

# Web Technologies (INBPA0316E) Exam Topics

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December 7, 2024

## 1 World Wide Web

- Basic concepts: resource, representation, content negotiation, dereferencing a URI, user agent
- The three types of standards by origin: de facto standards, de jure standards, voluntary consensus standards
- Organizations responsible for web standards: IANA; IETF, the RFC series; W3C; WHATWG

## 2 Unicode

- What is Unicode?
- Basic concepts: codespace, code point, Basic Multilingual Plane (BMP)
- Character encodings: UTF-8, UTF-16, UTF-32
- Expressing Unicode characters in CSS, JSON, XML, and HTML

## 3 Media Types

- What are media types?
- Components of media types: top-level type, subtype, parameters, structured syntax suffix
- Top-level types: `application`, `audio`, `font`, `image`, `message`, `multipart`, `model`, `text`, `video`

## 4 URI

- What is a URI?
- URI schemes
- URI characters, percent-encoding
- URI syntax, the host, port, path, query, and fragment identifier components
- Meaning of the fragment identifier

- URI-reference, relative reference
- Relative reference resolution
- URI comparison

## 5 HTTP Fundamentals

- The `http` and `https` URI schemes
- Message abstraction
- Fields
- The `User-Agent` header field
- HTTP methods: `GET`, `HEAD`, `POST`, `PUT`, `DELETE`
- Status codes, classes of status codes
- Redirection, the `Location` header field
- Content negotiation, proactive negotiation
- The `Accept` header field
- HTTP/1.1 message format

## 6 Web Browsers

- The structure and components of a web browser
- Steps of rendering a web page, critical rendering path
- Major rendering engines, major desktop and mobile browsers
- Browser add-ons, browser extensions
- Headless browsers
- The `about` URI scheme

## 7 Markdown

- What is a markup language? Examples of markup languages
- What is Markdown?
- Characteristics of Markdown
- Standardization, Markdown variants
- Practical uses of Markdown

## 8 An Introduction to XML

- What is XML?
- Comparison of XML and HTML
- Advantages and disadvantages of XML
- Document-centric and data-centric XML

## 9 XML 1.0

- XML documents, well-formedness
- Elements
- Special characters (the & and < characters)
- Markup constructs: start-tags, end-tags, empty-element tags, character references, entity references, comments, processing instructions, CDATA section delimiters, XML declaration, document type declaration
- Document type definition, validity
- Element type declarations: empty element, element content
- Predefined entities

## 10 JavaScript/ECMAScript

- What is ECMAScript/JavaScript?
- What is a JavaScript engine? Major JavaScript engines
- What is Node.js?

## 11 JSON

- What is JSON?
- Comparison of JSON and ECMAScript
- Comparison of JSON and XML
- Primitive types: strings, numbers, booleans, null
- Structured types: arrays, objects
- Converting XML to JSON, and vice versa (see the examples on pages 21 and 22 of the presentation about JSON)

## 12 CSS

- What is CSS?
- The development of CSS, CSS levels
- The CSS box model
- Syntactic elements: characters, escape sequences, comments, declaration blocks, at-rules, style rules
- Properties
- Selectors: type selector, universal selector, attribute selectors (only [att] and [att=val]), class selector, ID selector, pseudo-classes (:link, :visited, :hover, :active, :lang(C), :is(), :not()), and structural pseudo-classes), pseudo-elements
- Selectors: combinators (descendant combinator, child combinator, next-sibling combinator)
- Selectors: specificity, calculating the specificity
- Stylesheet origins: user agent, user, author

- Important declarations (`!important`)
- The cascade
- Rule ordering
- Inheritance
- Error handling
- Determining box sizes in CSS: the `box-sizing`, `width`, `height`, `min-width`, `min-height`, `max-width`, and `max-height` properties

## 13 CSS Preprocessors

- What is a CSS Preprocessor?
- Common features of CSS preprocessors
- Sass: the SCSS syntax, main features (variables, nesting, mixins, `@extend`)

## 14 Markup Languages of the Web

- What is HTML?
- The elements of HTML
- Global attributes (`id`, `class`, `lang`, `style`, custom data attributes)
- HTML syntaxes: the HTML syntax, the XML syntax
- Document Object Model (DOM)
- The HTML document type declaration
- Rendering modes of browsers: quirks mode, standards modes
- Error handling

## 15 Responsive Web Design

- What is Responsive Web Design?
- Page layouts: static/fixed width, fluid/liquid, adaptive, responsive
- Reference pixel, CSS pixels and physical pixels
- The absolute and relative length units of CSS, viewport units
- Media queries, media queries in CSS and HTML, syntax, evaluation, media types, media features (only `width`, `height`, and `orientation`), combining media features (`not`, `and`, `or`), the `min-` and `max-` prefixes (`min-width`, `max-width`, `min-height`, `max-height`)
- The visual and layout viewports, the `viewport` meta tag
- Mobile-first and desktop-first design
- Fluid grids: flexbox layout, grid layout
- Major characteristics of the Bootstrap CSS framework

## 16 Images in CSS and HTML

- Major image formats: JPEG, PNG, WebP, AVIF, SVG

- The `<img>` HTML element: the `alt` attribute; the `height/width` attributes, their importance, image layout shift

## 17 Advanced Features of HTTP

- Cookies: definition, uses, the `Set-Cookie` and `Cookie` header fields, cookie attributes, cookie management, third-party cookies
- Web tracking: information on which web tracking can be based on, the `Referer` header field, protection against tracking
- Origin, same-origin policy

## 18 HTTP/2 and HTTP/3

- Best practices for reducing latency: inlining, spriting, sharding, content delivery network (CDN), concatenation, minification
- What is HTTP/2?
- New features of HTTP/2
- What is HTTP/3? What is QUIC?

## 19 Reading Code

Students must be able to read and understand XML, DTD, JSON, JSON Schema, HTML, CSS, and SCSS (Sass) code.

They must be familiar with the HTML elements and CSS properties used in the computer labs over the semester.