A. Web planning process
    a. Steps
        i. Product requirements
        ii. Information architecture
        iii. User flows
        iv. Wireframes
        v. Visual designs/look and feel
        vi. Prototypes
        vii. Usability testing
    b. As you get closer to development phase, the fidelity/resolution of the step gets higher
        i. IA, user flows, wireframes = low resolution, quick, cheap sketches
        ii. Visual designs, prototypes = higher resolution, closer to actual product
B. Product requirements
    a. Stakeholders/product owners create product requirements
        i. As developer, you may be called to give input/help organize
    b. PRD = product requirements document
    c. Content varies
        i. Rationale for feature/product
        ii. Timelines
        iii. Functionality description
        iv. Data needs
        v. Timeline
        vi. Business objectives
        vii. User goals/needs
C. Information architecture
    a. https://www.webfx.com/blog/web-design/information-architecture-101-techniques-and-best-practices/
    b. Definition
        i. organizing, structuring, and labeling content in an effective and sustainable way in order to help users find information and complete tasks
        ii. specifying how items relate to each other within the system
    c. Why does IA matter?
        i. Peter Morville, week 1
        ii. “help users understand where they are, what they’ve found, what’s around, what to expect and what is possible”
        iii. Foundational structure that informs the rest of the process
            1. IA --> content strategy & user interface design --> interaction design (wireframing and prototyping processes)
            2. Architect : building :: Information architect : website/software/interactive services
    d. Organization scheme
        i. Inventory your content
            1. detailed listing of basic information about all the content that exists in a site or will need to be created new
            2. What do you have already?
            3. What do you need?
            4. Use conventions!
                a. eg business sites need contact pages, open hours
        ii. Group content into categories, pages, subpages

1. Subdivide content down further into smaller units until they represent comfortable, easily understood pieces for a user (“chunking”)

iii. Draw diagrams that show the site structure and rough outlines of pages with a list of core navigation links
1. “Site map”
2. Multiple hierarchy patterns
    a. Single page
    b. Flat structure
    c. Main page w/subpages (most common web pattern)

iv. Keep goals in mind!
1. What do you want your users to be able to do/find on the site?

v. Test the organization interactively with real users & refine

D. User flows
a. https://conversionxl.com/blog/how-to-design-user-flow/
b. Diagrams that show the steps a user would take to accomplish a goal on website
c. Start with understanding of user needs + business objectives
    i. business objectives: the action you want visitors to take on the site
    ii. user objectives: the desires or needs that they want to satisfy
    iii. match users needs with your business objectives
        1. goal is to map flows that take users from their entry pages toward the final action (signup, purchase etc).
        2. final action needs to provide value both to the user as well as the business
d. Understand how users enter the site
    i. Search? Social media? Email?
    ii. How user enters may indicate what their goal/need on site is
    iii. Different needs = different actions = different flows
e. Diagram flow
    i. Flows = individual screens where interactions take place
    ii. Each screen is showing something and the user is reacting to it
        1. state diagrams
        2. what the user sees | what the user does → what the user sees next | what the user does next
        3. focus on the most wanted action on every screen the users lands on
f. User flow example
    i. https://cargocollective.com/ameliabauerly/User-Flow-Example
    ii. Movie Night app: 'pinterest for films'. Users would follow other users ('critics') and lists of films created by other users. The content they would see displayed on their screens (ie, film recommendations) would be that curated by those they follow.

E. Wireframes
a. https://www.usability.gov/how-to-and-tools/methods/wireframing.html
b. What is a wireframe?
    i. two-dimensional/flat illustration of a page interface
    ii. middle ground between site map and prototype
    iii. focuses on space allocation and prioritization of content, available functionality and intended behavior
    iv. Only a guide to where the major navigation and content elements will appear
        1. NOT visual design
        2. Should be very basic & generic!

