning and ideas. Penalties for serious offenses include a zero on the assignment and egregious offenses can even result in expulsion from the university, so it is important to understand expectations. Plagiarism as defined by the OU Integrity Office includes:

- Copying words and presenting them as your own writing.
- Copying words, even if you give the source, unless you also indicate that the copied words are a direct quotation.
- Copying words and then changing them a little, even if you give the source.
- Even if you express it in your own words, it is plagiarism to use someone else's idea as your own.

Generative AI Policy

Throughout this course, you will develop the skills needed to effectively use Generative AI as an aid in your learning and in preparation for our changing field. There will be times in which you

will not be permitted to use Generative AI or may only use it in particular ways. These decisions are intentionally made to support you in developing the skills and content knowledge needed in order to effectively use Generative AI. Follow assignment instructions carefully, as they will guide you in what you are permitted to use Generative AI for in each assignment. Where Generative AI is used, you must follow assignment instructions for appropriate citation and reflection about your usage. Use of Generative AI outside of the scope of what is explicitly defined in our assignments, and without acknowledgment, will be considered a violation of the academic integrity policy for this course. If you have any questions about how Generative AI may or may not be used on an assignment, please talk with me.

Consequences for Violating the Generative AI Usage Policy: Deviating from guidelines provided in each assignment may be considered a violation of the academic integrity policy of this course. Per our usage policy, you will be responsible for accuracy, including appropriately citing and summarizing any articles you find through AI research tools, and thus must read the material you are citing. Submitting data or research that is not real (a risk when overly relying on Generative AI) may result in an academic integrity violation for falsifying information. Additionally, there may be times, such as in-class quizzes, midterms, or finals, where Generative AI usage is prohibited. Any use of AI in those cases will be considered a violation of the academic integrity policy.

My Use of Generative AI: I will model appropriate Generative AI usage by clearly disclosing when I use it and why. Expected use cases include: creating Generative AI course tutors, revising quiz or exam questions and responses (with my oversight), drafting case studies or educational games to help connect our course topics to the real-world, using my notes and previous PowerPoints to improve the structure of my lectures so that they are clearer to you all as students, graphic design, revising assignment instructions and rubrics to improve clarity for students, receiving feedback on how I communicate with students, and using AI research tools to find current articles to update our course readings. I will never use Generative AI to grade your work.

Late Work Policy

Late submissions are accepted up to 24 hours with a 10% penalty. No submissions are accepted after 24 hours.

Attendance Policy

- All students are expected to follow proper classroom behavior and treat other students and the instructor with respect. In order to fully benefit from our class activities, you are expected to attend class and actively participate in the exercises and discussions. In cases of sickness, we want to work with you to identify alternative arrangements, but you must alert us before the class period you miss via email. Absence does not excuse a student from material covered or any activity done on that day, nor does it extend a deadline unless documentation is provided.
- Attendance is mandatory during presentation days (when you/your team or other students / teams present). If you miss any presentation day, you will be deducted 10% for each missed day on that assignment.

Email Policy

Use your OU email account to email the instructor at doga@ou.edu. Start the subject line with "[CS 5970]" for a quicker response.

Course Announcements

Announcements will be made on Canvas. Students are responsible for checking Canvas and setting notifications.

Assignment Submission & Due Dates

- Assignment submissions are only on Canvas.
- You are responsible for your submission on Canvas and that your submission is accepted on time. This includes that you have submitted the right file(s) and that the file(s) are not corrupt. Canvas does not corrupt files.
- Assignments are always due at the start time of the class that day, unless noted otherwise

University Policies

Mental Health Support Services

Support is available for any student experiencing mental health issues that are impacting their academic success. Students can either been seen at the University Counseling Center (UCC) located on the second floor of Goddard Health Center or receive 24/7/365 crisis support from a licensed mental health provider through TimelyCare. To schedule an appointment or receive more information about mental health resources at OU please call the UCC at 405-325-2911 or visit University Counseling Center. The UCC is located at 620 Elm Ave., Room 201, Norman, OK 73019.

Title IX Resources and Reporting Requirement

The University of Oklahoma faculty are committed to creating a safe learning environment for all members of our community, free from sex-based discrimination, including sexual harassment, domestic and dating violence, sexual assault, and stalking, in accordance with Title IX. There are resources available to those impacted, including: speaking with someone confidentially about your options, medical attention, counseling, reporting, academic support, and safety plans. If you have (or someone you know has) experienced any form of sex-based discrimination or violence and wish to speak with someone confidentially, please contact OU Advocates (available 24/7 at 405-615-0013) or University Counseling Center (M-F 8 a.m. to 5 p.m. at 405-325-2911). Because the University of Oklahoma is committed to the safety of you and other students, and because of our Title IX obligations, I, as well as other faculty, Graduate Assistants, and Teaching Assistants, are mandatory reporters. This means that we are obligated to report sex-based violence that has been disclosed to us to the Institutional Equity Office. This means that we are obligated to report sex-based violence that has been disclosed to us to the Institutional Equity Office. This includes disclosures that occur in: class discussion, writing assignments, discussion boards, emails and during Student/Office Hours. You may also choose to report directly to the Institutional

Equity Office. After a report is filed, the Title IX Coordinator will reach out to provide resources, support, and information and the reported information will remain private. For more information regarding the University's Title IX Grievance procedures, reporting, or support measures, please visit Institutional Equity Office at 405-325-3546.

