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Art & Design Course Resources

This guide is a curated list of resources and essential production tips for a variety of media types. Students in Penn State's DMD program will refer to this guide during upper level courses where they are expected to conduct their own research and manage production steps independently.

Projects can leap between media and straddle disciplinary boundaries — but these resources had to be organized somehow! — so explore these pages as needed and don't feel constrained by these specific categories.

Media Categories

- [2D and 3D Animation](#)
- [Apps and Interactive Media](#) (VR, AR, and games)
- [2D Design and Illustration](#)
- [Web Design and Development](#)
- [Video Production and Photography](#)
- [Audio Production and Recording](#)
- [Products, Services, and UX](#)
- [Installations and Objects](#) (digital fabrication, art objects, prototypes, and exhibitions)

Each page describes potential project types, a recommended production timeline, and a proof of concept that you will produce early on to confirm your plan with your instructor.

If you have a project idea that doesn't fall within one of these categories, just get in touch with your instructor!

Portfolio Tips

Creating a portfolio is not a requirement for any DMD courses, but it is essential to most creative fields and something that students frequently ask about. Learn more about documenting your work and creating a website on the [Portfolio Tips](#) page.

2D and 3D Animation Projects

You can easily combine 2D and 3D animation techniques, and/or [live video](#) footage.

Types of 2D Animation Projects

1. Narrative short film
2. Explainer animation ([Vox](#) makes a lot of fun infographic style videos)
3. Motion graphics (bumper animations, commercials, titles, user interface elements in 3D environments)
4. Experimental or non-narrative content: [Examples on vimeo.com](#)
5. Scientific or data-driven simulations and visualizations
6. VJ loops for live performances
7. Projection mapping (projecting video onto structures or surfaces)
8. Web-based animation (HTML/CSS/Javascript)

Note about short films: Short films can often be one of the most compelling means of storytelling. They can sometimes be completed by one person over the course of multiple years, or by a skilled team in a few short months. It is unusual for a short film to be quickly created by only one person, as there are many production requirements that take time to produce. If you would like to create a short film, consider assembling a team with complimentary skills, or choose an animation process and style that can be rapidly produced if you are working solo. You can outsource pre- or post-production tasks and focus on your core production interest.

Production requirements

The following are common production requirements for most types of animations, and may include more or fewer depending on the project. They can also occur in different orders, but in general, if these steps are followed, you are more likely to produce a successful animation.

After creating a script and storyboard, you will have to choose one or more software tools to create your video and audio elements. If you're unsure which of the following software to use, ask your instructor!

1. Research

- Brainstorm ideas and research relevant work or subject matter.
- Collect inspiration images or clips to show the visual style you're aiming for.
- Write a short synopsis of narrative work.
- [Concept art playlist on Youtube](#)
- [Creating mood boards](#)
- [InVision](#) (collaborative inspiration board tool)

2. Storyboarding

Make a storyboard! (Even if you use stick figures). This helps you plan your shots and visualize things. Don't forget to number your scenes and shots.

This is a great place to decide on your aspect ratio (traditionally 16:9 but it depends on your distribution format and creative goals).

- [Storyboarding for film and animation](#)
- [Storyboard Templates](#)
- [Storyboarder App](#)

3. Script

For scripted narrative work, obviously write a script. Experimental or documentary work might not include this step.

- [Scrivener](#)

- [Final Draft](#)
- [Screenplay Formatter for Google Docs](#)

4. Animatics

Place images from your storyboard into a video editor (such as Adobe Premiere) and edit them into a rough sequence to figure out the timing and length of your animation.

- [Animatic Foundations: Storyboarding](#) (LinkedIn Learning)
- [Example of animatic](#) (animated storyboard) from Into the Spiderverse

5. Adding Sound

See the [audio page](#) for more.

- [Sound foley](#)
- [Recording narration and actor dialogue](#)
- [FreeSound](#) — Library of Creative commons sound effects
- [Free Music Archive](#) — Library of creative commons music

6. Testing

Do a proof-of-concept (see below for more) to test out your entire workflow: video codecs, renders, lighting, animation, and simulation as needed.

7. Animation production

- Traditional animation
 - [LinkedIn learning path](#)
 - Tools: [ToonBoom](#), [Blender grease pencil](#)
 - [How to create a hand-drawn whiteboard animation](#)
- Motion design
 - [LinkedIn Learning path](#)
 - Tools: [AfterEffects](#), [Cinema 4D](#)
 - [AfterEffects CC 2019 Essential Training: The Basics](#) (LinkedIn Learning)
 - [AfterEffects Character Animation](#) (LinkedIn Learning)
 - 3D animation and simulation
 - [Animation pipeline](#) (LinkedIn Learning)
 - [Blender](#) — Open source and free! Include tools for modeling, shading, sculpting, animating—the works!
 - [Essential Training on LinkedIn Learning](#)
 - [Blender Guru](#) YouTube channel
 - [Autodesk Maya](#)
 - [Houdini](#)
 - [3D Realtime film](#)
 - [Cinema 4D](#) — Integrates with Adobe AfterEffects to easily mix 3D elements with 2D animation or video.
 - Your Adobe subscription includes a copy of Cinema 4D Lite; learn more about how to [access that and integrate with AfterEffects](#). [ZBrush](#) — A powerful sculpting tool for organic shapes and more.
 - Animation for the Web
 - [Three.js](#) — Complex but powerful framework for generating 3D animations in the browser; requires serious coding.
 - [CSS Animation Basics](#)
 - [Animating SVG illustrations with CSS](#)
 - [Interneting is Hard](#) — Basic HTML and CSS tutorials.

1. Scoring

With some MIDI software, it's pretty easy to make some ominous synth tracks or arpeggiated melodies, but you can also find creative commons music to use in your projects with attribution.

MIDI is a standard type of virtual instrument (i.e. digitally creating sounds on your computer); some audio programs are geared toward recording analog sound.

- [GarageBand](#) — Simple MIDI instruments and editing.
- [Premiere Pro](#) — Edit audio right in your video editor or export entire projects to Audition...
- [Adobe Audition](#) (LinkedIn Essential Training) — Dedicated audio editor, record and mix, easily interface with Premiere (no MIDI instruments)
- [Ableton Live](#) (LinkedIn Essential Training) — Great MIDI and recording suite, relatively cheap, great for electronic music.
- [Logic Pro](#) — Record and mix, MIDI instruments (especially ones that sound like traditional strings, brass, etc.)
- [Pro Tools](#) — Industry standard for recording and mixing; expensive.
- [Audacity](#) — A free open-source audio editor. It's pretty simple, so use Adobe Audition if you can.