v. Sometimes can be used for usability testing
    1. Generic enough that users don't focus on design
    2. Can be too basic for real interactivity
    3. Often wait to the prototype stage

c. Why should we have wireframes?
    i. They connect the IA to visual design
    ii. Illustrate consistent ways for displaying information in the UI
    iii. Determine intended functionality in the interface
    iv. Prioritize content
        1. how much space to allocate
        2. where that item is located

d. Example wireframe, http://www.reactjs.org
    i. http://framebox.org

F. Visual design/look and feel
    a. What do I mean by design theory?
        i. principles of creating visual communication
        ii. how we see and perceive visual information
        iii. separates ideas of style, taste and trend from universal principles of aesthetics
        iv. the thinking and the ability to combine design principles and the purpose of the design to achieve an effective and pleasing result
    b. Everyone is a designer!
        i. We all design when we plan for something new to happen
            1. Recipe
            2. Rearranging the living room
            3. Refactoring code
        ii. Design thinking = inherent to human cognition
        iii. Professional designers study and understand design principles and apply them consciously
    c. Design process
        i. Start with understanding the context in which the thing will be created and eventually exist
            1. Where will it be experienced?
            2. By whom?
            3. What do those people already know?
            4. What is the budget & timeline?
        ii. Combination of research, requirements gathering and understanding constraints
    d. Design principles
        i. https://www.wix.com/blog/2018/07/7-principles-of-design-websites/
        ii. Balance
            1. keep the visual weight equally distributed on your website
            2. Website principles lead from newspaper/magazine design
                a. Strong grid
                b. https://www.nytimes.com/
        iii. Contrast & Emphasis
            1. Applying elements that are inherently opposite of each other in order to draw the eye or create visual interest
            2. Examples
                a. round vs. sharp shapes

b. negative vs. positive space
c. smooth vs. rough textures
d. Contrasting type styles (bold vs. regular, large type vs. small)
e. Contrasting colors (Reactjs.org get started)

iv. Movement
1. Think of movement/animation as a way to guide the user to elements you want them to see in a certain order
2. Motion can illustrated processes started/stopped/in progress
3. Gives tactile experience
a. Things move when we interact with them in real life

v. Repetition
1. Consistency = create a sense of certainty & reassurance
2. Elements create rhythm through the repetition of certain design elements
a. Consistent line spacing
b. Consistent typography/fonts
c. Templates so that users can locate information in the same place
3. Excessive repetition/consistency = monotony, boredom
a. Combine with other design principles
b. add visual breaks and white spaces to give viewers' eyes rest

vi. Hierarchy
1. Effective composition = three levels of hierarchy
a. the most important
b. the middle stuff
c. the least important
2. Human brains can't give same level of importance to every element
a. places more importance on the first elements that it perceives
3. Z scanning
a. https://webdesign.tutsplus.com/articles/understanding-the-z-layout-in-web-design--webdesign-28
b. super-impose the letter Z on the page
c. Western readers will scan a site the same way that they would scan a book - top to bottom, left to right
d. Most important = top left
e. Least important information = middle of the page (scanned quickly)
f. Call to action = bottom right (end of Z)

vii. Similarity
1. https://www.smashingmagazine.com/2016/05/improve-your-designs-with-principles-similarity-proximity-part-1/
2. Assigning relationships to like elements
a. Color
i. Color is often strongest indicator of relationships, can override things like shape & size
b. Shape
c. Visual weight
d. Size
e. Orientation
3. https://www.nytimes.com/
a. Example: size of features, visual divisions

viii. Proximity
1. https://www.smashingmagazine.com/2016/05/improve-your-designs-with-principles-similarity-proximity-part-1/
2. Placing related design elements together
3. Close proximity = items are connected or have a relationship to each other
    a. become one visual unit
    b. organise or give structure to layout
    c. logically grouped proximate content is easier to read and scan
4. Unrelated elements should be placed further apart to emphasize lack of relationship
5. White space
    a. Empty space
    b. natural inclination is to spread out the content evenly to fill the space
    c. White space can help group and organize
    d. Can make users look for divisions, perceived differences if separating elements that actually are related

