# **COMM 3545 Human-Computer Interaction & User Experience (HCI & UX)**

School of Communication | Autumn 2022 | Section 27435

Wed & Fri 12:45 PM - 2:05 PM | Journalism 216

**In-Person & Hybrid Instruction** 

# **Instructor: Dr. Nicholas Matthews**

- Email: <u>Matthews.345@osu.edu</u> (Please include COMM3545 in subject line)
- Office: 3062 Derby Hall (Unavailable for face-to-face meetings due to COVID)
- Office hours: TBA or by appointment via Carmen Zoom: Link to meeting room

# **Course description**

This course is an introduction to human-computer interaction (HCI) and user experience (UX). The goal of this class is to help you learn how to design usable interactive technologies. To that end, we will consider what constitutes good design, we will study a variety of ways to conceptualize design problems, we will examine how users' cognitive abilities and emotions influence design, and we will learn about interfaces.

The class is designed to complement COMM3165: Evaluation & Usability Testing, which provides an introduction to research methods used in HCI and UX.

# Course learning goals and outcomes

Students who successfully complete this course will be able to:

- 1. Explain the theoretical origins for the study of HCI/UX and their application to design
- 2. Apply communication concepts and theories to interactive technologies
- 3. Develop strategies for evaluating and designing interactive technologies
- 4. Provide you with the critical skills to analyze and interpret interactive technologies
- 5. Start developing a toolkit for understanding user experience design (UXD) and conducting UX-relevant research
- 6. Illustrate your understanding of these principles through practice

## Mode of delivery

This course will be presented face-to-face (i.e., in-person). Due to COVID, we will reserve a hybrid style of instruction as a contingency. As a result, you must be prepared for a distance-learning (i.e., fully online) mode of instruction if necessary.

## **Required materials**

#### Textbooks

- 1. Sharp, H., Rogers, Y., and Preece, J. (2019). Interactive Design: Beyond Human-Computer Interaction. (5th edition) West Sussex: John Wiley & Sons, Ltd. (Note: I label this "**ID**" in the course schedule)
- Lidwell, W., Holden, K., & Butler, J. (2015). The pocket universal principles of design: 150 essential tools of artists, designers, developers, engineers, inventors, and makers. Beverly, MA: Rockport Publishers. (Note: chapters from this book are denoted by a + sign in the course schedule)

**PDFs.** I will provide PDFs of additional readings in the files section of Carmen. Please see the final section of the syllabus for a full list of all PDF readings.

## **Grading Plan**

Category	Percentage of final grade
Midterm exam	30%
Final exam	30%
Essays	25%
Class Participation	15%

## Grading policy & scale

I use the standard OSU grading scale. I do not round/bump grades. If this course is required for you to graduate or to avoid academic probation/expulsion, I expect you to perform at your best to avoid an undesirable outcome. Be proactive. Be professional.

		B+	87.00-89.99%	C+	77.00-79.99%	D-	+ 67.00-69.99%
A	93.00-100%	В	83.00-86.99%	С	73.00-76.99%	D	60.00-66.99%
A-	90.00-92.99%	B-	80.00-82.99%	C-	70.00-72.99%	F	0-59.99%

# **Course Requirements**

## Essays

There are three essays for this class, each of which involves applying course concepts to existing technologies. You will practice thinking through a design problem space, evaluate a piece of technology, and propose improvements to an existing technology. I will release specifics about each assignment about 2 weeks prior to each due date.

## Exams

There are two exams in this course. The final is cumulative. Exams questions will be generated from the material covered in class lectures and textbook readings. The exams include multiple choice, fill in the blank, and short essay questions. I will host a review session prior to each exam.

## Participation

We will often perform graded in-class activities. If you are not present in class when there is an activity, you will not receive credit for it. However, I will excuse missed activities if you email me before class begins to let me know that you need to miss class. I excuse absences due to illness, emergency, and university-recognized activities (e.g., sports, religious observance, etc.). I do not require documentation to excuse an absence. If you email me after class begins, you may still earn an excused absence, but I will apply a lateness penalty (-25% penalty after class begins then -2% for each additional hour that passes).