2. Effects, editing, compositing, rendering

- Editing
 - What is a non-linear editor? ([NLE](#))
 - [Adobe Premiere Pro Essential Training](#) (LinkedIn Learning)
 - [Basic cuts](#) (Film editing crash course)
- Effects
 - [Adobe AfterEffects](#) — Add complex animation or special effects to Premiere clips or export standalone video.
 - [DaVinci Resolve](#) (LinkedIn Learning) — An NLE but most commonly used for color grading
- 3D Compositing
 - [Natron](#)
 - [Nuke](#)
 - [Blender compositing](#)

3. Audio Editing and Mixing

Editing refers to placing and layering sounds in your timeline, including sound effects, music, and vocals; mixing is the process of getting them all to sound good together (now you can show off to your friends at the Oscars).

You can do all of this in a video editor like Premiere, but you can do some fancy stuff like [noise removal](#) if you export clips or your entire timeline into Audition.

- [Mixing Audio in Audition and Premiere](#)
- [How to export Premiere Audio to Audition](#)

4. Exporting

It's a good idea to test your workflow entirely with a proof of concept (see below) to make sure the final product looks the way you expect it to. You don't want to spend two hours rendering your video at midnight and have it turn out all squished and weird looking.

Video files include a container (a.k.a. file extension) and a codec (specific algorithm used to encode the frames of the video).

Containers:

- MOV and MP4 — Great, often what your video files are straight off the camera, and good for exporting high-quality master files.
- WebM — For video on the web; use this to get really small file sizes if you need to put your video on a website without something like YouTube or Vimeo. MP4 can also be used for this. Websites like [Converterpoint](#) are your best bet for generating these files; they'll get smaller file sizes than Premiere.

Codecs:

- h.264 and h.265 — Lossy, compressed video; h.264 is the standard codec used by most cameras, phones, and web players. Its successor is newer and will get smaller file sizes relative to quality, but may not be supported in some contexts. This is probably fine for most contexts.
- ProRes — Lossless, compressed video; this will give you better quality but potentially huge file sizes. Only use this for your main source copy of the project or potentially projecting in a theater. Not for online distribution. There are [a few types of ProRes](#) depending on your quality/filesize desires.

Frame Rates:

Typically stick with the frame rate of your source footage, though it is possible to mix frame rates within a single timeline.

- 30fps or 29.97fps — Standard video frame rate; can give a slightly "day time television" look to things.

- 24fps — The standard for film; use this for a slightly choppier, more cinematic look.

Frame Size

- 3840px x 2160px — 4K; probably overkill unless you have a 4K monitor or projector to display your work on. Useful if you want the freedom to crop shots without losing quality.
- 1920px x 1080px — Standard HD
- 1280px x 720px — "720p" HD; sometimes nice for web uploads.
- 640px x 480px — SD; hilariously small and to be avoided unless you're putting the video on the web.

Proof of concept

The goal of an animation proof is to demonstrate that you can operate the necessary software and show that you can a strong grasp of animation principles. Choose one of the following based on your project interests:

1. **Traditional keyframe animation:** Demonstrate knowledge of keyframe animation and 12 principles by creating a few seconds of animation using a character or other content from your proposal concept. ToonBoom is the industry standard animation package, but others are acceptable.
2. **Motion design:** Create a few seconds of rendered animation using a 2D animation package like Adobe AfterEffects or 3D software such as Cinema 4D, Blender, Maya, or similar. You can also achieve motion design for the web using Adobe Animate CC.
3. **Other animations:** Create an example animatic (blocked animation and sound), animated character rig, or other animated asset relevant to your concept that demonstrates you can complete the core technical challenge of the project.

Graphic Design, 3D Rendering, and Illustration

Whether creating work to tell your own story, or developing branding to communicate the message of a client, this type of visual design can take many forms.

For long term projects, ensure that you are producing an appropriate amount of work. So rather than a single logo or poster, you might develop a series of images or variations for diverse use cases.

Project types

- Branding and/or print design
 - Design system or standards manual
 - Logo design
 - Stationary or merchandise design
- Posters and Infographics
- Typeface design
- Digital illustrations
 - Concept art for pre-production (character, vehicle, environment design for comics, games, film, etc.)
 - Sequential comics (print or web)
 - Digital children's book (for iPad or mobile device)
- Architectural renderings
- Product renderings
- App or website mockups (see those respective development pages for more)
- Data visualizations or Infographics
- 2D or 3D assets for games including character design and environment design
- Code-generated art

Production requirements

1. Research

- Visual and theoretical works and publications that can provide a context for your work.
- Collect inspiration images.
 - [Rebrand](#) — Gallery of real world branding work
- For branding projects, complete a [branding research document](#).
- [Creating mood boards](#)
- [Dribbble](#) — A great showcase of work in UI, branding, illustration, typography, etc.
- [Designing Brand Identity](#) by Alina Wheeler and Debbie Millman (PSU Library eBook)
- [Everything you need to know about Design Systems](#)
- [Logo Lounge Annual Trend Reports](#)

2. Design ideation

- Generative processes including kit bashing, photo bashing, or other means.
- Thumbnail sheets
- Create low fidelity sketches to arrive at a design direction.
 - Traditional drawing
 - Digital illustration
 - Digital design
 - Digital art

3. Design iteration and improvement

- Image Assets

- [The Noun Project](#) — Creative commons vector icons
- [Unsplash](#) — Creative Commons stock photos
- [Pexels](#) — More CC stock photos
- Typography
 - [Google Fonts](#)
 - [Adobe Fonts](#)
 - [FontShare](#) — Excellent library free, high-quality variable fonts.
 - [Font Squirrel](#)
 - [Butterick's Practical Typography](#) — Short but insightful guide to type principles
 - [Web Typography Learning Game](#) — Useful for any type context
- Software
 - Adobe Illustrator — Vector editor; great for logos, screen design, layout, illustration.
 - A few [tutorials](#) on making [simple illustrations](#) in [Illustrator](#)
 - Adobe Photoshop — Raster editor; great for editing photos and digital painting.
 - Removing images from backgrounds with the [Select and Mask tool](#).
 - Adobe InDesign — Dynamic Publication editor; great for multi-page documents or anything with a lot of text and images assets.
 - Sketch — A paid vector editor favored in software industries, includes powerful collaboration tools.
 - Adobe XD — Design UI screens and connect them to make interactive prototypes; more limited in visual design than Illustrator.
 - Figma — Free cloud-based design app, excellent collaboration and prototyping features.

