Foundations of Computer Science (KU2DSCCSE102)

FYIMP S2 24 - 25

Unit IV: Fundamentals of WWW: Web Technology - Client Server Communication - DNS Server. Web Design using HTML: Static and Dynamic Web - Introduction to HTML5 - Anatomy of HTML document - Container Tags - Empty Tags - Element - Attributes. Creating HTML document - Fundamental Elements (<!DOCTYPE>, <head>, <title>, <body>) - View HTML document in Browsers. Text Formatting: <b>, <i>, <u>, <emp>, <mark>, <small>, <del>, <sub>, <sup> - Comments - Headings - Paragraphs - Alignments - Background and Text Colour Formatting. Inserting Images: image formats supported, src, alt, width, height, alignment, border. Adding Links: img, target, image as a link, link to email. Tables: Creation, Row, Columns, Borders, Size, Heading, Caption, Alignment. Lists: Ordered, Unordered, Description. Additional Formatting: address, marquee, font, favicon. Case Study: Design and development of static web pages using HTML

Foundations of Computer Science

Web Technology

- Web technology is the establishment and use of mechanisms that make it possible for different computers to communicate and share resources
- Web technologies are infrastructural building blocks of any effective computer network
- Communication on a computer could never be as effective as they are without the web technologies in existence

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Web Technology

- The main advantage of web technology is that it offers convenience and a high speed of communication in the computer world
- Wherever we are, processes using a computer are more swift and straightforward with the use of a network
- Web technology allows messages to be sent around a system, whereas before it may have been necessary to employ a runner or leave our workspace to communicate a message
- It is clear to see how web technology reduces costs and makes a company more efficient, raising business potential

Foundations of Computer Science

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Web Technology

- Web technology encompasses the tools, protocols, and languages that enable communication between devices over the Internet, facilitating the creation, maintenance, and interaction with websites and web applications
- Key elements of web technology are:
  - Web Browsers - Software applications that allow users to access and interact with content on the World Wide Web
  - They interpret and display web pages, enabling navigation through hyperlinks
  - Popular web browsers include Google Chrome, Mozilla Firefox, Safari, and Microsoft Edge

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Web Technology

- Key elements of web technology are:
    - HTML (Hypertext Markup Language) - The standard markup language used to create web pages
    - It structures content by defining elements such as headings, paragraphs, links, and images
    - HTML provides the foundational framework that browsers use to render web pages

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Web Technology

- Key elements of web technology are:
    - CSS (Cascading Style Sheets) - to describe the presentation of a web page, including layout, colors, and fonts
    - It works alongside HTML to enhance the visual appeal and user experience of a website

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Web Technology

- Key elements of web technology are:
  - JavaScript - a programming language that enables interactive and dynamic content on web pages
  - It allows developers to implement features like form validations, animations, and responsive menus, enhancing user engagement

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Web Technology

- Key elements of web technology are:
    - Web Servers - Computers that store, process, and deliver web pages to users
    - When we request a website, the web server retrieves the appropriate content and sends it to our browser for display

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Web Technology

- Key elements of web technology are:
    - HTTP/HTTPS (Hypertext Transfer Protocol / Secure) - the protocol used for transmitting data over the web
    - HTTPS is its secure version, encrypting data to protect sensitive information during transmission
    - These protocols define how messages are formatted and transmitted between browsers and servers

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Web Technology

- Key elements of web technology are:
  - APIs (Application Programming Interfaces) - Sets of rules that allow different software applications to communicate with each other
  - In web development, APIs enable functionalities like retrieving data from a server without reloading the page, integrating third-party services, and more.
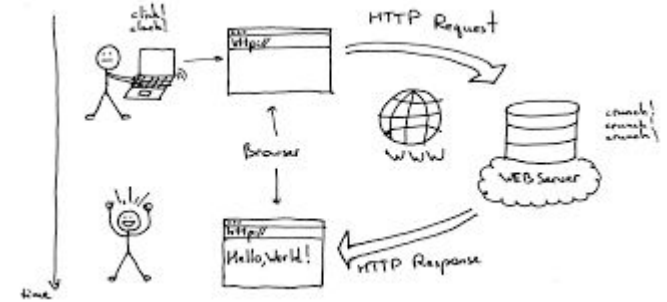
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Web Technology