# **Communication Policy**

#### Please avoid the following:

- Using Canvas messages/mail. Use Buckeye email instead. Canvas messages cannot be tracked and they erase previous messages in the email chain. As a result, Canvas messages cannot be used as evidence of communication attempts.
- Unprofessional messages. Please include your course number, a salutation, and your full name along with a courteous message.
- Emails that require immediate attention. Messages will be answered within 24 hours of receipt on business days (Monday Friday) during business hours (9am 5pm). Be professional and plan ahead.
- Using non-OSU email addresses for correspondence. Only messages from OSU accounts can be tracked. Non-OSU accounts are often identified as spam.

#### What to do if you have a question:

- **First source**: Course message boards. It is likely that your question has already been answered on the discussion boards. Please post to the appropriate board to ensure an accurate and swift answer.
- Second source: The instructor. If both the message boards and your TA cannot help you, contact me at <u>matthews.345@osu.edu</u> or visit my office hours (see top to syllabus)

# **Course-Specific Policies**

**Deadlines**. All deadlines are in Eastern Time (ET).

English. You forfeit all possible points for assignments not written/spoken in English.

Late work. You may submit essays late. Lateness penalties increase cumulatively. Submitting work 1 second after the deadline yields a -2% point penalty. For each additional hour after the deadline, you lose an additional -2%. This means that you may submit work (technically) up to 48 hours after the due date.

**Unenrollment**. OSU does not recognize unenrollment as a valid excuse for missing work. If you become unenrolled from the course for any reason, it is your responsibility to contact me and establish alternative means to submit work prior to the specified deadline. If you suspect that this policy will affect you, I recommend saving the syllabus to your local computer or printing it out for reference.

**Professionalism**. You must ensure that the work you submit is correct and accessible. Submitting the wrong link, submitting to the wrong location, submitting files that are corrupt, the wrong version, the wrong format, missing components, the wrong file type, etc. is unprofessional. It is your responsibility to check the integrity of your work immediately following submission. If I cannot access your submission, you forfeit all points for your submission.

If your work is unprofessional, you may re-submit your work. If technical issues prevent you from re-submitting, you may email me your submission. If you email me work, the time that I receive your work will become the submission time used to evaluate lateness. After the deadline passes, you may re-submit work that you discover is unprofessional, but I will apply a lateness penalty to the final submission.

**Technology issues**. According to course requirements, you must have regular internet-connected access to a working computer with some form of data redundancy (e.g., One Drive). Remember that OSU's computer labs are available should you need them. Only system-level technological interruptions documented by OSU (see this page) excuse late or missing work.

If you experience a problem with OSU systems (e.g., email, Carmen, etc) not documented by OSU, you must raise a ticket with IT (<u>see this page</u>). If IT confirms your issue, we will recognize IT's confirmation as a valid excuse for missing work.

**Grade appeals**. You may send me an email to instigate a grade appeal within 1 week after the grade has been posted. An appeal is a formal process with explicit expectations. Appeals can result in an unchanged grade, a higher grade, or a lower grade. If you wish to appeal a grade, email me that you wish to appeal and then await further instructions.

**Copyright disclaimer**. The lectures and materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

**Course leave**. If you become seriously ill or something happens to you that prevents you from participating in the course for an extended amount of time (e.g., mental illness or a friend's mental illness, taking care of an immediate family member, childbirth, etc.), you may apply for course leave. You must let the instructor know of your situation as soon as practical when you become aware of the need for leave to avoid point penalties (either the day you learn of the need or the next workday). Be proactive by letting us know asap if you think you need leave. We will not grant leave retroactively. Course leave is similar to OSU's Family and Medical Leave (FML) and has many of the same rules (see here for more information). If you qualify for leave, we will allow you to make up missed work with the following point penalties:

- -0% for work due 6 days prior to notification
- -33% for work due 7-13 days prior to notification
- -66% for work due 14-20 days prior to notification
- -100% for work due > 20 days prior to notification

## Credit hour and work expectation

This class is worth 3 credit hours. According to OSU 3335-8-24 A-1, "One credit hour shall be assigned for each three hours per week of the average student's time, including class hours, required to earn the average grade of 'C' in this course." Thus, it is expected that you will spend an average of 9 hours per week for this course. We spend less than 3 hours in class; the remaining time should be devoted to reading, studying, and working on course assignments. <u>ASC Honors</u> provides an excellent guide to scheduling and study expectations.