1. Packaging and presentation.

Consider how to present your work in a professional distribution package. How can you provide context for your design beyond simply exporting some JPEGs?

- Project website
- Printing a physical book
- Poster prints
- Formatting for digital devices
- Digital publication (PDF)

Proof of concept

A proof of concept should demonstrate drawing skills, ability to use the elements and principles of design, and proficiency with your software of choice. Showing process is important for the proof of concept, consider recording your screen, show ideas written on paper or journal, and your ability to approach a personal or client project critically and with an industry standard process.

Realtime Interactive

Types of Realtime Interactive Projects

- Augmented/Virtual Reality (AR/VR) games, visualizations, architecture, and journalism.
- Interactive 2D or 3D fiction or non-fiction story
- 2D or 3D video game, ideally something [creative](#) or [serious](#)
- Physical game (printed boards, cards, and/or 3D objects)
- Projected or screen-based interactive installation art
- Physical computing project (Arduino, Raspberry Pi, etc.)
- Creative coding projects (e.g. Processing)
- Apps for mobile devices or desktop.
 - For designer-friendly app prototypes, see the [UI/UX page](#).

Note about realtime interactive projects: These projects are incredibly engaging and exciting means of communication. Depending on the scope of the project, they can be [produced in a few days on a train](#), or they can sometimes take multiple years by a skilled team in a few short months. It is unusual for an interactive project to be quickly created by only one person, as there are many production requirements that take time to produce. If you would like to create a project like this, consider assembling a team with complimentary skills, or if working solo, choose a style and assets that afford rapid production. You can outsource pre- or post-production tasks and focus on your core production interest.

Example projects

- 3D game and immersive environments
 - [PlayCanvas.com](#) (web-first game engine)
 - Blender to Unity pipeline
 - [CG Masters](#)
 - [Lynda.com listing](#)
- Augmented Reality (AR)
 - [AR with Unreal Engine](#)
 - ARKit and Unity
 - [Lynda.com: Build a Drivable Car in Augmented Reality](#)
- Apps
 - [Apple Design Awards](#) Best iOS apps
 - [Somebody app](#) — Conceptual artwork by Miranda July
 - [After Ice](#) — Climate change visualization app
- AR: XCode and UnrealEngine
 - [Using XCode and Unreal together](#)
- Virtual Reality (VR)
 - Fundamentals
 - [Mixed Reality Development Fundamentals](#)
 - [Getting started with VR in Unity](#)
 - [Getting started with VR in UnrealEngine4](#)
 - [Web VR Showcase](#) (built with A-frame web framework.)
- Computer vision and SDK
 - [Processing](#)
 - [Open Frameworks](#)
 - [Pure Data](#)
 - [MaxMSP](#)
- Motion capture

- [Kinect and Blender](#)
- Physical Computing
 - [Adafruit projects, guides, and shop](#)
 - [Arduino art projects](#)
 - [Physical computing examples](#)

Production requirements

1. Research

- Brainstorm ideas and research relevant work or subject matter.
- Collect inspiration images or clips to show the visual style you're aiming for.
- Write a short synopsis of narrative work.
- [Creating mood boards](#)
- [InVision](#) (collaborative inspiration board tool)

2. Storyboarding or Wireframing

Storyboards can still be useful for interactive software or physical installations! Outline the sequence of events in your head. For apps, you would typically produce a simple wireframe using sketched screens or post-its to figure out the how users would navigate your interface.

- [Storyboarding for film and animation](#)
- [Storyboard Templates](#)
- [Storyboarder App](#)
- [Wireframing Best Practices](#) (Practical UX Weekly on LinkedIn Learning)
- [Illustrator for UX Design](#) (LinkedIn Learning)
- [Wireframing in Adobe XD](#) (LinkedIn Learning)
- [InVision Prototyping Tool](#) — Turn sketches or screen designs into an interactive prototype.

1. Asset production

Prepare images, sounds, 3D models, textures, or other assets you will need for your project.

- Game assets (3D models, textures, etc.)
- Physical materials or electronic hardware
- UI elements or designs

2. Interactive media production

- Game Production
 - [Game production pipeline overview](#)
 - [Unity 5: 2D Essential Training](#) — Build a simple sidescroller game
 - [Unity 3D Essential Training](#)
 - [Creating Mobile games with Unity](#)
 - [Swift 5 Essential Training](#) for iOS games.
- App Development
 - [iOS vs. Android](#) — If you have a Mac, developing for iOS or Mac OS is typically easier because Apple's [Xcode](#) development tool includes limited visual design tools, but you will still need to program in Swift to one extent or another.
 - [Xcode 11 Essential Training](#)
 - [Beginner's Guide to Web App Development](#) — For advanced coders only.
- Physical Computing
 - [Arduino Learning Pathway](#) (LinkedIn Learning)
 - [Adafruit projects, guides, and shop](#)
- Physical Games

There are many sites that will print custom boards and cards, as well as mail-away 3D printing services. Do some searching and contact your instructor for tips.

Proof of concept

The goal of a proof is to demonstrate that you can operate the necessary software, create needed assets, and show that you have a strong grasp of relevant production principles.

Produce a basic example of a realtime project in your chosen software production pipeline that demonstrates you are capable of manipulating digital assets and code. This should be an exported runtime application compatible with Mac OS or Windows, or video documentation of a functional device.

For physical games or interactive projects, produce a low fidelity prototype.

Audio Projects

Types of Audio Projects

- Podcast
- Audio tour or [site-specific](#) experience
- Experimental installation (something that explores the possibilities of sound and perception)

If you are interested in creating an audio-focused project, it would be good to include some visual component such as branding designs, supplemental images/video, documentation, or a user interface for accessing and distributing the work. Talk to your instructor for more ideas.

Production requirements

Depending on the type of project, you may need more or fewer steps than what are listed here.