e. Color theory
i. http://www.tigercolor.com/color-lab/color-theory/color-theory-intro.htm
ii. What do I mean by color theory?
1. The interaction of colors in a design
2. 16.8 million colors
3. How do we know how to use colors effectively?
iii. Colors have meaning/psychology
1. impart a tone and emotional impact
2. powerful design tool
3. vary dramatically across cultures and regions, know your culture/audience!
    a. Examples are primarily US/Western Europe
4. Red
    a. vibrant, aggressive
    b. Danger = stop signs, error messages, blood
    c. Red + black --> masculinity, aggression eg sports cars
    d. Red + whites or gold --> love and passion (think valentines day)
5. Orange
    a. less aggressive than red,
    b. Highly visible → construction, safety, and hunting equipment
    c. Represents fall → leaves, pumpkins, and Halloween
    d. warmth→ fun and energetic without red danger
6. Yellow
    a. sun, warmth, and summertime
    b. most visible color on the spectrum
    c. highest visibility especially combined with white or black
        i. safety equipment, school buses, and taxis
7. Blue
    a. celestial, the tropical, water
    b. Professional, stability (IBM = Big Blue)
    c. refreshing and cleansing
    d. darker shades can convey sadness
8. Green

a. plant life, growth and health --> organic, environment
b. Greens + blues + browns = nature
c. wealth and finance in the U.S.
d. Serenity, success -- green for go, success messages

9. Brown
    a. Not often used on the web, implies dirtiness (except when invoking nature re green)
    b. earthiness and luxury, esp food (https://www.godiva.com/)
10. Purple
    a. ancient Rome, only the rich could afford purple
    b. Still strong association w/luxury & creativity brands
11. White
    a. purity, innocence, and sterility
    b. weddings, healthcare, science, and spirituality
    c. cleanliness and freshness, eg laundry, clean sheets
12. Black
    a. strength, luxury, evil, death, and the unknown
    b. Good vs. evil = white vs. black
    c. Yin & yang

iv. Primary colors
1. basis for all other shades
2. Humans perceive three base colors: red, blue, and yellow
3. All other colors = combination of these in varying brightnesses, tints, and shades

v. Secondary colors
1. Green, orange and purple
2. Formed by mixing combinations of primary colors

vi. Tertiary colors
1. Yellow-orange, red-orange, red-purple, blue-purple, blue-green & yellow-green
2. Primary + secondary

vii. Temperature (hot/cold)
1. Colors have warmth associated with them
2. Warm/hot colors
    a. higher amounts of reds and yellows
    b. invoke sense of warmth and passion
    c. aggressive and bold → stand out, catch the eye
        i. Eg stop signs
        ii. Eg red is often used in error messages
3. Cool/cold colors
    a. higher amounts of blue
    b. Invoke sense of chilly climates, ice, winter, water, nighttime, death, and sadness
        i. can connote loneliness, coldness, and fear.
        ii. less aggressive and more soothing/relaxing
            1. Eg green success messages
4. Increasing temperature = increasing orange levels
    a. warmer and happier
        i. eg world looks happier when the sun is shining
5. Reducing temperature = decreasing orange levels

        a. colder and less inviting, like an overcast day
    viii. Color wheel
        1. http://www.tigercolor.com/color-lab/color-theory/color-harmonies.htm
        2. Complementary colors
            a. colors that are contrasting and located opposite of each other on the color wheel
                i. blue and orange
                ii. purple and yellow
                iii. red and green
            b. high contrast
            c. vibrant look at full saturation
        3. Analogous colors
            a. colors that are next to each other on the color wheel
                i. Purple and red
                ii. Orange and yellow
                iii. Blue and green
            b. match well
            c. create serene soothing designs
        4. Triadic colors
            a. Colors at the points of an equilateral triangle on color wheel
                i. Red yellow blue
            b. Vibrant
            c. Colors need to be balanced w/ 1 dominant and other accents
        5. Split-complementary colors
            a. Uses base + colors on either side of complementary color
            b. strong visual contrast
            c. less tension/vibrancy
        6. Rectangular + square
            a. 4 colors from wheel
    ix. Accessibility & usability from week 1
        1. High/low contrast
        2. Avoid difficult-to-discern color combinations: Green & Red; Green & Brown; Blue & Purple; Green & Blue; Light Green & Yellow; Blue & Grey; Green & Grey; Green & Black
        3. Use various shades of a single color (monochrome palette)
        4. Use high contrast
            a. Color blind people can perceive contrast, differences in hue, saturation and brightness
            b. Body text should be very high contrast -- black & white
        5. Use thicker lines
        6. Don't assume colors will signal emotions in and of themselves
            a. consider adding another symbolic element to convey meaning to color blind viewers
        7. Use texture in addition to color to differentiate