## **Discussion and communication guidelines**

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

**Tone and civility**: Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always come across online. The instructor and TA both work very hard to provide a positive learning experience. Please keep this in mind and remain civilized and respectful in your email and discussion board communications.

**Citing your sources**: When we have academic discussions, please cite your sources to back up what you say. (For the textbook or other course materials, please use APA style. For online sources, be sure to include a link).

# **Course technology policies**

For help with your password, university e-mail, Carmen, or any other technology issues, questions, or requests, contact the OSU IT Service Desk. Standard support hours are available at <u>https://ocio.osu.edu/help/hours</u>, and support for urgent issues is available 24x7.

#### Baseline technical skills necessary for online courses

Basic computer and web-browsing skills

Navigating Carmen

#### Necessary equipment

Computer: current Mac (OS X), PC (Windows 7+), or equivalent Linux desktop/laptop with high-speed internet connection

Web cam and microphone

#### **Necessary software**

To complete this class, you will need a computer that has a webcam and microphone, and that has reliable Internet access (minimum of about 5Mbps). Most, but not all, class work can be completed using a tablet. You will also find it helpful to have access to a word processor such as Google Docs, Microsoft Word or Apple Pages. Note, OSU students have access to Microsoft Office products <u>free of charge</u>. To install, please visit <u>https://osuitsm.service-now.com/selfservice/kb\_view.do?sysparm\_article=kb04733</u>

## Carmen

Carmen, Ohio State's Learning Management System, will be used to host materials and activities throughout this course. To access Carmen, visit <u>carmen.osu.edu</u>. Log in to Carmen using your name.# and password. If you have not setup a name.# and password, visit <u>my.osu.edu</u>.

Help guides on the use of Carmen can be found at https://resourcecenter.odee.osu.edu/carmen

This online course requires use of Carmen (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations with your instructor. See <u>Carmen accessibility for more</u>.

## **Carmen Zoom**

Office hours will be held through Ohio State's conferencing platform, Carmen Zoom. A separate guide to accessing Carmen Zoom and our office hours is posted on the course Carmen page under Files.

Students may use the audio and video functions if a webcam and microphone are available. If not, there is still a chat function within Carmen Zoom for the student to live chat with the professor or TA in the virtual office hours room.

## Carmen Zoom help guide

## Turnitin

Students at The Ohio State University are accountable for the integrity of the work they submit. Therefore, you should be familiar with the guidelines provided by the <u>Committee on Academic</u> <u>Misconduct (COAM)</u> and <u>Section A of OSU's Code of Student Conduct</u> in order to meet the academic expectations concerning appropriate documentation of sources. In addition, OSU has made Turnitin, a learning tool and plagiarism prevention system, available to instructors. For this class, you will submit your papers to Turnitin from Carmen. When grading your work, I will interpret the originality report, following <u>Section A of OSU's Code of Student Conduct</u> as

appropriate. For more information about Turnitin, please see <u>the vendor's guide for students</u>. Note that submitted final papers become part of the OSU database.

Self-Service and Chat support: <u>http://ocio.osu.edu/selfservice</u>

Phone: 614-688-HELP (4357)

Email: <u>8help@osu.edu</u>

**TDD:** 614-688-8743

# **COVID-Specific Policies**

Please note that these policies may be updated to reflect changes in the epidemic, changes in our understanding of the disease, and changing University, local, state, and federal recommendations/mandates. For OSU's most current policies, visit the <u>OSU Safe and</u> <u>Healthy website</u>.