1. Assess Hardware Needs

Audio Recording Starter Kit

- Microphone(s) — Here is a detailed [overview of common microphone types](#).
 - Dynamic: Less sensitive, hold close to speaker, good for interviews in loud spaces.
 - Condenser: More sensitive, record far away sources (including background noise...)
- Digital Audio Interface — Connect microphones to your computer; converts analog audio signals into digital ones. USB mics include a built-in version of this, but you'll get better quality with a truly analog mic and a separate interface box.
- Portable recorder — All-in-one device with built-in mics! If you are on the tightest budget, you can manage an awful lot with one of these. [Zoom recorders](#) are industry standard and come at a variety of price points.
- Headphones — Avoid anything with "bass-boosting technology" or earbuds. You want a nice even sound.
- Speakers — Monitors or bookshelf speakers are the best bet; prioritize even sound reproduction over loudness or bass-boosting.

2. Synopsis

- Write a short synopsis of the work.
- Find examples of similar media to study and draw inspiration from.

3. Script

For scripted narrative work, obviously write a script. Experimental or documentary work might not include this step.

- [Scrivener](#)
- [Final Draft](#)
- [Screenplay Formatter for Google Docs](#)

1. Sound recording

- [Sound foley](#)
- [Recording narration and actor dialogue](#)
- [FreeSound](#) — Library of Creative commons sound effects
- [Free Music Archive](#) — Library of creative commons music
- [ZenCaster](#) — Great tool for recording remote audio conversations between two people.
- [Beginners guide to microphone types](#)

2. Scoring or Original Production

- [GarageBand](#) — Simple MIDI instruments and editing.
- [Premiere Pro](#) — Edit audio right in your video editor or export entire projects to Audition...

- [Adobe Audition](#) (LinkedIn Essential Training) — Dedicated audio editor, record and mix, easily interface with Premiere (no MIDI instruments)
- [Ableton Live](#) (LinkedIn Essential Training) — Great MIDI and recording suite, relatively cheap, great for electronic music.
- [Logic Pro](#) — Record and mix, MIDI instruments (especially ones that sound like traditional strings, brass, etc.)
- [Pro Tools](#) — Industry standard for recording and mixing; expensive.

3. Mixing and Mastering

- Mixing — Balancing and dynamic adjustment for all channels.
 - [Mixing and Buses in Audition](#)
 - [Adobe Audition: Mixing Music and Dialogue](#)
- Mastering — Refining the primary exported file.
 - [Audio Mastering Techniques](#)

4. Distribution

You'll want a high quality source copy of your project, but if you're uploading your project to the web, podcast services, or physical playback devices, you will probably want a smaller file size.

- [Guide to sample rates and bit depth](#)
- Filetypes to Know:
 - WAV - Uncompressed, high quality, high filesize
 - MP3 - Lossy compression, low quality, loq filesize
 - FLAC - Lossless compressions, high quality, high filesize

Proof of concept

Demonstrate your filming or editing abilities with one of the following:

- Vignette: <https://vimeo.com/337054827>
- A sample scene or interview
- Video and audio example for an experimental project

Physical Installations and Objects

Digital tools offer many ways to shape experiences in the real world and work with physical materials in extraordinary ways. This page is for anyone building things, installing objects in a physical environment, or using digital fabrication techniques like 3D printing to create artworks or designs.

Example projects

- Physical art object(s)
- Installation or exhibition
- Detailed proposal for an exhibition
- Speculative installation
- Design-based community event or festival
- Curation of an art or design exhibition
- Public art or intervention
- Fabricated designs or prototypes

Note about design projects requiring fabrication equipment: If you are interested in using PSU Main Campus fabrication equipment including laser cutters, 3D printers, CNC Routers, water-jet cutters, etc., you must coordinate a time to visit, complete requisite safety training in advance, and schedule a time on the required machines. Contact your professor for more information. Depending on your location, it is often less expensive to pay for an object to be fabricated using an online service or local company rather than paying for travel and lodging to come to Penn State Main Campus.

Production requirements

1. Research

- Evaluate previous events that were similar to this one
- Identify stakeholders or exhibition locations
- Research potential materials or fabrication techniques
 - 3D Printing
 - [Shapeways](#) — Mail order printing service
 - [Recommended commercial 3D printers](#)
 - [RepRap](#) — Open source design for building a printer
 - Plotters and Cutters
 - [Recommended home cutters and plotters](#) — These can cut paper and draw according to a digital design.
 - [Ponoko](#) — Mail order laser cutting and related fabrication
 - Electronics
 - [Adafruit projects, guides, and shop](#)
 - [Arduino art projects](#)
 - [Physical computing examples](#)

1. Project goals

- How will you measure the success of your project?
- What new skills or materials will you need to acquire?
- Do you need the participation of outside parties?

2. Branding, website, other event infrastructure

- Consider how to advertise your project if you want to attract a public (or online) audience.

3. Identify a venue or location

4. Create a budget

5. **Identify team members or volunteers if needed**
6. **Production of printed or fabricated materials, props and other objects**
7. **Create a call for participation, event registration, or other invitations for event attendance**
8. **Participate or observe hosted event or intervention**
9. **Event documentation and outcomes**
 - If you don't get a photo, did it really happen?
 - Good video documentation is hard, you may need multiple camera and microphones to get enough footage. See the video page for suggestions.
 - Phone cameras are pretty darn good these days, but it's still better to use a DSLR or Mirrorless camera if possible to get really stellar photos. Lighting may also be key.
 - [Studio photography of small/medium objects](#)

Proof of concept

Exhibition or public project: Create a detailed proposal including materials, budget, diagrams, and an outline of your production timeline.

Fabricated art or design object: Create a prototype or detailed digital mockup.

Product, service, UI/UX

This category could include real-world commercial projects, speculative design, or more in-depth research projects.

To participate in a real-world project, you will need to locate a client — a company, event, organization, group, etc. — that has a specific challenge. You can then work with the client to design a solution that meets a need or opportunity. Whether you are working with web and information technology, or 3D printing physical prototypes, many aspects of the design process will be similar.

Depending on the deliverable, you may want to explore related media pages for technical and process tips.