- Key elements of web technology are:
  - Databases - Store and manage data for websites and applications
  - They allow for the retrieval, insertion, updating, and deletion of data, supporting dynamic content and user interactions

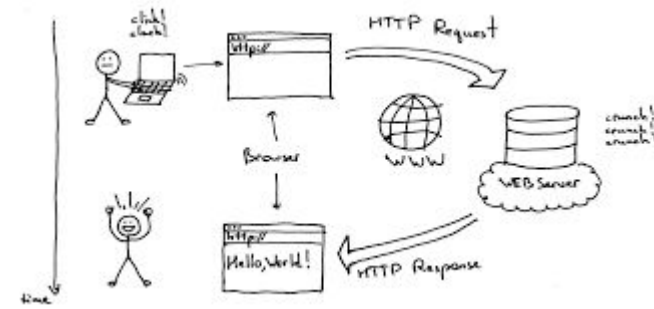## Web Technology - Client Server Communication

- Web technology make use of client-server communication to interact between the users' devices (clients) and central computers (servers) over a network

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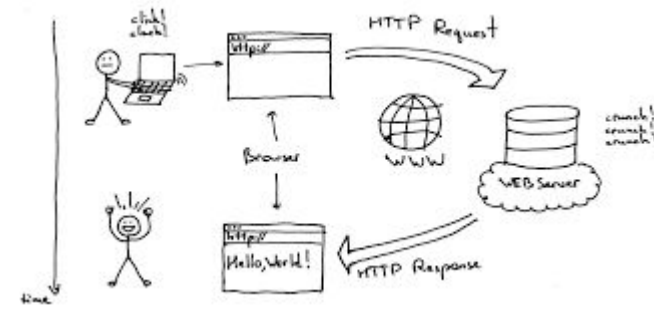**Web Technology - Client Server Communication**

- Key components of client-server communication are
    - Client: A device or application, such as a web browser, that initiates requests for resources or services from a server
    - Server: A system that processes client requests and delivers the requested resources or services

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Web Technology - Client Server Communication

- Communication process involves the following steps
    - Request Initiation: The client sends a request to the server, typically using the Hypertext Transfer Protocol (HTTP) or its secure version, HTTPS
    - Server Processing: The server receives the request, processes it—potentially interacting with databases or other services—and prepares a response
    - Response Delivery: The server sends the response back to the client, which then processes and displays the information to the user

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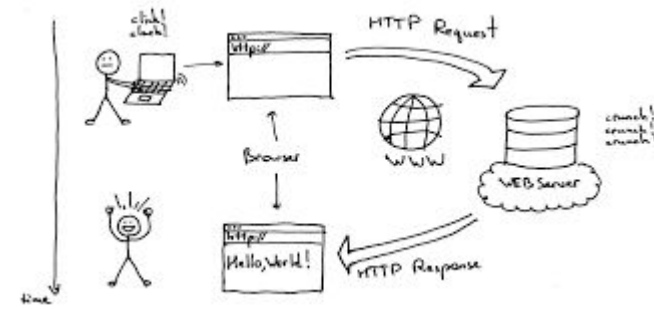**Web Technology - Client Server Communication**

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Web Technology - Domain Name Servers

HOW DNS WORKS

- When we access a website such as kannuruniv.ac.in (domain name), there is a corresponding IP address for every website hosted on a server
- We need only provide the website address in words
- .Who will do the lookup for the corresponding IP address then?
- Domain Name Servers are the Internet's equivalent of a phone directory! They maintain a directory of domain names and translate them to Internet Protocol (IP) addresses
- This is necessary because, although domain names are easy for us to remember, computers or machines, access websites based on IP addresses

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Web Technology - Domain Name Servers