G. Prototyping
    a. Designers design based on descriptions/product requirements from stakeholders
    b. Sometimes requirements are not clear/poorly understood

c. Prototypes provide a visual overview of what is actually going to be made before developers get involved
    i. Takes visual design or wireframes and hooks them together via buttons, links, etc. to produce interactive UI
        1. build understanding
        2. explore options
        3. identify barriers that become obvious when UI is built
d. Often used at usability testing stage since users are able to click and explore UI and move through flows
e. Biggest benefit is mitigating risk at design step
    i. Failing earlier = learning earlier
    ii. Still have opportunity to validate, iterate and improve before development begins
f. Lots of tools/frameworks to prototype
    i. Either dedicated prototyping tool like InVision, Fluid, Adobe InDesign
    ii. Could also create rapid prototypes with a web framework like Bootstrap
    iii. Just need something that helps you rapidly set up interactive elements/screens
g. Prototype example
    i. https://www.justinmind.com/usernote/tests/17386057/17386059/36027864/index.html#/screens/993d5081-ce5b-42bd-9a93-4c8daca4fbbe

H. Usability testing
a. What is usability testing?
    i. evaluating a product or service by testing it with representative users
    ii. participants will try to complete typical tasks while observers watch, listen and takes notes
    iii. Goals
        1. identify any usability problems before they are coded
        2. Learn if participants are able to complete tasks successfully
        3. Identify how long it takes to complete tasks
        4. Find out how satisfied users are
        5. Identify changes required to improve user performance and satisfaction
b. What to test?
    i. questions about how site will work in practice
        1. Eg particular interaction or workflow
    ii. What do users notice on your home page?
    iii. what they would do first?
    iv. If planning to redesign a website or app, test the current version to understand what's not working
c. Whom to test?
    i. consider who will be using your product and how you can reach those people
    ii. Try to test representatives who will react like your users, but having people test early is better
        1. Usually not a good idea to design a site that only target audience can use
    iii. Small samples are fine!
        1. Usability expert Jakob Nielsen
        2. testing five people will catch 85% of the usability issues with a design, remaining 15% of issues with 15 users
        3. First 3 users likely to catch vast majority of problems
d. How to test

i. Determine goals/user flows that you want tester to accomplish
ii. Encourage thinking out loud
iii. Try not to help too much or give hints
iv. Ask probing questions (what are you noticing?)
    1. Follow up questions on why a user thinks what they do
v. Keep instructions simple