Types of product or service projects

- Functional mobile or web app
- High fidelity interactive mockups (UI)
- Speculative or discursive design projects
- Comprehensive user experience (UX) research
- Instructional design product
- Digital fabrication products or prototypes (handheld objects, furniture, wearables, clothes, toys, etc.)
- Physical computing or Internet of Things (IoT) device

Production requirements

1. Research, design thinking, and ideation

- Design Frameworks
 - [IDEO Design Kit](#)
 - [Stanford D.School](#)
 - [Universal Methods of Design: 100 Ways to Research Complex Problems, Develop Innovative Ideas, and Design Effective Solutions](#)
- Specific UX Methods
 - [Types of UX research tools and when to use them](#)
 - To *understand* a problem
 - Interviews (see [suggestions for user interviews](#))
 - Surveys (Google Forms, etc.)
 - Field studies
 - Data analytics
 - To *define* a problem
 - Themes and insights
 - [Affinity Maps](#): A workshop-style method for organizing research findings and design ideas.
 - Competitor testing (notes taken while critically examining existing tools)
 - [Journey Maps](#): What happens during the user's experience from awareness to desired outcome?
 - [Empathy Maps](#): What does a hypothetical user feel, think, say, and do? Who are they?
 - [Personas](#): Imagining specific hypothetical user biographies.
 - Counterpoint: [Are personas a useful tool?](#)
 - Focus on user needs not their biographical identities.
 - To *explore* a problem
 - [Card sorting](#)
 - [User Flows](#): A flowchart depicting a subsection of the larger user journey, focusing specifically on the use of the software or tool.
 - Low-fidelity prototyping (paper or digital wireframes in Figma etc.)
- Branding

- For branding projects, complete a [branding research document](#).
- [Designing Brand Identity](#) by Alina Wheeler and Debbie Millman (PSU Library eBook)
- [Guide to Successful Brand Positioning in Your Market](#)
- Design Systems
 - [Everything you need to know about Design Systems](#)
- Mobile App design
 - [Mobbin](#) — Gallery of real world mobile app screen designs.
 - [PageFlows](#) — Excellent gallery of user flow videos from apps and websites.
- 2. Prototyping and production
 - CAD modeling
 - [Rhino3D](#) (recommended)
 - [SolidWorks](#) (free access to PSU students)
 - [AutoCad](#) (free education license available)
 - Polygonal/Nurbs modeling
 - Blender, Autodesk Maya, Maxon C4D, Foundry Modo
 - Digital fabrication
 - [3D printing](#) — Shapeways will print designs and mail them to you.
 - [Laser cutting](#)
 - Advanced fabrication: CNC Routing, turning, and milling, water-jet cutting (using fabrication equipment requires proximity to PSU Main Campus and coordination with facility operators in advance)
 - Device programming: [Arduino](#)
 - UI/UX Design
 - [LinkedIn Learning UX Learning Pathway](#)
 - Software
 - Illustrator: Powerful vector editor
 - Adobe XD: Design UI screens and prototype navigation with links and interactions.
 - [Figma](#): Web app for responsive UI design, interactions, prototypes, and collaboration.
 - [Sketch](#): UI Design and prototypes; web app or MacOS.
 - [Framer](#): Web app for UI design and prototypes
 - [Flinto](#): MacOS app for UI designs and prototyping; used in-house at Apple.
 - Product Mockups
 - [Free Mockup](#): Photoshop templates for displaying 2D designs on business cards, t-shirts, etc.
 - [Mockups Design](#): More Photoshop templates for product images
 - UX Research
 - A project in this area could take the form of a case study, video presentation, website, or other means of communicating in-depth research into a particular experience design.
 - [Complete beginner's guide to UX research](#)
 - [How to write a UX case study](#)
 - [Collection of case studies](#)
 - More UX case studies:
 - [Cujo](#) app and branding for home security
 - [Uber] app design
 - [Red Pen](#) design feedback app
 - [Data Visualization Learning Path](#) (LinkedIn Learning)
 - Web design and development
 - Website dev tools and technology: [VS Code](#), [Github](#), [Git Pages Tutorial 1](#), [Git Pages Tutorial 2](#), [Webflow](#) — See web page for more.
 - **Everything list:** [Extensive list of web tools and technology](#)
 - App Development
 - [FlutterFlow.io](#) – Visual low/no-code app development software
 - [Xcode](#) — Apple's development suite for iOS; generally easier than developing for Android as it has a visual editor in addition to coding. Still a ton of work to program anything complex. Stick to something simple if you're new to this.

3. Testing and analysis

- User testing
 - Conduct a survey online
 - Get your friends to test your prototype
 - Use structured feedback questions to get useful data
- Performance testing
- Accessibility evaluation
- Heuristic evaluation: comparing your design to industry benchmarks for usability. The [10 Usability Heuristics](#) from the Neilson Norman group are commonly used.

4. Iterate

- Keep refining and testing ad infinitum!

Proof of concept

The goal of a proof is to demonstrate that you have a strong grasp of relevant research, design, fabrication, and/or development principles.

- For a product or service, a low or high fidelity mockup would demonstrate the essential functionality of your idea.
- For a research project, you could collect some test data and compose a brief presentation of your research, or demonstrate your plan to collect primary data and outline any testing or visualization strategies.

Video Production and Photography

Types of video projects

- Narrative short film — Something with characters and a plot.
- Experimental film — [Examples on vimeo.com](#)
- Documentary short
- Animations — See Animation page 😊

Types of Photography Projects

For long term projects, you would likely be creating a series of photos, that could be collected in formats like:

- Physical exhibition
- Virtual exhibition
- Digital/Print publication

Your photography could be journalistic, artistic, staged, or blended with other media.

Production requirements

Depending on the type of project, you may need more or fewer steps than what are listed here.

1. Assess Hardware Needs

For some projects, you may need access to professional video and audio equipment, though a lofi aesthetic or concept related to everyday devices might work well with phone cameras. A smartphone camera limits you to very [wide angle lens](#), but filmmakers like Stephen Soderbergh have shot feature films with them! But if you're interested in these producing this kind of media professionally, it is probably worth investing in some hardware.

Student discounts are offered at [B&H](#) and [Adorama](#) and many manufacturers offer refurbished gear at slight discounts (as does B&H). You can also find kits that package the essential items together for a reduced price.

Video Production Starter Kit

- DSLR or Mirrorless Camera — offers greater [depth of field](#) and lens customization than a camcorder, and finer control of exposure, frame rate, and settings, than a smartphone.
- Tripod — Required for most professional video work.
 - [Smartphone tripod](#) — If shooting with a phone, you can still get a tripod!
- Shotgun (Hypercardioid) Microphone — Best for directional recording if your subject is speaking; Rode makes good ones for DSLR cameras.
 - For recording sound effects or voiceovers, see the recommendations on the [audio page](#).
- Lighting: a [reflector board](#) or piece of white foamcore can reflect light towards your subject, but electric lights on stands are best for stationary indoor photography.