HOW DNS WORKS
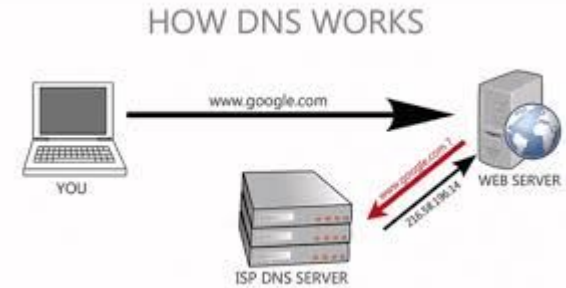
Primary functions of DNS are
- Name Resolution: DNS servers convert domain names into corresponding IP addresses, enabling browsers to locate and load Internet resources
- Efficient Internet Navigation: By providing a decentralized system for domain-IP mappings, DNS ensures users can access websites without needing to remember complex numerical addresses
- Load Distribution and Redundancy: If one server is unavailable, DNS can reroute requests to another server, ensuring continuous access
- Email Delivery: DNS plays a crucial role in directing email traffic by translating domain names in email addresses to the appropriate mail servers, facilitating accurate and efficient email routing

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Web Technology - Static and Dynamic Website
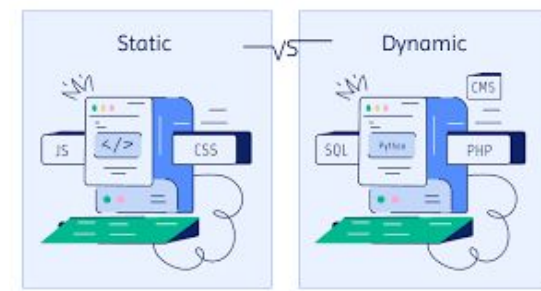
- In web development, websites are generally categorized as either static or dynamic, based on how their content is delivered and managed
- Static Websites
  - Static websites consist of fixed content - each page is a separate HTML file that displays the same information to every visitor
  - They are straightforward to develop and host, as they don't require server-side processing or databases
  - Static sites often load faster due to their uncomplicated structure
  - Updating content can be labor-intensive, as changes must be made manually to each HTML file.

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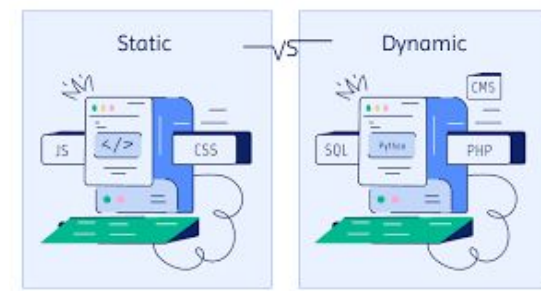**Web Technology - Static and Dynamic Website**

- Static Websites
    - We can often tell if a page is static or dynamic simply by looking at the page's file extension in the URL, located in the address field of the Web browser
    - If it is ".htm" or ".html," the page is probably static

Web Technology - Static and Dynamic Website

- Dynamic Websites
  - Dynamic websites generate content on-the-fly, tailoring information based on user interactions or real-time data
  - They offer personalized experiences, adjusting content according to user input or preferences
  - Development involves server-side scripting languages (e.g., PHP, Python) and databases to manage and deliver content dynamically
  - Content updates are more efficient, as changes in the database can reflect across multiple pages without altering individual files
  - If the webpage extension is ".php," ".asp," or ".jsp," the page is most likely dynamic.
  - While not all dynamic Web pages contain dynamic content, most have at least some content that is generated on-the-fly

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Web Technology - HTML

- When we look at a webpage in a Web browser, we see words. But most of the time webpages contain styled text rather than plain text
- Styled text is also accompanied with images, audio and video
- Let us learn how to develop a web page
- HTML is the fundamental language to develop a web page. To display the page on the client side device, a browser starts out by reading the HTML
- The W3C (World Wide Web Consortium) and the WHATWG (Web Hypertext Application Technology Working Group) maintains the HTML international standards and specifications