# **Vaccination**

The university requires everyone to get their COVID-19 vaccination. <u>FAQs</u> and additional information about the vaccine is available on the <u>Wexner Medical Center website</u>

# <u>Masks</u>

Ohio State continues to respond to changes in public health guidance. Ohio State's guidance on face masks was last updated April 19, 2022.

- **Masks are optional** in most settings on all Ohio State campuses, including generalpurpose buildings, residence halls, dining facilities, classrooms, offices, the Ohio Union, and on public transportation. Masks are also optional outdoors. (Read guidance for individuals for specific circumstances)
- **Masks are required** in clinical health care settings (including at the Wexner Medical Center), COVID-19 testing locations and child care centers.

Public events, such as those that take place at the Schottenstein Center and the Covelli Center, are mask optional, effective March 8, 2022.

**Please note:** The U.S. Centers for Disease Control and Prevention recommends masking in public indoor spaces for communities with "high" levels of COVID-19. Use the <u>CDC's</u> <u>COVID-19 County Check tool</u> to see your community's current level.

On July 22, 2022, the City of Columbus and Franklin County issued <u>a health advisory</u> recommending masking for all public indoor spaces and in crowded areas, regardless of vaccination status.

# Attendance

Please do not attend class if you are feeling sick. If you are absent due to illness, including but not limited to COVID, I will give you a reasonable opportunity to make up missed work. You do not need to provide a physician's document of illness, but you must let the instructor know of your situation as soon as practical when you become aware of the need for an absence (either the day you learn of the need or the next workday).

Guidance for people who test positive for COVID-19:

- Isolate at home for at least five days (from the onset of COVID-19 symptoms or from the date of test for asymptomatic positive individuals).
- You can leave your house after five days if you have no fever for 24 hours (without the use of fever-reducing medication) and no other symptoms (or your symptoms are generally resolving).

**COVID-19 Accommodations.** The university strives to make all learning experiences as accessible as possible. In light of the current pandemic, students seeking to request COVID-related accommodations may do so through the university's <u>request process</u>, managed by Student Life Disability Services. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. **SLDS contact information:** <u>slds@osu.edu</u>; 614-292-3307; <u>slds.osu.edu</u>; 098 Baker Hall, 113 W. 12<sup>th</sup> Avenue.

## **Recordings of class sessions**

I intend to post recordings of our class sessions on Carmen. These recordings are not a substitute for the in-person learning experience. Instead, they are a tool to help those who are forced to miss class on account of illness to catch up. As such, recordings may fail to capture in-class activities, they may be incomplete in other ways, or they be entirely missing (e.g., in the event of a problem with the recording technology).

# **Other related resources**

**Food Security** (<u>https://www.buckeyefoodalliance.org/</u>, 614-688-2508). The Ohio State University is committed to ensuring that all students have access to adequate and healthy food. Any undergraduate or graduate student with a BuckID may confidentially use the Buckeye Food Alliance food pantries. No proof of need is required. The pantry is located in Lincoln Tower, Suite 150 (1800 Cannon Dr., Columbus, OH 43210). Check the website or call for current hours.

**COVID-19 emergency financial assistance** (<u>https://sfa.osu.edu/contact-us/consumer-disclosure/COVD-19-aid</u>) Ohio State has emergency grants available to aid students who are facing unexpected financial challenges related to the pandemic. Students may use the funds toward any component of the cost of attendance, or for emergency costs that arise as a result of the COVID-19 pandemic such as food, housing, tuition, health care (including mental health care) or child care. Please visit the website for more information.