2. Discover and Define

- Brainstorm ideas and research relevant work or subject matter.
- Collect inspiration images or clips to show the visual style you're aiming for.
- Write a short synopsis of the video work.
- [Creating mood boards](#)
- [InVision](#) (collaborative inspiration board tool)

3. Storyboarding

Make a storyboard! (Even if you use stick figures). This helps you plan your shots and visualize things. Number your scenes and shots and check them off during production (e.g. you forgot to show the character putting on the hat—oops!).

This is a great place to decide on your aspect ratio (traditionally 16:9 but it depends on your distribution format and creative goals).

- [Storyboarding for film and animation](#)
- [Storyboard Templates](#)
- [Storyboarder App](#)

4. Script

For scripted narrative work, obviously write a script. Experimental or documentary work might not include this step.

- [Scrivener](#)
- [Final Draft](#)
- [Screenplay Formatter for Google Docs](#)

5. Shooting

There are very specific formatting and syntax rules for professional screenplays, but depending on your professional goals, you can write a script however you want...

- [Film Basics 101](#) — Some quick tips on choosing your shots
- [15 Essential camera shots, angles, and movements](#)
- PRO TIP: Make a shot list ahead of time.

6. Sound recording

The built-in mics on your phone and camera are terrible; do not use them—especially outdoors where you will record nothing but wind. Getting a good mic is one of the fastest ways to make your video seem more professional (see gear recommendations above).

Sometimes you can plug a good mic directly into your camera, but it may also be useful to record audio separately on a portable audio recorder and sync the audio with the video while editing. Premiere and Final Cut have tools to [automate this](#), but you can also have your subject clap their hands or use a [clapper](#) to manually sync audio.

See the [audio page](#) for more.

- [Sound foley](#)
- [Recording narration and actor dialogue](#)
- [FreeSound](#) — Library of Creative commons sound effects
- [Free Music Archive](#) — Library of creative commons music
- [ZenCaster](#) — Great tool for recording remote audio conversations between two people.
- [Beginners guide to microphone types](#)

7. Scoring

With some MIDI software, it's pretty easy to make some ominous synth tracks or arpeggiated melodies, but you can also find creative commons music to use in your projects with attribution.

MIDI is a standard type of virtual instrument (i.e. digitally creating sounds on your computer); some audio programs are geared toward recording analog sound.

- [GarageBand](#) — Simple MIDI instruments and editing.
- [Premiere Pro](#) — Edit audio right in your video editor or export entire projects to Audition...
- [Adobe Audition](#) (LinkedIn Essential Training) — Dedicated audio editor, record and mix, easily interface with Premiere (no MIDI instruments)
- [Ableton Live](#) (LinkedIn Essential Training) — Great MIDI and recording suite, relatively cheap, great for electronic music.
- [Logic Pro](#) — Record and mix, MIDI instruments (especially ones that sound like traditional strings, brass, etc.)
- [Pro Tools](#) — Industry standard for recording and mixing; expensive.
- [Audacity](#) — A free open-source audio editor. It's pretty simple, so use Adobe Audition if you can.

8. Effects, editing, compositing, rendering

- Editing
 - What is a non-linear editor? ([NLE](#))

- [Adobe Premiere Pro Essential Training](#) (LinkedIn Learning)
- [Basic cuts](#) (Film editing crash course)
- Effects
 - [Adobe AfterEffects](#) — Add complex animation or special effects to Premiere clips or export standalone video.
 - [DaVinci Resolve](#) (LinkedIn Learning) — An NLE but most commonly used for color grading.
- 3D Compositing
 - [Natron](#)
 - [Nuke](#)
 - [Blender compositing](#)

9. Audio Editing and Mixing

Editing refers to placing and layering sounds in your timeline, including sound effects, music, and vocals; mixing is the process of getting them all to sound good together (now you can show off to your friends at the Oscars).

You can do all of this in a video editor like Premiere, but you can do some fancy stuff like [noise removal](#) if you export clips or your entire timeline into Audition.

- [Mixing Audio in Audition and Premiere](#)
- [How to export Premiere Audio to Audition](#)

10. Exporting

It's a good idea to test your workflow entirely with a proof of concept (see below) to make sure the final product looks the way you expect it to. You don't want to spend two hours rendering your video at midnight and have it turn out all squished and weird looking.

Video files include a container (a.k.a. file extension) and a codec (specific algorithm used to encode the frames of the video).

Containers:

- MOV and MP4 — Great, often what your video files are straight off the camera, and good for exporting high-quality master files.
- WebM — For video on the web; use this to get really small file sizes if you need to put your video on a website without something like YouTube or Vimeo. MP4 can also be used for this. Websites like [Converterpoint](#) are your best bet for generating these files; they'll get smaller file sizes than Premiere.

Codecs:

- h.264 and h.265 — Lossy, compressed video; h.264 is the standard codec used by most cameras, phones, and web players. It's successor is newer and will get smaller file sizes relative to quality, but may not be supported in some contexts. This is probably fine for most contexts.
- ProRes — Lossless, compressed video; this will give you better quality but potentially huge file sizes. Only use this for your main source copy of the project or potentially projecting in a theater. Not for online distribution. There are [a few types of ProRes](#) depending on your quality/filesize desires.

Frame Rates:

Typically stick with the frame rate of your source footage, though it is possible to mix frame rates within a single timeline.

- 30fps or 29.9fps — Standard video frame rate; can give a slightly "day time television" look to things.
- 24fps — The standard for film; use this for a slightly choppy, more cinematic look.

Frame Size

- 3840px x 2160px — 4K; probably overkill unless you have a 4K monitor or projector to display your work on. Useful if you want the freedom to crop shots without losing quality.
- 1920px x 1080px — Standard HD
- 1280px x 720px — "720p" HD; sometimes nice for web uploads.
- 640px x 480px — SD; hilariously small and to be avoided unless you're putting the video on the web.

Proof of concept

Demonstrate your filming or editing abilities with one of the following:

- Vignette: <https://vimeo.com/337054827>
- Film a sample scene or interview
- Video and audio example for an experimental project

Web Design and Development

Many professionals work primarily as a designer (visual layouts and styles) or a developer (building the functional website or web app through coding). For smaller projects, you can do it all yourself, and there are some options for code-free development, but it's worth considering what skills you want to focus on. Some projects may function better as interactive prototypes or speculative mockups, which you can read more about on other pages.

You might also create a website to supplement or present other types of work, such as illustrations, podcasts, or photography.