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Web Technology - HTML

- HTML was conceived by Tim Berners Lee in the late 1980s
- He is an English computer scientist best known as the inventor of the World Wide Web, the HTML markup language, the URL system, and HTTP
- He is a professorial research fellow at the University of Oxford and a professor emeritus at the Massachusetts Institute of Technology

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Web Technology - HTML

- HTML is a markup language for describing web documents (web pages)
- A markup language is a set of markup tags
- HTML documents are described by HTML tags. Each HTML tag describes different document content
- HTML separates "content" (words, images, audio, video, and so on) from "presentation" (instructions for displaying each type of content)

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Web Technology - HTML - Element
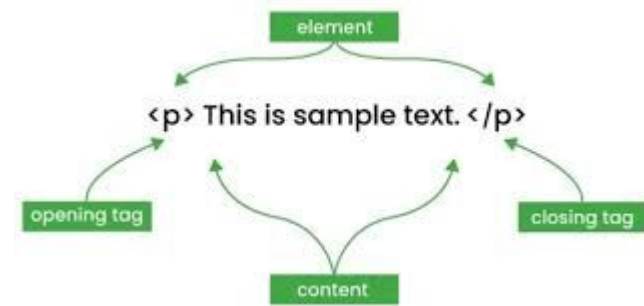
- The basic building block of html document is element
- Eacd HTML element has an opening tag, a closing tag, and the content sandwiched in between the start and end tags
  - \<tagname\>content\</tagname\>
- Element include two matching tags and everything in between
- The two angle brackets (<, >) and all of the characters between them are known as a tag
- The closing tag is always slightly different from the opening tag in that it has a forward slash after the first angled bracket
- Tags dictate the appearance of the content which is sandwiched between the tags

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Web Technology - HTML - Attributes

HTML Tags
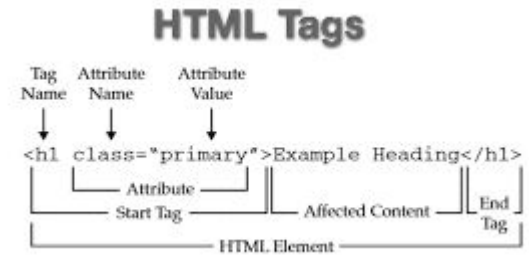
- Attributes are used to say something about the element that carries them, and they always appear on the opening tag of the element that carries them
- All attributes are made up of two parts: name and value
  - The name is the property of the element that we would like to set
  - The value is what we would like to assign for that attribute

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Web Technology - HTML - Container Tag
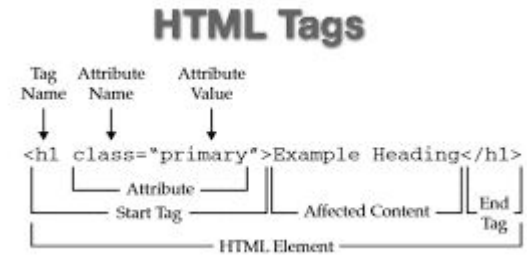
- A container tag is an element designed to encapsulate other elements
- These tags typically consist of an opening tag, enclosed content, and a closing tag

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Web Technology - HTML - Empty Tag

- An empty HTML tag consists of only an opening tag - it has no content or closing tag
- Empty elements are sometimes called self-closing elements
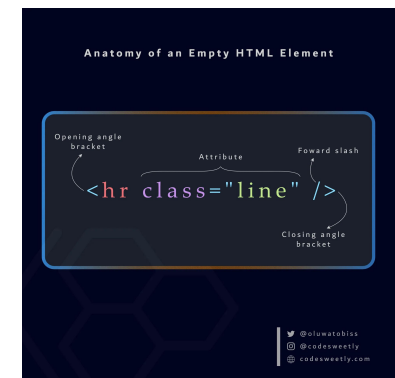
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Web Technology - Fundamentals Elements

- There few fundamental elements that are to be placed in every HTML document
    - <!DOCTYPE>
    - <html>
    - <head>
    - <title>
    - <body>

