TuOpti588: Introduction to Display Science and Technology
Syllabus and Course Policies (Term: Fall 2025)

Lecture Time: Tuesday/Thursday 12:30-1:45PM Location: Rm747
Course website: D2L

Instructor information

- Prof. Hong Hua, Rm 741 (west wing)
- Email: hhua@optics.arizona.edu (Preferred method of contact)
- Office hour (zoom): Thursday 12:30-1:45PM

Zoom information

- Tuesday discussion sessions: https://arizona.zoom.us/j/84946822787
- Instructor Thursday office hours: https://arizona.zoom.us/j/85213218791

The password for joining all the zoom meetings above: opti588

Teaching modality

- This class will be taught in a hybrid modality, consisting of in-person supplemental lectures, Q&A/office hours, and guided self-study.
- In-person supplemental lecture recitations: The class will meet between 12:30 and 1:45PM on Tuesday in Meinel Rm 747 for supplemental lecture recitations. In-person attendance is mandatory for local students, while DL students are encouraged to attend these sessions via the zoom link provided above. If DL students are unable to attend these recitation sessions, you are required to watch the recorded lectures which will be available through D2L after each meeting.
- Q&A/office hour sessions: The time slots between 12:30 and 1:45PM on Thursdays will be reserved for Q&A and office hours. This time slot is reserved primarily for addressing questions you may have on recorded lectures and homework. I may also schedule guest lectures for these time slots. Q&A/office hour sessions are held via the zoom link provided above unless students are notified for in-person sessions.
- Guided self-study: All students are required to watch the pre-recorded lectures posted via D2L, following the schedules attached at the end of this syllabus.

Course description (3 credits)

The class examines the fundamentals of 2D and 3D display technologies (e.g. human visual system, color and depth perception, color theory and metrology, and state-of-the-art display technologies), display performance evaluation and calibration, and display research frontiers. The class is suited for both graduate and undergraduate students. You are encouraged to talk to the Instructor to find out if this is the right course for you.

Prerequisite

Opti 202/502 or equivalent

Desired background

Opti 340, Opti 517, Opti 506, or equivalent

Course outline

- Introduction (0.5 week)
  - How have applications been driving display developments?
  - Evolution of display technology

- Human visual system (1.5 weeks)
  - Eye anatomy and eye optics
  - Visual performance of the eye
  - Models of visual performance and photometry
- Color vision and colorimetry (3 weeks)
  - Color vision basics
  - Color matching experiments and color matching functions
  - Color systems and spaces
  - Colorimetry
- 2D display technology and operation (3 weeks)
  - Display system interfaces and performance parameters
  - CRT displays
  - Flat panel displays: AMLCD, LCOS, Plasma, OLED,
  - Projection systems
  - New display technologies: high dynamic range display, enriched color display
- Display metrology: display performance measurement and calibration (3 weeks)
  - General principles of display evaluation
  - Evaluation of 2D displays
  - Color management and calibration
- Binocular vision and 3D display technology (3 weeks)
  - Binocular vision and perception basics
  - 3D display principles and techniques
  - head-mounted displays
  - Spatially immersive displays
  - Auto-stereoscopic displays
  - Volumetric displays
  - Holographic displays
  - Human factors associated with 3D displays and 3D display evaluations

Textbook and reading

- Recommended books (PDF available under the Reference section of the D2L site)
  - Color vision and colorimetry: theory and applications (by Daniel Malacara). Book is available via http://ezproxy.library.arizona.edu/login?url=http://dx.doi.org/10.1117/3.881172
  - Electronic image display (by Jon C. Leachtenauer). Book is available via: https://doi-org.ezproxy2.library.arizona.edu/10.1117/3.2265057
  - Introduction to Flat Panel Displays, 2nd Edition, By Jiun-Haw Lee, I-Chun Cheng, Hong Hua, and Shin-Tson Wu, https://onlinelibrary.wiley.com/doi/book/10.1002/9781119282211
  - Field guide to visual and ophthalmic optics, by Jim Schweigerling (PDF also available via SPIE digital library: https://doi.org/10.1117/3.592975)
- Lecture notes will be provided.
- Supplementary readings (book chapters, articles) will be available for downloading from the course website.

Assignment and grading policy

The final grade of this course will be based on performance on (1) Written homework; (2) Exams; and (3) Final project presentation and reports. Grades in these individual items will be weighted as follows

- Written homework: 20%

- Exams
  - Term exam: 30%
  - Quizzes: 10%
- Class project (each student is required to sign up for a class project starting at the beginning of the semester. The student will perform the project through several milestones and demonstrate the completion of the project through an oral presentation and a detailed project report): 40%

The Final letter grades will not be computed "on the curve". Instead, they will be determined on a fixed scale. You are *not* competing with other students for grades. In principle, everyone in this class could fail, and similarly, everyone could earn an *A*.

Honor code

- All work in this course is to be your own, and the university honor code is in effect.
- For lecture recordings, which are used at the discretion of the instructor, students must access content in D2L only. Students may not modify content or re-use content for any purpose other than personal educational reasons. All recordings are subject to government and university regulations. Therefore, students accessing unauthorized recordings or using them in a manner inconsistent with UArizona values and educational policies (Code of Academic Integrity and the Student Code of Conduct) are also subject to civil action.

Late submission policy

No late submission is accepted for all assignments unless you receive permission from the instructor for legitimate excuses.

Accessibility and accommodations

At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, https://drc.arizona.edu) to establish reasonable accommodations.