Types of Web Projects

- Landing page or informational site
- Business or eCommerce site
- Experimental site
- Net art
- Interactive storytelling
- Web app

Production Requirements

1. Research

- Brainstorm ideas and research relevant work or subject matter.
- Collect inspiration images or clips to show the visual style you're aiming for.
- Write a short synopsis of narrative work.
- [Creating mood boards](#)
- [Godly](#) — Trendy gallery of websites
- [SiteInspire](#) — Gallery of websites, filter by type
- [SeeSaw](#) — Another great gallery of sites.
- [Nice Every Nice](#) — A gallery of UI patterns and components (e.g. hero sections, navigation...)
- [Dribbble](#) — Community design showcase, usually mockups and not actual sites.
- [Awwwards](#) — Curated and beautiful websites
- [One Page Love](#) — Curated collection of one page websites.

2. Outline Content and Wireframe

Prepare content like text and images prior to designing so you know what you're working with; think about how to organize content logically among pages or sections. A wireframe should be low fidelity: sketched on paper or in design software with labeled boxes.

- [Wireframing Best Practices](#) (Practical UX Weekly on LinkedIn Learning)
 - [Illustrator for UX Design](#) (LinkedIn Learning)
 - [Wireframing in Adobe XD](#) (LinkedIn Learning)
 - [InVision Prototyping Tool](#) — Turn sketches or screen designs into an interactive prototype.
 - [How to Create a UX Sitemap](#) — Use index cards or a digital equivalent to map out your content.

3. High Fidelity Mockup

Compared to a simple wireframe, a mockup should look exactly like the finished site. This gives you a blueprint to refer to while developing and lets you experiment with layouts and visual styles faster than you can while coding. It also lets you get feedback early in the process.

- [Illustrator for Web Design](#)
- Recommended apps besides Illustrator:
 - Adobe XD: Design UI screens and prototype navigation with links and interactions.

- [Figma](#): Web app for responsive UI design, interactions, prototypes, and collaboration.
- [Sketch](#): UI Design and prototypes; web app or MacOS.
- [Framer](#): Web app for UI design and prototypes

1. Development

Penn State students have free personal web hosting offered through the university. You have to [request for your server space to be activated](#), and you can host static websites at a domain like "<https://personal.psu.edu/user123>"

If you want a more professional-looking domain, or wish to use a dynamic CMS like Wordpress, you'll have to buy your own hosting plan and domain.

- Web hosts and registrars
 - Free [JAMstack](#) Hosting for Github repos
 - Typically used with a static site generator (see below) but can host any static HTML files.
 - [Netlify](#)
 - [GitHub Pages](#)
 - [Cloudflare Pages](#)
 - Domain Registrars (\$)
 - [Namecheap](#) — Domain registration only
 - Shared Hosting (\$\$ – \$\$\$)
 - Typically includes domain registration; use an FTP client to manage files
 - [BlueHost](#) — Good all-purpose host
 - [Siteground](#) — Slightly fancier and more expensive
 - [Green Geeks](#) — Solar powered servers! *
- Static vs. Dynamic Sites
 - [General overview](#)
 - [Explainer video](#)
- Static Site Platforms
 - Hand-coded HTML
 - Only for simple sites with a few pages. To use page templates or modules, try...
 - Static Site Generators (requires command line use)
 - [Introduction to Static Site Generators](#)
 - [Eleventy](#)
 - [Beginner's Guide to Eleventy](#) — Covers basics of git, npm, and static site generators
 - [11ty Rocks!](#)
 - [Jekyll](#)
 - [Hugo](#) tutorials and resources
- Dynamic Content Management Systems (CMS)
 - [Wordpress](#) — Free, but requires hosting with database access.
 - [Beginner's Guide to Wordpress](#)
 - [How to Install Wordpress Locally with MAMP](#)
 - [Where to Learn Wordpress Theme Development](#)
 - [Become an Advanced Wordpress Developer](#) — LinkedIn Learning Path
 - Some great starter themes
 - These are essentially blank themes designed for making your own themes in a modern development environment.
 - [WP Rig](#)
 - [JointsWP](#) — Built on Foundations framework
- Code-Free Development
 - [Webflow](#) — A powerful visual development tool. Contact your instructor to inquire about free educational access to the full app.
 - Contact your instructor to be added to the free PSU Webflow Team account (equivalent to a premium account). You will lose access to this at the end of the course, but can export your work beforehand.
 - Webflow also offers a [massive discount for students](#) if you want to just use a personal account. Not sure how long you can keep that after you graduate.

- Squarespace, Wix, Weebly, and Carrd — These tools are meant for non-designers; they are more limited than anything listed above. If you want to use these, you should emphasize the content of the site as part of your creative work since your web design would be largely constrained by templates.
- Everything list — [Extensive list of web tools and technology](#)

2. Deployment

- Essential checklist:
 - Check all text for spelling
 - Optimize images for fast page loading
 - [Squoosh](#)
 - [Optimizing images in Photoshop](#)
 - [Check contrast](#) of text and background colors
 - Create a [favicon](#)
 - Check for broken links
 - Check your site in multiple browsers and screen sizes.
- For real world sites:
 - Add [meta tags](#) for search engines.
 - Create [social meta tags and share images](#).
 - Set up tracking with [Google Analytics](#) or [Fathom](#)
 - [Wordpress launch checklist](#)
 - Check your [page speed](#)
 - Check your [search engine optimization](#) (SEO) and ensure your site appears in Google searches.

3. Documentation

- Take some nice screenshots!
- Or record your screen to document animated content, or take us on a quick site tour.

Proof of Concept

A high-fidelity mockup or interactive prototype will be a good proof-of-concept.

If you're learning a new development tool, creating a simple test page would also be a good idea (likely running locally on your computer).

Portfolio Tips

A portfolio of work is essential for any creative field, to demonstrate your skills and interests. We'll break this down into two parts: assembling materials and creating a portfolio website.

1. Assembling Portfolio Materials

You should prepare images and videos of your work so you can have your portfolio materials ready to include with application to jobs, grants, or exhibitions.

Portfolio Media

Collect 10-20 examples of work that illustrate your skills and interests. A good portfolio can include examples of diverse media, but should show a cohesive voice and perspective. Showing similar themes, subject matter, or style can help tie your work together.