Foundations of Computer Science

Fundamentals Elements


```
         template.html
1   <!DOCTYPE html>
2
3   <html lang="en">
4   <head>
5       <meta charset="utf-8">
6       <title>Page Title</title>
7   </head>
8
9   <body>
10
11  </body>
12  </html>
13
```

- There few fundamental elements that are to be placed in every HTML document
  - <!DOCTYPE>
    - This not an element - its declaration to be used by the browser
    - Used to specify the version of HTML used in the document
    - This ensures that browsers render the content consistently and according to the appropriate standards
    - This is the first element typically used in a html document
    - To ensure uniformity and adherence to web standards, it is essential to include the <!DOCTYPE> declaration in all HTML pages

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Web Technology - Creating HTML page

- There few fundamental elements that are to be placed in every HTML document
  - \<html\>
    - the root of an HTML document. It contains all other elements to define the overall structure and content
    - It begins with the opening \<html\> tag and concludes with the closing \</html\> tag, encompassing both the \<head\> and \<body\> sections

Foundations of Computer Science

Fundamentals Elements

- There few fundamental elements that are to be placed in every HTML document
  - <head>
    - It serves as a container for metadata — information about the document that is not displayed directly on the webpage. Metadata is essential for browsers and search engines
    - It is placed between the opening <html> tag and the <body> tag
    - Metadata include the title of the web page, the character set, author, description, and keywords relevant to the document, external resources like stylesheets, internal CSS styles that apply to the document and JavaScript code or references for interactive functionalities

Foundations of Computer Science

Fundamentals Elements

- There few fundamental elements that are to be placed in every HTML document
    - `<title>`
        - Specifies the title of the webpage, which is displayed in the browser's title bar or on the page's tab ▬▬
        - Search engines utilize the title to understand the page's content, influencing its ranking and how it appears in search results
        - When users bookmark a page or share it on social media, the title often serves as the default description, providing context about the page's content
        - It is placed under the `<head>` element

Foundations of Computer Science

Fundamentals Elements

```
template.html
1   <!DOCTYPE html>
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9   <body>
10
11  </body>
12  </html>
13
```

- There few fundamental elements that are to be placed in every HTML document
  - \<body>
    - Serves as the container for all the content that is displayed to users within a webpage
    - This includes text, images, videos, links, tables, and other media
    - It is placed immediately after the \<head> element
    - It is enclosed within the \<html> tags
    - In HTML5, the \<body> tag is not strictly mandatory; browsers can infer its presence even if it's omitted
    - Its inclusion is highly recommended to maintain a clear and consistent structure, ensuring that all visible content is properly organized and displayed across various browsers

Foundations of Computer Science

Fundamentals Elements

```
                                    template.html
1    <!DOCTYPE html>
2
3    <html lang="en">
4    <head>
5        <meta charset="utf-8">
6        <title>Page Title</title>
7    </head>
8
9    <body>
10
11   </body>
12   </html>
13
```

- There few fundamental elements that are to be placed in every HTML document
    - `<body>`
        - Serves as the container for all the content that is displayed to users within a webpage
        - This includes text, images, videos, links, tables, and other media
        - It is placed immediately after the `<head>` element
        - It is enclosed within the `<html>` tags
        - In HTML5, the `<body>` tag is not strictly mandatory; browsers can infer its presence even if it's omitted
        - Its inclusion is highly recommended to maintain a clear and consistent structure, ensuring that all visible content is properly organized and displayed across various browsers

Foundations of Computer Science

Anatomy of HTML Document

```
①──────────── <!DOCTYPE html>

          ┌──── <html>

          │     ┌── <head>
          │     │   <meta charset="utf-8"> ──────── ④
      ③───┤         <title>Title here</title> ──── ⑤
②─────────┤     └── </head>
          │     ┌── <body>
          ⑥         Page content goes here.
          │     └── </body>

          └──── </html>
```