Reasonable Accommodation Policy

The University of Oklahoma (OU) is committed to the goal of achieving equal educational opportunity and full educational participation for students with disabilities. If you have already established reasonable accommodations with the Accessibility and Disability Resource Center (ADRC), please log into iAdvise to request your semester accommodations as soon as possible and contact me privately, so that we have adequate time to arrange your approved academic accommodations. If you have not yet established services through ADRC, but have a documented disability and require accommodations, please complete ADRC's pre-registration form to begin the registration process. ADRC facilitates the interactive process that establishes reasonable accommodations for students at OU. For more information on ADRC registration procedures, please review their website. You may also contact them at (405)325-3852 or `adrc@ou.edu`, or visit `www.ou.edu/adrc` for more information. Note: disabilities may include, but are not limited to, mental health, chronic health, physical, vision, hearing, learning and attention disabilities, pregnancy-related. ADRC can also support students experiencing temporary medical conditions.

Religious Observance

It is the policy of the University to excuse the absences of students that result from religious observances and to reschedule examinations and additional required classwork that may fall on religious holidays, without penalty. [See Faculty Handbook 3.15.2]

Adjustments for Pregnancy and Related Issues

Should you need modifications or adjustments to your course requirements because of pregnancy or a pregnancy-related condition, please request modifications via the Institutional Equity Office website or call the Institutional Equity Office at 405/325-3546 as soon as possible. Also, see the Institutional Equity Office FAQ on Pregnant and Parenting Students' Rights for answers to commonly asked questions.

Final Exam Preparation Period

Pre-finals week will be defined as the seven calendar days before the first day of finals. Faculty may cover new course material throughout this week. For specific provisions of the policy please refer to OU's Final Exam Preparation Period policy.

Emergency Protocol

During an emergency, there are official university procedures that will maximize your safety.

Severe Weather: If you receive an OU Alert to seek refuge or hear a tornado siren that signals severe weather.

1. Look for severe weather refuge location maps located inside most OU buildings near the entrances.
2. Seek refuge inside a building. Do not leave one building to seek shelter in another building that you deem safer. If outside, get into the nearest building.
3. Go to the building's severe weather refuge location. If you do not know where that is, go to the lowest level possible and seek refuge in an innermost room. Avoid outside doors and windows.
4. Get in, Get Down, Cover Up
5. Wait for official notice to resume normal activities.
   Additional Weather Safety Information is available through the Department of Campus Safety.

The University of Oklahoma Active Threat Guidance

The University of Oklahoma embraces a Run, Hide, Fight strategy for active threats on campus. This strategy is well known, widely accepted, and proven to save lives. To receive emergency campus alerts, be sure to update your contact information and preferences in the account settings section at one.ou.edu.

RUN: Running away from the threat is usually the best option. If it is safe to run, run as far away from the threat as possible. Call 911 when you are in a safe location and let them know from which OU campus you're calling from and location of active threat.

HIDE: If running is not practical, the next best option is to hide. Lock and barricade all doors; turn of all lights; turn down your phone's volume; search for improvised weapons; hide behind solid objects and walls; and hide yourself completely and stay quiet. Remain in place until law enforcement arrives. Be patient and remain hidden.

FIGHT: If you are unable to run or hide, the last best option is to fight. Have one or more improvised weapons with you and be prepared to attack. Attack them when they are least expecting it and hit them where it hurts most: the face (specifically eyes, nose, and ears), the throat, the diaphragm (solar plexus), and the groin.

Please save OUPD's contact information in your phone.

NORMAN campus: *For non-emergencies call (405) 325-1717. For emergencies call (405) 325-1911 or dial 911.*

TULSA campus: *For non-emergencies call (918) 660-3900. For emergencies call (918) 660-3333 or dial 911.*

Fire Alarm/General Emergency:

If you receive an OU Alert that there is danger inside or near the building, or the fire alarm inside the building activates:

1. *LEAVE* the building. Do not use the elevators.
2. *KNOW* at least two building exits.
3. *ASSIST* those that may need help.
4. *PROCEED* to the emergency assembly area.
5. *ONCE* safely outside, *NOTIFY* first responders of anyone that may still be inside building due to mobility issues.
6. *WAIT* for official notice before attempting to re-enter the building.

OU Fire Safety on Campus

Office of Access and Opportunity's Belonging Statement

Why You Belong at the University of Oklahoma: The University of Oklahoma fosters an inclusive culture of respect and civility, belonging, and access, which are essential to our collective pursuit of excellence and our determination to change lives. The unique talents, perspectives, and experiences of our community enrich the learning, and working environment at OU, inspiring us to harness our innovation, creativity, and collaboration for the advancement of people everywhere.

Copyright Statement

Students may not share course material with individuals not enrolled in the class or upload materials to other online environments.

Tentative Schedule (Subject to Change)

Week	Topics	Tentative Key Dates
1	Introduction to Virtual, Augmented, and Mixed Reality	
2	Understanding the Graphics Pipeline	Form groups for team projects
3	Modeling the Physical World	Quiz #1; Proposal plan
4	Human Visual System (Mechanics of sight and depth cues)	Personal Assignment #1
5	Head-Mounted Displays (display fundamentals)	Personal Log #1
6–7	Audition (mechanics of hearing), audio interfaces	Quiz #2
8	Tactile immersion	Personal Log #2; Personal Assignment #2
9	Motion tracking sensors, navigation and interaction	Quiz #3
10	Inertial measurement	Project progress report

11	Human factors, health and safety issues	Quiz #4
12	User experience in Virtual Reality	Personal Log #3
13–14	Applications in VR (education, training, medical, military)	Personal Assignment #3
15	Future of Virtual Reality	Quiz #5
16	Final presentations	Peer evaluation

Note: The schedule and due dates are tentative and may be updated on Canvas.

This syllabus is intended for use on Overleaf. Hyperlinks are provided for institutional resources and the Canvas course site.