Images

- Prepare a variety of image sizes when exporting work, because different applications will ask for different things.
 - **High-resolution:** A PDF for vector-based work, or a 300ppi large size image for raster images. Consider how large you might print an image and check its dimensions in Photoshop.
 - **Large web size:** 1920px x 1080px (or similar depending on your aspect ratio); the largest size you'll typically need for websites or anything viewed on a screen.
 - For your website, optimize the image in [Photoshop](#) or [Squoosh](#).
 - **1000px wide:** A medium-size image that is often asked for in applications.
- [Tips on photographing paintings and 2D work](#)
 - [Studio photography of small/medium objects](#)
 - For apps, websites, videos, or other interactive work, take screenshots that illustrate the core functionality and most visually exciting parts of your project.

Videos

- **Documenting physical works or events:** definitely get a tripod, and if recording audio, get a microphone. See video and audio pages for more.
- **Edit a short trailer:** It's good to have lots of footage to draw from, but juries, hiring boards, and online audiences don't want to watch a twenty minute movie. Edit a 1-2 minute video that shows the gist of your work. This goes for documentation of physical work or digital time-based or interactive work.
- **Record a tour of screen-based work:** Use Quicktime or other screen recording apps to record yourself navigating websites/apps/games/coding projects and the like. You can always edit it down later.
- **Add a soundtrack:** Silent videos can be boring, so consider adding some nice instrumental or ambient music from the [Free Music Archive](#)

Reels

For filmmakers and animators, it's expected that you will have a short trailer documenting your work *overall* in addition to specific projects. A reel should feel exciting and in line with the style of your work, edited like a film trailer to advertise your abilities and breadth of work.

- [Examples of animation and VFX reels](#)
- [Film and videography reels](#)
- [Miscellaneous reels on Vimeo](#)

Interactive Media

- Websites, games, and prototypes can be made available online for people to view directly.

Written Materials

- **Artist Statement or Design Philosophy:** Depending on what creative field you consider yourself in, you would title and skew this differently, but essentially you should have a brief written summary of your professional interests.
 - Write about your ideas and process, and use examples from your work as illustrations.
 - Length: Definitely less than one page. 2-3 paragraphs is good, though you may want a separate extra short version that is a single paragraph.
 - Name drop: Include references to specific artists or designers who inspire you or relate to your work; include names of specific movements or styles to show you are familiar with the history of your field.
 - [Artist Statement Guidelines](#)
 - [UNSCA](#)
 - [Moma Art Glossary](#)
 - [Technical Design Terminology](#)
 - [Example of a needlessly complex statement and it's translation](#)
 - [International Art English](#)
 - [The Guardian: A user's guide to artspeak](#)
 - [How to Write an Artist Statement](#)
 - [Sample Artist Statements](#)
 - [Artist Statements We Love](#)
- Media Checklist
 - Prepare written captions for your main portfolio item, so it's ready to go and adapt for applications. Here's an example:
 - ***You are what you eat, 2020, video installation.*** This project was a generative video projected onto a moving food truck that incorporated archival film footage and contemporary news clips to produce abstracted commentary on industrial agriculture.
- Curriculum Vitae (CV)
 - A CV includes everything you've ever done that is relevant to your career; a **resume** is a shorter version that is geared to a specific job application.
 - CV Guidelines from the [College Arts Association](#)
 - As a designer, this is an opportunity to highlight your design skills with excellent typography and organization, but don't go crazy. Keep color to a minimum and ensure that it looks good if printed in black and white.
 - Prepare a PDF in Word or InDesign, but you may also want to include some of this information on your website as live web text.

2. Portfolio Websites

Recommendations are organized according to how much experience you have making websites. Whatever you do, get a real domain name like "<https://yourname.com>".

For Beginners

The following web apps are for non-designers, so they are more limited in terms of customization and advanced features. They're fast and easy to use, but make it clear that you are not a web designer.

- [Squarespace](#)
- [Wix](#)
- [Weebly](#)
- [Carrd](#) (one page sites)

For People with Some Web Experience

- [Webflow](#)
 - This is another web with a GUI, so you don't need to code, but you do need to understand CSS properties for layout and design. The plus side of that is that your site can be very customized and unique.
 - Downside: More expensive than some options.
 - Includes CMS tools for custom post types and back-end blogging etc.
- [Wordpress](#) (with an existing theme)
 - [Choose a free or premium theme](#): you can customize basic things like colors and fonts, and add in custom CSS for more advanced things, but you'll be primarily relying on the layout and functionality of your chosen theme.
 - [Beginner's Guide to Wordpress](#)
 - You'll need a domain name and a server that supports databases to install Wordpress— but that means you can shop around for hosting and can move your site at any time. Some of the options above lock you in to hosting with the company providing your visual design tool.
 - [Namecheap](#) — Domain registration only
 - [BlueHost](#) — Good all-purpose host
 - [Siteground](#) — Slightly fancier and more expensive
 - [Green Geeks](#) — Solar powered servers! *

For Web Developers

If you want to work in web development or as a freelancer, you want an awesome highly customized website to demonstrate your abilities. These more advanced platforms can also be a great learning opportunity, but will require a lot of time and Googling if you're learning something new.

```
* [Wordpress](https://wordpress.org) \ (custom theme\)
```

- * Building a theme from scratch requires working with PHP, but if you're familiar with HTML and CSS you can probably figure it out one step at a time.
- * Starter Themes: these are essentially blank themes designed for making your own themes in a modern development environment.
- * [WP Rig](https://wprig.mor10.com/)
- * [JointswP](https://jointswp.com/) – Built on Foundations framework
- * [Beginner's Guide to Wordpress](https://www.wpbeginner.com/guides/)
- * [How to Install Wordpress Locally with MAMP](https://www.wpbeginner.com/wp-tutorials/how-to-install-wordpress-locally-on-mac-using-mamp/)
- * [Where to Learn Wordpress Theme Development](https://css-tricks.com/where-to-learn-wordpress-theme-development/)
- * [Become an Advanced Wordpress Developer](https://www.linkedin.com/learning/paths/become-an-advanced-wordpress-developer?u=76811570) – LinkedIn Learning Path using WP Rig
- * Static Site Generators
 - * These are a relatively new type of website, that is faster than a database-backed CMS like Wordpress. These do require some use of Command Line, but that's web development for ya!
 - * [Introduction to Static Site Generators](https://davidwalsh.name/introduction-static-site-generators)
 - * [Jekyll](https://jekyllrb.com/)
 - * [GitHub Pages](https://pages.github.com/) – Hosts projects on GitHub.io
 - * [Hugo](https://gohugo.io/)
 - * [Eleventy](https://www.11ty.dev/)

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