1. The doctype declaration is not an HTML tag, but it tells the browser which version of HTML is to prepare the the page
2. The <html> element defines the whole document
   a. Only two elements appear as direct children of an <html> element: <head> and <body>
3. The <head> element is just a container for all other header elements. It should be the first thing to appear after the opening <html> tag
   a. <head> element should contain a <title> element indicating the title of the document

Foundations of Computer Science

Anatomy of HTML Document

```
                                    <!DOCTYPE html>        ①

                                    <html>

                                    <head>
                                    <meta charset="utf-8">   ④
                                    <title>Title here</title> ⑤
                                    </head>

                                    <body>
                                    Page content goes here.
                                    </body>

                                    </html>
```

4. The <body> element appears after the <head> element
   a. The <body> element defines the document body

Foundations of Computer Science

Text Formatting - Creating Headings using hn Elements

- Syntax: <hn> "String" </hn>
- 6 levels of headings – h1 and h6 produce the largest and smallest headings, respectively
- Most browsers display the contents of h4 tag with the default font and size. h1, h2 and h3 will be bigger and h5 and h6 will be smaller
- Heading can be aligned - left, right and center
- align attribute is used for this purpose
  - Example: <h1 align="left">Left-Aligned Heading</h1>

Foundations of Computer Science

Text Formatting - Creating Paragraphs using <p> Element

- Syntax: <p> "String" </p>
- When a browser displays a paragraph, it usually inserts a new line before the next paragraph and adds a little bit of extra vertical space.
- If you put several consecutive spaces between two words, by default, only one space will be displayed by the browser. This is known as white space collapsing
- Similarly, if you consecutive empty lines, these will be ignored and simply treated as one space. tab characters will also be treated similarly

Foundations of Computer Science

Text Formatting - Presentation Elements

- \<b\>
  - It stands for bold
  - Used to apply bold formatting to text content
  - Example:- \<p\>This is a \<b\>bold\</b\> word in this sentence.\</p\>
    - In this example, the word **bold** will appear in boldface within the paragraph

Foundations of Computer Science

Text Formatting - Presentation Elements

- \<b\>
  - It stands for bold
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  - Example:- \<p\>This is a \<b\>bold\</b\> word in this sentence.\</p\>
    - In this example, the word **bold** will appear in boldface within the paragraph

Text Formatting - Presentation Elements

- \<i>
  - It stands for italics
  - Used to represent a span of text that is set off from the normal text for various reasons, such as idiomatic expressions, technical terms, or phrases from other languages
  - Used to present text in an *italicized typeface* formatting to text content
  - Example:- \<p>The term \<i>carpe diem\</i> is Latin for "seize the day".\</p>
    - In this example, the word *carpe diem* is italicized

Foundations of Computer Science

Text Formatting - Presentation Elements

- <u>
  - It stands for underline
  - The <u> tag renders text with an <u>underline</u> by default, distinguishing it from surrounding content

  - Example:- <p>The term <u>carpe diem</u> is Latin for "seize the day".</p>
    - In this example, the word <u>carpe diem</u> is underlined

Foundations of Computer Science

Text Formatting - Presentation Elements

-
  - Semantically denotes stressed emphasis. By default, browsers render content within the tag in italics
  - Example:- <p>The term carpe diem is Latin for "seize the day".</p>
    - In this example, the word *carpe diem* is empasised

Foundations of Computer Science

Text Formatting - Presentation Elements

- \<mark\>
  - Used to highlight or mark text that holds special relevance or importance within a document
  - Browsers typically render this text with a yellow background to distinguish it from the surrounding content
  - Example:- \<p\>Remember to buy \<mark\>milk\</mark\> today.\</p\>
  - Here <mark>milk</mark> is highlighted

Foundations of Computer Science

Text Formatting - Presentation Elements

- `<small>`
  - Intended for content that is less prominent, like legal disclaimers or side comments
  - Browsers typically display the `<small>` element's content one font size smaller than the parent element's font size.
  - Example:- `<p>All rights reserved. <small>Terms and conditions apply.</small></p>`