I. Contingency design & other things to consider as a developer
    a. What is contingency design?
        i. Design for when system deviates from expected/"normal" parameters
        ii. Real world examples
            1. Smoke alarms
            2. Life jackets
            3. TV closed captioning/subtitles
            4. Childproof containers
    b. Empty & too many results state
        i. Empty results
            1. Good: https://www.apple.com/us/search/qwerty?src=serp
            2. Good: https://www.target.com/s?searchTerm=qerty
            3. Good: https://www.target.com/s?searchTerm=xapatos
            4. Improve: https://www.nytimes.com/search?query=the
            5. Close enough guess -- "did you mean"?
            6. Clear explanations for no result or displaying inexact matches
            7. Enable users to expand search
            8. Provide helpful tips on how to improve results
        ii. Too many results
            1. Good: https://www.target.com/s?searchTerm=clothes
            2. Good: https://www.google.com/search?q=the
            3. Categories
            4. Pagination
            5. Lazy-loading chunks
    c. Text entry forms
        i. Difficult to make bulletproof!
        ii. Make text inputs painless
            1. Highlight required & optional fields
                a. Conventions bold, asterisks
                b. HTML "required" attribute
        iii. Ask details logically from the user's perspective
            1. not from the application or DB perspective
            2. Grouping
            3. https://cloud.netlifyusercontent.com/assets/344dbf88-fdf9-42bb-adb4-46f01eedd629/11a25465-3f60-4a15-8038-f79ea3be523a/1-designing-more-efficient-forms-preview-opt.png
        iv. Accept entries in common formats
            1. Number/textpad input -- only allows numbers
                a. https://storage.googleapis.com/twg-content/original_images/form-entry-nugget-3.png
            2. Be smart enough to be able to format to your needs
            3. Eg telephone numbers, dates, etc.

4. Know your audience re: formatting! (ie international area codes, mm/dd/yyyy format order, etc.)

v. Provide sample entries, dropdown menus instead of text, formatting hints for clean data
   1. https://css-tricks.com/wp-content/csstricks-uploads/top-aligned.png
   2. Eg passwords -- tell your users what acceptable format is, don't make them guess!
   3. For limited list of options, provide dropdown instead of freeform (eg, countries, states) or calendar selection for dates

vi. Eliminate invalid selections
   1. Don't let a user choose an invalid selection, remove from the UI
   2. Eg, out of range dates, deprecated selections

vii. Validate the entries as soon as possible
   1. Ie on entry or on blur
   2. Immediate feedback

viii. Don't include reset buttons in forms
   1. Do we really need a button that erases all the form content if clicked by accident?
   2. Submit and done!

ix. Disable submit on click

x. Cache information wherever possible in case the user drops out of the flow
   1. Browser form fills
   2. Temporary localstorage

d. Error state
   i. Good error message
      1. Error occurred
      2. What the error is
      3. How to recover
   ii. https://www.landsend.com/co/account/register (click submit without filling)
   iii. Give errors that are noticeable at a glance
   iv. Use color, icons and text to clearly highlight and explain problem AND problem area
      1. Clearly state the error at the top of the page and at the point where the error occurred
      2. Indicate the problem with bold red text (cf color blind contingencies)
      3. Draw attention to the error with icons or other indicators
      4. Offer possible solutions/mitigations
      5. Don't make users re-enter information that was correct
   v. Always identify errors in the same way
      1. Consistency!
   vi. Eliminate the need for back and forth clicking
      1. Collect errors and display them on a page that lets the user correct them without backtracking
   vii. Helpful server-side errors
      1. Customized 404 pages
         a. https://www.amazon.com/baz
         b. Navigation
         c. Search box
      2. Redirect commonly misspelled urls

e. Transitional states

i. http://michaelsoriano.com/wp-content/uploads/2014/05/ui-mistakes_14.png
ii. Server processes can take time, even with asynchronous requests
iii. Show users that something is happening
    1. Website is still functional and not stuck!
    2. Spinners, progress bars
    3. Animation = usability, grabs attention
iv. Notify users as to what's happening
    1. Modal letting user know what process is happening
    2. Checklist of steps happening to gauge progress
v. Disable UI until interaction can happen
    1. Use when clicking multiple times could kick off harmful process, eg, clicking twice charges credit card twice

f. I18n
    i. "internationalization"
    ii. For global sites, text needs to be translated into different languages
        1. Might involve change from ltr to rtl
    iii. Not every language will have same word length
    iv. UI needs to be able to flex/adapt to different text sizes plugged in
        1. Try not to set UI sections/elements to fixed widths
        2. Buttons, dropdowns, input fields
    v. UI should be able to adapt to text orientation in terms of readability
        1. Z-scanning, still work rtl?
g. Accessibility & usability from week 1
    i. Color contrast
    ii. Large tap areas for mobile
    iii. Scaleable/flexible UIs on text resize