## **OSU Policies**

Accessibility accommodations for students with disabilities

#### **Requesting accommodations**

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#### **Student Academic Services**

Arts and Sciences Advising and Academic Services' website provides support for student academic success. Information on advising issues such as tutoring, transfer credits, academic standing, and contact information for Arts and Sciences advisors can be obtained through this website. The site is: <u>http://advising.osu.edu/welcome.shtml</u>

#### **Student Services**

The Student Service Center assists with financial aid matters, tuition and fee payments. Please see their site at: <u>http://ssc.osu.edu</u>

## **Copyright Disclaimer**

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## Diversity

The School of Communication at The Ohio State University embraces and maintains an environment that respects diverse traditions, heritages, experiences, and people. Our commitment to diversity moves beyond mere tolerance to recognizing, understanding, and welcoming the contributions of diverse groups and the value group members possess as individuals. In our School, the faculty, students, and staff are dedicated to building a tradition of diversity with principles of equal opportunity, personal respect, and the intellectual interests of those who comprise diverse cultures.

## Title IX

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at <a href="http://titleix.osu.edu">http://titleix.osu.edu</a> or by contacting the Interim Ohio State Title IX Coordinator, Molly Peirano, at <a href="http://titleix.osu.edu">titleix@osu.edu</a>

## **Mental Health**

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing.

If you are or someone you know is suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting <u>this link</u> or calling 614-292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on-call counselor when CCS is closed at 614-292-5766.

If you are thinking of harming yourself or need a safe, non-judgmental place to talk, or if you are worried about someone else and need advice about what to do, 24 hour emergency help is also available through the Suicide Prevention Hotline (Columbus: 614-221-5445 / National: 800-273-8255); or text (4hope to 741741); or <u>visit this site</u>.

#### **COVID-19 and Illness Policies**

#### Instructor illness or absence

If the *instructor* is too ill to teach the course for a period of time, the designated backup for this course will step in. You will be notified via email from the School of Communication.

#### Academic integrity policy

#### Policies for this online course

Written assignments: Your written assignments, including discussion posts, should be your own original work. In formal assignments, you should follow **APA** style to cite the ideas and words of your research sources. You are encouraged to ask a trusted person to proofread your assignments before you turn them in--but no one else should revise or rewrite your work.

**Reusing past work**: In general, you are prohibited in university courses from turning in work from a past class to your current class, even if you modify it. If you want to build on past research or revisit a topic you've explored in previous courses, please discuss the situation with me.

**Falsifying research or results**: All research you will conduct in this course is intended to be a learning experience; you should never feel tempted to make your results or your library research look more successful than it was.

#### **Academic Misconduct**

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct http://studentlife.osu.edu/csc/

# **Course Schedule**

**Note:** "**ID**" refers to the *Sharp, Rogers, and Preece (2019) Interactive Design* book. "**EBD**" refers to the *Evil by Design* PDFs in the files section of Carmen. **Individual names with** + **signs** such as +IKEA effect and +Development cycle refer to the *Lidwell et al (2015) The pocket universal principles of design* book.

Week	Dates	<b>Topics &amp;</b> <i>Readings in bullets</i>	Activities & Deadlines
	Wed 8/24	Introduction • Syllabus	•
1	Fri 8/26	<ul> <li>What is HCI?</li> <li>ID (Ch. 1)</li> <li>+Development cycle</li> <li>+Flexibility tradeoffs</li> <li>+Iteration</li> <li>+Dunning-Kruger effect</li> <li>+IKEA effect</li> </ul>	Syllabus Quiz

		What is HCI? (Continued)	
2	Wed 8/31	Usability goals & Affordances Norman (Ch. 1) <u>UX Planet: Affordances</u> +Affordance +Constraint +Errors +Forgiveness +Form follows function +Mental model +Visibility	•
	Fri 9/2	Usability goals & Affordances (Continued)	

		Usability goals & Affordances (Continued)	
3	Wed 9/7	The Design Process • ID (Ch. 2) • +Confirmation • +Consistency • +Factor of Safety • +Mapping	•
	Fri 9/9	Problem-space activity	Problem-space activity
4	Wed 9/14	The Design Process (Continued)         Design Principles: Complexity         • Norman (Ch. 2)         • +80/20 Rule         • +Control         • +Hick's Law         • +Hierarchy         • +Iconic Representation         • +Progressive Disclosure         • +Signal-to-Noise Ratio	•
	Fri 9/16	Design Principles: Complexity (Continued)	