Foundations of Computer Science

Text Formatting - Presentation Elements

- \<del\>
  - Used to represent text that has been removed from a document
  - Browsers render this text with a ~~strikethrough~~, indicating its deletion
  - Example:- \<p\>She enjoys \<del\>playing tennis\</del\> \<ins\>playing soccer\</ins\>.\</p\>

Foundations of Computer Science

Text Formatting - Presentation Elements

- \<sup\>
  - Used to display text as superscript, meaning the text is rendered slightly above the baseline and often in a smaller font size
  - This is utilized for mathematical expressions, such as exponents, ordinal indicators, or footnotes.
  - Example:- \<p\>The formula for the area of a square is A = s\<sup\>2\</sup\>, where s is the length of a side.\</p\>
  - In this example, the "2" is displayed as a superscript, indicating "s squared."

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Text Formatting - Presentation Elements

- \<sub>
  - The \<sub> HTML element is used to display text as subscript, meaning the text appears slightly below the baseline and is often rendered in a smaller font size
  - This formatting is commonly applied in contexts such as chemical formulas, mathematical expressions, and technical annotations
  - Example:- \<p>The chemical formula for water is H_{2\}O.\</p>
  -

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Text Formatting - Background and Text Colour

- In HTML 5, changing the font color of text is achieved as follows:
    - `<p style="color: red;">This is a red paragraph.</p>`
    - `<body style="color: red;">This is a red paragraph.</body>`
    - Color names can be specified as predefined names like red, blue, or green
- Similarly background colour is changed as follows:
    - `<p style="background-color: lightgray;">` This paragraph has a light gray background. `</p>`
    - `<body style="background-color: powderblue;">`
        `<!-- Page content goes here -->`
        `</body>`

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Inserting Images

- <img> element is used to insert images
- This element supports a variety of image formats including JPG (Joint Photographic Experts Group), PNG (Portable Network Graphics), GIF (Graphics Interchange Format), SVG (Scalable Vector Graphics), and WebP (Google)
- Syntax: <img src="path/to/image file" alt="Description of the image", width="pixels" height="pixels">
- Example:-
  - <img src="image.jpg" alt="Description of image" style=" width: "100" height: "100">

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Adding Links: img, target, image as a link, link to email

- Hyperlinks are created using the <a> (anchor) element, which allows users to navigate to different web pages, resources, or sections within the same page
- Syntax: Link Text
  - href attribute specifies the destination URL of the link such as abc.com
  - Link Text: The clickable text that users see
  - Example:- Visit Example
- Linking to Sections Within the Same Page:
  - Assign an id to the target element: <h2 id="section1">Section 1</h2>
  - Create a link to that id: Go to Section 1

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Adding Links: img, target, image as a link, link to email

- To make an image function as a hyperlink in HTML, you can wrap the <img> tag inside an <a> (anchor) tag. This allows users to click on the image to navigate to a specified URL
- Syntax: <img src="image_source" alt="description">
  - href: Specifies the destination URL
  - src: Indicates the path to the image file
  - alt: Provides alternative text for the image, enhancing accessibility
- Example:- <img src="logo.png" alt="Company Logo">

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Adding Links: img, target, image as a link, link to email

- In HTML, you can create a link that opens the user's default email client with a pre-filled recipient address using the mailto within an anchor (<a>) tag
  - Send Email

Foundations of Computer Science
Lists: Ordered, Unordered, Description

- Three types of lists
    - Unordered lists, which are like lists of bullet points.
    - Ordered lists, which use a sequence of numbers or letters instead of bullet points
    - Description lists, which allow you to specify a term and its description

Foundations of Computer Science

Lists: Ordered, Unordered, Description

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Foundations of Computer Science
Lists: Ordered, Unordered, Description

- Unordered Lists
    - \ Element is used to create unordered lists (which stands for unordered list)
    - Each bullet point or line should then be contained between opening \ tags and closing \ tags (the li stands for list item)
    - Example:-
    \
        \
Bullet point number one\
        \
Bullet point number two\
        \
Bullet point number three\
    \