Academic advising

If you have questions about your academic progress this semester, please reach out to your academic advisor (https://advising.arizona.edu/advisors/major). Contact the Advising Resource Center (https://advising.arizona.edu/) for all general advising questions and referral assistance. Call 520-626-8667 or email to advising@.arizona.edu

Life challenges

If you are experiencing unexpected barriers to your success in your courses, please note the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office can be reached at (520) 621-2057 or DOS-deanofstudents@email.arizona.edu.

Physical and mental-health challenges

If you are facing physical or mental health challenges this semester, please note that Campus Health provides quality medical and mental health care. For medical appointments, call (520) 621-9202. For After Hours care, call (520) 570-7898. For the Counseling & Psych Services (CAPS) 24/7 hotline, call (520) 621-3334.

Attendance policy

- It is mandatory for local students to attend the in-person recitations. DL students are encouraged to attend the recitations.
- If you feel sick or may have been in contact with someone who is infectious, stay home. Except for seeking medical care, avoid contact with others and do not travel.
- Non-attendance for any reason does not guarantee an automatic extension of due date or rescheduling of examinations/assessments. Please communicate and coordinate any request directly with your instructor.
- If you must miss the equivalent of more than one week of class, you should contact the Dean of Students Office DOS-deanofstudents@email.arizona.edu to share documentation about the challenges you are facing.
- Students are responsible for completing any work that they might miss due to illness or the need to quarantine/isolate, including lecture attendance, assignments, tests and exams.
- Students who miss a lecture or a series of lectures are required to watch the recorded ZOOM lectures and provide the instructor confirmation or feedback.

OPTI588—Tentative Lecture Schedule (Fall 2025) (Updated)

	Lect	Day	Lecture Plan	Topic	Assignment	Due
W1	1	Aug 26	Recitation	Introduction		
	2	Aug 28	Office hour	Recorded Lecture (RL)2: Human visual system		
W2	3	Sep 2	Sup. to RL2-3	RL3: Visual performance of the eye	**HW1**	
	4	Sep 4	Q&A on RL2-3	RL4: Models of visual performance		
W3	5	Sep 9	Sup. to RL4-5	RL5: Photometry and color vision introduction		
	6	Sep 11	Q&A on RL4-5	RL6: Color vision basics	**Quiz 1 (1-4)**	
W4	7	Sep 16	Sup. to RL6-7	RL7: Color models: RGB and XYZ	**HW2**	**HW1 due**
	8	Sep18	Q&A on RL6-7	RL8: Color models: Other color systems		
W5	9	Sep 23	Sup. to RL8-9	RL9: Color models: Color mixture		
	10	Sep 25	Q&A on RL8-9	RL10: Color system adaptation & transformations	**Quiz 2 (5-8)**	
W6	11	Sep 30	Sup. to RL10-11	RL11: Display system interface and CRT displays	**HW3**	**HW2 due**
	12	Oct 2	Q&A on RL10-11	RL12: Flat panel displays: LCD		
W7	13	Oct. 7	Sup. to RL12-13	RL13: Flat panel displays (plasma, DMD, OLED)		**RP1 due**
	14	Oct 9	Q&A on RL12-13	RL14: Projection display	**Quiz 3 (9-12)**	
W8	15	Oct 14	Sup. to RL14-15	RL15: Laser-based display		
	16	Oct 16	Q&A on RL14-15	RL16: Color-enriched displays		
W9	17	Oct 21	Sup. to RL16-18	RL17: HDR displays	**HW4**	**HW3 due**
	18	Oct 23	Q&A on RL16-17	RL18: flexible displays, HUD	**Quiz 4 (13-16)**	
W10	19	Oct 28	No Recitation	RL19: Color calibration of CRT and LCD	Travel	
	20	Oct 30	Q&A on RL18-19	RL20: Physical display quality measures		
W11	21	Nov 4	Sup. to RL19-24	RL21: Perceptual display quality measures		
	22	Nov 6	Q&A on RL20-21	RL22: Display utility assessment	**Quiz 5 (17-21)**	**RP2 due**
W12	23		Holiday	RL23: Recorded mid-term review		
	25	Nov. 13	Q&A on RL22-23	RL24: Binocular visual perception	**HW5**	**HW4 due**
W13		Nov 18		Term Exam		
	26	Nov 20	Q&A on RL24-28	RL26: Stereoscopic display systems		
W14	27	Nov 25	HMD tutorial PI	RL27: Head-mounted displays for VR/AR		
		Nov 27		Holiday, no lecture		
W15	28	Dec 2	HMD tutorial PII	RL28: 3D displays, autostereoscopic display systems, volumetric displays		
	30	Dec 4	Student	Final project presentations		**HW5 due**
W16	31	Dec 9	Student	Final project presentations		
W17		Dec 16-18		Final week (No final exam, FRP due)		**FRP due**

Opti588—Fall 2025 Semester Calendar

First Day of Class: August 25th, 2025

Last Day of Class: December 10th, 2025

	Mon.	Tuesday	Wed.	Thursday	Fri.	Notes
W1	08/25	Lect 1		Lect 2		Class begins
W2	09/01	Lect 3		Lect 4		
W3	09/08	Lect 5		Lect 6		
W4	09/15	Lect 7		Lect 8		
W5	09/22	Lect 9		Lect 10		
W6	09/29	Lect 11		Lect 12		
W7	10/06	Lect 13		Lect 14		
W8	10/13	Lect 15		Lect 16		
W9	10/20	Lect 17		Lect 18		
W10	10/27	Lect 19		Lect 20		FiO Travel
W11	11/03	Lect 21		Lect 22		
W12	11/10	Holiday		Lect 25		
W13	11/17	Term exam		Lect 26		
W14	11/24	Lect 27		Holiday	Holiday	
W15	12/01	Lect 28		Proj. Presentation		
W16	12/08	Proj. Presentation	Last day	Reading day		
W17	12/15					**No Final Exam**