		Design Principles: Complexity (Continued)	
	Wed		•
	9/21	Conceptualizing Design	
		• ID (Ch. 3)	
5	Fri 9/23	Conceptualizing Design (Continued) Interfaces & Interaction • ID (Ch. 7)	Problem-Space Assessment Due Friday before 11:59PM

	Wed 2/28	Interfaces & Interaction (Continued)	
6 Fri 9/30 Interfa	Interfaces & Interaction (Continued)		
7	Wed 10/5	Material catch up day	
7	Fri 10/7	REVIEW	EXAM REVIEW

	Wed 10/12	MIDTERM EXAM (In-Person)	MIDTERM EXAM
8	Fri 10/14	Autumn Break - No Class	
	Wed 10/19	Users: Cognition • EBD (pp. 69-74 & 204-210) • +Classical Conditioning • +Operant Conditioning	•
9	Fri 10/21	Heuristic Evaluation activity	Heuristic Evaluation activity
10	Wed 10/26	UX at OSU Guest Lecture Diane Meves, UX Manager	
10	Fri 10/28	Users: Cognition ID (Ch. 4) +Performance Load +Depth of Processing +Entry Point +Horror vacui +Legibility	•

		Users: Cognition & Affect	
	Wed 11/2	<ul> <li>EBD (pp. 41-50)</li> <li>+Chunking</li> <li>+Interference effects</li> <li>+Serial position effects</li> <li>+Stickiness</li> <li>+Von Restorff effect</li> </ul>	•
11	Fri 11/4	Users: Affect ID (Ch. 6) Shneiderman (pp. 406-411) +Aesthetic-usability effect +Biophilia effect +Contour bias +Mere exposure effect +Performance vs. preference +Wabi Sabi	Heuristic Evaluation Due Friday before 11:59PM
	Wed 11/9	<ul> <li>Users: Affect &amp; Motivation</li> <li>Shneiderman (pp. 416-420)</li> <li>+Threat detection</li> </ul>	
12	Fri 11/11	Veterans Day - No Classes	

	Wed 11/16	Users: Motivations & Individual Differences • EBD (pp. 69-74 & 145-161) • +Flow • +Gamification • +Supernormal stimulus	Redesign Activity
13	Fri 11/18	Users: Social Sharp (Ch. 5) +Anthropomorphism +Attractiveness bias +Crowd intelligence +Expectation effects +Face-ism +Immersion +Uncanny valley	•
14	Wed 11/23	Thanksgiving Break - No Class	
	Fri 11/25	Indigenous Peoples' Day - No Class	

	Wed 11/30	Users: Social <ul> <li>Khatchadourian (2015)</li> </ul>	•
15	Fri 12/2	<b>Prototyping</b> • <i>ID (p. 421-434, 447-453)</i>	Redesign Due Friday before 11:59PM
16	Wed 12/7	REVIEW	Exam Review Day
Finals Week	Fri 12/9 Thur 12/15	In-person Final Exam 12/12 (Monday) from 4:00 pm - 5:45 pm	FINAL EXAM

## **Course reading list**

Buolamwini, J. (2016). How I'm fighting bias in algorithms. Talk for TEDxBeaconstreet. Link to source

Harris, T. (2016). How technology is hijacking your mind: From a magician and Google's design ethicist. *Medium*. Link to source

Nodder, C. (2013). Evil by design: Interaction design to lead us into temptation. Wiley & Sons.

Norman, D. A. (1988). The psychology of everyday things. Basic Books.

Plattner, H. (2020). An introduction to design thinking: Process guide. Stanford University

Schell, J. (2014). The art of game design: A book of lenses. CRC Press.

Shneiderman, B., Plaisant, C., Cohen, M. S., Jacobs, S. M., & Elmqvist, N. (2017). *Designing the user interface: Strategies for effective human-computer interaction* (6th ed.). Pearson.

Teehan, G. (2016). Reactions: not everything in life is likable. Medium. Link to source