Foundations of Computer Science
Lists: Ordered, Unordered, Description

- Unordered Lists
  - Shape of the bullets used can be altered using the type attribute
  - Values of this attribute are: disc, circle and square
  - Default shape is circle.
  - Example:-
    ```
    <ul type="disc" >
        <li>Bullet point number one</li>
        <li>Bullet point number two</li>
        <li>Bullet point number three</li>
    </ul>
    ```

Foundations of Computer Science

Lists: Ordered, Unordered, Description

- Ordered Lists
  - In an ordered list, each point is prefixed with a number (1, 2, 3), letters (A, B, C), or Roman numerals (i, ii, iii)
  - An ordered list is contained inside the <ol> element
  - Each item in the list should then be nested inside the <ol> element and contained between opening <li> and closing tags
  - Example:-

        Point number one
        Point number two
        Point number three

Foundations of Computer Science

Lists: Ordered, Unordered, Description

- Ordered Lists
  - type attribute can be used to specify the whether we need numbers, alphabets or roman numerals in ordered list

Value for type Attribute	Description	Examples
1	Arabic numerals (the default)	1, 2, 3, 4, 5
A	Capital letters	A, B, C, D, E
a	Small letters	a, b, c, d, e
I	Large Roman numerals	I, II, III, IV, V
i	Small Roman numerals	i, ii, iii, iv, v

  - Example:-
    ```
    <ol type= "i">
         <li>This is the first point<
         <li>This is the second point</li>
         <li>This is the third point</li>
    </ol>
    ```

Foundations of Computer Science
Lists: Ordered, Unordered, Description

- Description List
- Definition lists are contained inside the <dl> element
- The <dl> element then contains alternating <dt> and <dd> elements
- The content of the <dt> element is the term that will be defined. The <dd> element contains the definition of the previous <dt> element
- Example:-

```
<dl>
        <dt>Unordered List</dt>
        <dd>A list of bullet points.</dd>
        <dt>Ordered List</dt>
        <dd>An ordered list of points, such as a numbered set of steps.</dd>
        <dt>Definition List</dt>
        <dd>A list of terms
</dl>
```

Foundations of Computer Science

Tables: Creation, Row, Columns, Borders, Size, Heading, Caption, Alignment

- A table consists of rows and columns
- A table is constructed using <table> element
- Within the <table> tag, a row can be defined using <tr> element
- Within a row, columns can be added using <td> element
- Example:-

```
<table border="1">
      <tr>
            <td>Row 1, Column 1</td>
            <td>Row 1, Column 2</td>
      </tr>
      <tr>
            <td>Row 2, Column 1</td>
            <td>Row 2, Column 2</td>
      </tr>
</table>
```

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- Example:-

```
<table border="1">
      <tr>
            <td>Row 1, Column 1</td>
            <td>Row 1, Column 2</td>
      </tr>
      <tr>
            <td>Row 2, Column 1</td>
            <td>Row 2, Column 2</td>
      </tr>
</table>
```

Foundations of Computer Science

Tables: Creation, Row, Columns, Borders, Size, Heading, Caption, Alignment

- Attribute Border is used to specify the border thickness of the table
- A The value for this attribute is the width you want the outside border of the table to be in pixels
- If you give this attribute a value of 0, or if you do not use this attribute, then no borders will be placed for the table

Foundations of Computer Science
Tables: Creation, Row, Columns, Borders, Size, Heading, Caption, Alignment

- Every cell in a table will be represented by either a <td> element for cells containing table data or a <th> element for cells containing table headings
- By default the contents of a <th> element are usually displayed in a bold font, horizontally aligned in the center of the cell
- The content of a <td> element, meanwhile, will usually be displayed left-aligned and not in bold
- <tr> element creates a row

Foundations of Computer Science

Tables: Creation, Row, Columns, Borders, Size, Heading, Caption, Alignment

- To add a caption to a table, you just use the <caption> element after the opening <table> tag and before the first row or header
- Example
  <table>
  <caption>Spanning columns using the colspan attribute</caption>
  <tr>

========